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

Date of Report: 9/5/07

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: WH Complex

B. Fire Number: MT-GNF-000078

C. State: MT

D. County: Park, Sweetgrass

E. Region: 01

F. Forest: Gallatin

G. District: 01, 02

H. Fire Incident Job Code: P1DV34

I. Date Fire Started: 8/9/07

J. Date Fire Contained:

K. Suppression Cost: $5,500,000 as if 8/26

L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles): 7 as of 9/5/07
2. Fireline seeded (miles): 0
3. Other (identify):

M. Watershed Numbers: 100700020906, 100700020903, 100700020303, 100700020302,

N. Total Acres Burned: 29,000 as of 9/5/07
NFS Acres(29,000) Other Federal (0) State (0) Private (0) some unburned private acres are within the fire perimeter

O. Vegetation Types: Engelmann spruce/subalpine fir (35%) lodgepole pine and Douglas fir (50%), Whitebark Pine (10%), grassland (5%)

P. Dominant Soils: Soils are medium textured with many rock fragments. Dominant parent materials are alluvium and colluvium over residuum derived from consolidated Tertiary volcanics. Soils are moderately productive and have low to moderate erosivity. Soil productivity is generally moderate, but is low on some areas of shallow or extensively rocky soils. Primary landscape forming processes are stream down cutting, slope wash, and some debris flows.

Q. Geologic Types: intrusive and extrusive Tertiary volcanics, Cambrian Paleozoic sediments along Mill Creek

R. Miles of Stream Channels by Order or Class: 1st order 110 miles, 2nd order 25 miles, 3rd order 17 miles, 4th order 11 miles

S. Transportation System

Trails: 36.7 miles Roads: 43 miles

PART III - WATERSHED CONDITION

A. Burn Severity (acres): 15,130 (low) 12,100 (moderate) 500 (high)

B. Water-Repellent Soil (acres): 12,100 (mostly moderate repellancy but pockets of high)

C. Soil Erosion Hazard Rating (acres):
1,782 (low) 10,818) (moderate) 15,130 (high)

D. Erosion Potential: 76 tons/acre

E. Sediment Potential: 19 cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 2 grass/shrubs 20-50 conifers

B. Design Chance of Success, (percent): 70

C. Equivalent Design Recurrence Interval, (years): 5

D. Design Storm Duration, (hours): 6 and 1 hr

E. Design Storm Magnitude, (inches): 1.5 (6hr), 0.98 (1hr)

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

G. Estimated Reduction in Infiltration, (percent): 55

H. Adjusted Design Flow, (cfs per square mile): 84

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:

The 26,500 acre Wicked Creek fire and the 2,500 acre Hicks Park fire form the 29,000 acre WH complex. Major tributary streams burned within the Wicked Creek fire area include Colley Creek, Anderson Creek,

Passage Creek, East Dam Creek, parts of the East Fork of Mill Creek, and additional parts of Mill Creek. Very little of the fire burn pattern is mosaic. The table below displays the burn intensity for the main watershed in the Wicked Creek fire. Moderate burn intensity areas had primarily low burn severity while high burn intensity areas had a combination of low and moderate burn severity. Approximately 38% of the Wicked Creek fire has soil erosion hazard while 55% has high erosion hazard.

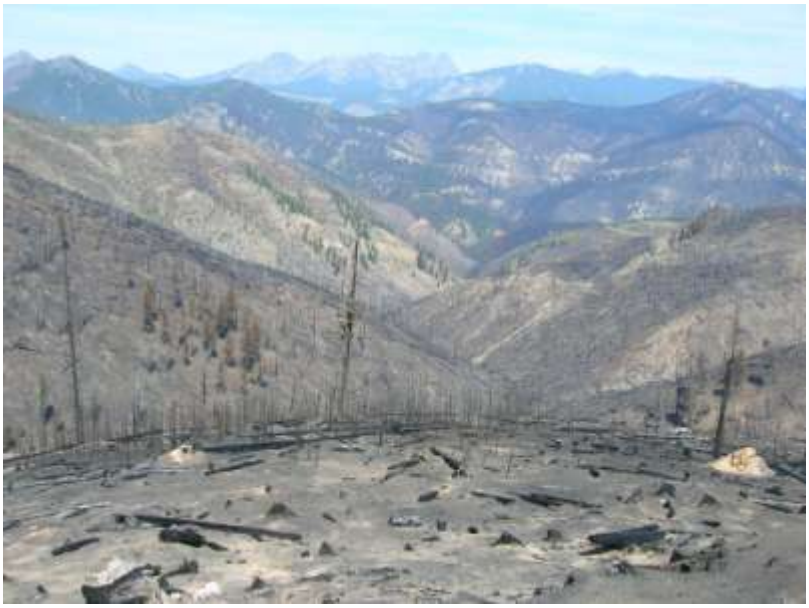
Burn Intensity for Wicked Fire.

Watershed Name	Total Acres	Moderate Burn Intensity acres	High Burn Intensity acres
Wicked Creek	2,080	504	1200
Passage Creek	13,570	4,940	3,810
Anderson Creek	5,120	1,260	3,480
Colley Creek	4,350	940	920
Mill Creek @ Snowbank Cpg	50,240	10,200	11,800

The 2500 Hicks Park fire (east end of the WH complex) had about 20% high intensity burn, 50% moderate intensity burn, and 30% low intensity and unburned. No BAER treatments are being requested for Hicks Park fire except for some weed treatments on the west side of the fire.

About 50% Most of the soils examined displayed hydrophobic conditions in burned areas. Areas of high burn intensity examined 2 weeks after the Wicked Fire and rain events of 8/18 and 8/19 had limited infiltration in spots below a wet ash layer indicating infiltration reduction in burned areas. The Wicked Creek and Hicks Parks fires were a lightning ignition, wind driven events which burned actively for about 1 week. The WH Complex is about 70% within the Absaroka -Beartooth Wilderness, hence the high ratio of trail treatments. Stormflow runoff response could be robust through the remainder of 2007 and into the summer of 2008 due to reduced ground cover. During the winter of 2007/2008, fire induced water repellency is expected to be reduced, particularly after spring 2008 green up. Vegetative recovery is expected to be robust during the summer of 2008. In high intensity burn areas, however, the vegetation mass will need to be compressed by snow onto the soil during the winter of 2007/2008 and will begin to form a protective litter layer and expected substantial storm response decline in 2008.

The primarily drainages affected by the Wicked Creek Fire include Wicked, Colley Creek, Passage, Anderson, and Mill Creek. Wicked Creek (58%) and Anderson Creek (68%) have the highest percent of high intensity burn. Sediment increases were modeled with the R1R4 model with an estimated pre-fire sediment yield of 2% to 10% prefer over natural to 156% to 315% over natural the first year after the fire. Peak flows were calculated for watersheds less than 5000 acres using the NRCS (TR-20) Fire Hydrology (2002) spreadsheet (RCN method) and for watersheds greater than 5000 acres via adjustments to Parrott (2004) USGS regression equations. Results for the 3.25 mile^2 Wicked Creek watershed indicated a Q_5 NRCS method peak flow increase from pre-fire 32 cfs to post fire 273 cfs. The USGS method for Mill Creek indicates a Q_5 peak flow increase from pre-fire 645 cfs to post fire 905 cfs. Flooding in Mill Creek, Passage Creek, or Anderson Creek is not anticipated from the fire although localized debris flows and 1-2nd order tributary erosion could occur in localized areas and in Wicked or East Dam Creeks due to locally intensive rain events.



View north along Wicked Creek. This 3.25 mi^2 drainage has been historically heavily logged & roaded and moderately burned in the 1991 Thompson Creek wildfire. Sediment levels are modeled to increase from 10% over natural prefire to 315% over natural the first year after the fire. Stormflow modeling indicates a 5 x (Q2) to 3 x (Q50) increase in first year stormflows.

Cultural features. There are no known cultural features at risk in this area. A pre-historic site 24PA0156 is on a terrace above Mill Creek about 3 miles below the fire perimeter. Mill creek streamflow increases are not projected to be sufficient to pose accelerated flooding to the site.

Yellowstone Cutthroat Fishery: The Mill Creek stream system above a constructed barrier near the Forest Boundary contains Yellowstone cutthroat (YCT), representing one of the strongest YCT meta-populations in the upper Yellowstone River drainage. The tributaries of Mill Creek (e.g. Wicked, Colley, Anderson, Passage Creeks) contain individual populations of YCT. Substantial adverse fisheries impacts from increased sediment yields and debris flows as result of the fire are possible in Wicked, Colley, Anderson, and Passage Creeks. The overall YCT meta-population in the Mill Creek drainage is not considered at high risk because YCT populations in the East and West Forks of Mill Creek and in Main Mill Creek upstream of the Passage from the fire are not directly threatened by fire impacts. However, the YCT populations in Anderson and Wicked Creeks are at very high risk without specific treatments to modify road stream crossings. In Wicked Creek, these crossings are both a fish passage issue and a high sediment risk; in Anderson Creek, the crossing is a fish passage issue. In both cases where fish passage is an issue, if a sediment event extirpates the population in the stream, fish will be unlikely to re-found a population in the stream because the culvert precludes access. This is a particular problem in Anderson Creek, where the culvert blockage is located only a few meters above the stream's confluence with Mill Creek.

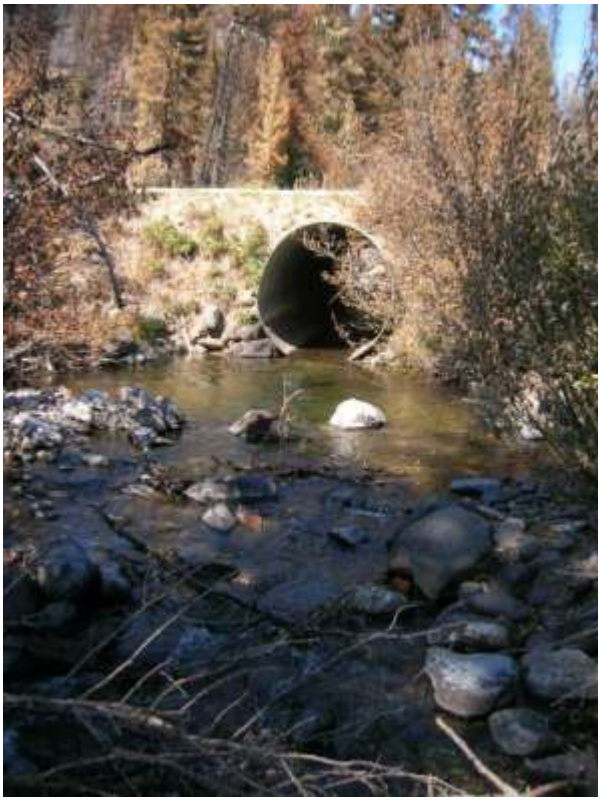
Access routes and road infrastructure: About 10 miles Of the 43 miles of roads within the fire perimeter are open for public travel and under potential damage from accelerated erosion processes, localized flooding, and sediment acumulation. These include the main Mill Creek Road 486 and parts of the Passage Road 2508.

Several sites were identified as being at high risk, meaning potential emergency situations. A **High Emergency Priority Determination** was identified, creating the need for treatment. These roads include:

- Road #2508 at Milepost 0.550 (Colley Creek tributary A) where the 24" pipe is too small
- Road #2508 at Milepost 1.030 (Colley Creek tributary A) where the 24" pipe is too
- Road #2508 at Milepost 1.850 (Colley Creek tributary A) where the 18" pipe is too small
- Lower Wicked Road 3725 at the Wicked Creek crossing where a 26 'fill over an undersized pipe poses considerable impoundment breach risk and sediment source to Wicked Creek and Mill Creek.
- Upper Wicked Creek Road at 2 crossings where 14' and 19' fills over undersized pipes pose impoundment breach risk and sediment risk to Wicked Creek.
- Mill Creek Road #486 at Milepost 6.3 (Anderson Creek) where the 6' pipe is too small to carry a burned Q10 event.

The Main Creek road # 486 is the primary National Forest access to Mill Creek which is the most heavily used National Forest recreation area near Livingston. The Anderson Creek culvert, if washed out would cutoff access to the upper 3.9 miles of trail and access to the Collery Creek trail, Lambert Creek trail, and to Road #2508 which has access to the Passage Creek access road and inholding – a 52 acre private land area inholding with 5 parcels and 26 landowners.

Burned section of Road #2508. This section of road needs to have ditches cleaned, relief culvert inlets cleaned, and 3 undersized culverts replaced.



The Anderson Creek watershed was heavily impacted by the Wicked Creek fire with 68% high intensity burn in the 5122 acres watershed. The Anderson Creek culvert just above confluence with Mill Creek has a 6' culvert with capacity of 215 cfs and an estimated burned Q5 event of 208 cfs and a Q10 of 420 cfs. The 2002 Gallatin NF fish passage inventory judged this culvert to be impassible to fish during high flow events due to high velocities. A 12' replacement culvert is proposed which would be 30- 40% buried and designed to meet R1 Aquatic habitat standards. The resultant installation would carry about 750 cfs which could pass a Q25 burned and Q100 unburned events.

Trails: Approximately 36.7 miles of Gallatin National Forest trails are at risk erosion and sediment acceleration in the burn area due to additional runoff and sediment from post-fire conditions. Most of the trail treatments are in high burn intensity areas with steep slide slopes at substantial risk for accelerated erosion and stream sedimentation. Failure of existing drainage dips and water bars may cause stream capture onto trail surface area, and soil erosion, including loss of the trail by rilling and gullying as well as sediment increases to adjacent drainages. Hazard trees pose a significant safety risk to BAER rehab crews. Trails at risk include:

#51 – East Fork Mill Creek Trail
#54 – Anderson Ridge Trail
#58 – Wallace Pass Trail
#59 – Passage Creek Trail
#78 – Wicked Creek Trail
#193 – East Dam Trail
#221 – Moose Park Trail
#280 – Lambert Creek Trail
#290 – Pyramid Trail
#588 – Passage Falls Trail

To ensure BAER rehab crew safety, a number of post-fire hazard trees will need to be removed during rehabilitation of system trails leading into the burned area. The Safety Handbook and the Fire Suppression Manual, clearly state that when hazards to these workers are recognized, they should be immediately dealt with and paid with fire suppression or BAER funds.

Range Vegetation and Invasive Species

No active grazing allotments occur with the Wicked Creek or Hicks Park fire perimeters.

Approximately 774 acres of known noxious weed infestations within and adjacent to the Wicked Creek fire area such as spotted knapweed, Canada thistle, musk thistle, yellow toadflax, etc. Many of these known infestations occur along roads, trails and old logging units, which can be vectors for weed spread. The Wicked Creek fire poses a substantial potential increase of weed establishment into burned areas. The Livingston District has an ongoing program for treating approximately 50 acres of weeds in this area that are found primarily along the roads and at trailheads.

Approximately 20 acres on the west side of the Hicks Park fire are at risk from weed expansion of existing infestations into the fire area. These weed sources are from the Boulder road corridor and include oxide daisy, hounds tongue, Canada thistle, and musk thistle.

B. Emergency Treatment Objectives:

Road treatments – Decrease the risk of diverting overland flow and stream flow down roadways, accelerating erosion, and damaging road facilities. Culvert replacement is designed to reduce the risk that stream flows will overtop the road and potentially damage the road and or culvert. The Anderson Creek culvert replacement on Mill Creek road 486 has the additional objective of meeting R1 Aquatic passage criteria and preventing cutting off road access to the upper Mill Creek road and trailheads and to the Passage Falls road #2508 and inholding (26 landowners). The Wicked Creek road fill removal is designed to reduce the risk that stream flows will overtop the road prism with potential massive sediment mobilization and breach surges to Wicked Creek. Upgrading the 3 Passage Falls road #2508 culverts is also designed to avoid access cutoff to the 26 Passage Falls inholding landowners.

Trail treatments - Permit reasonable safe passage for BAER rehab crews and reduce or prevent accelerated erosion by diverting, discharging, and dissipating runoff down the trail tread. This protects the downsteam watershed by lessening lthe force and concentration of water flowing downslope.

Weed treatments - Reduce the spread of existing noxious weed infestations into burned areas.

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

Land **60** % Channel **na** % Roads/Trails **70** % Protection/Safety **na** %

D. Probability of Treatment Success

Years after Treatment

	1	3	5
Land (fence reconst)	**na**	**na**	**na**
(weed treatment)	**50**	**70**	**90**
Channel	**na**	**na**	**na**
Roads/Trails	**70**	**80**	**90**
Protection/Safety*	**na**	**na**	**na**

E. Cost of No-Action (Including Loss): $887,000

F. Cost of Selected Alternative (Including Loss): $540,700

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Mark T. Story

Email: mtstory@fs.fed. Phone: 406-587-6735 FAX: 406-587-6758

H. **Treatment Narrative:**

Weed Treatments:

Weed treatments in the Wicked Creek fire will consist of hand pulling or herbicide treatment of expansion of noxious weeds from existing infestations into the burned area. Treatment area is approximately 517 acres. Weed treatments in the Hicks Park fire will also consist of hand pulling or herbicide treatment in about 20 acres along the western perimeter of the fire.

Road Treatments:
Mill Creek Road 486 and Road 2508 (10 miles total) will have culverts and ditches cleaned during October 2007, just after spring snowmelt runoff (late May – June 2008) and once during the summer of 2008. Additional cleanings, if needed, will be done with non-BAER road maintenance funds. Existing stream crossing and ditch relief culverts will be cleaned focusing on inlets/outlets and catch basins to insure unobstruced flows to drain points are maintained.

Several road sites were identified as being at high risk, meaning potential emergency situations. A **High Emergency Priority Determination** was identified, creating the need for treatment. These roads include:

- Road #2508 at Milepost 0.550 (Colley Creek tributary A) where the 24” pipe is too small and recommended to be replaced with a 48” pipe
- Road #2508 at Milepost 1.030 (Colley Creek tributary A) where the 24” pipe is too small and recommended to be replaced with a 48” pipe
- Road #2508 at Milepost 1,850 (Colley Creek tributary A) where the 18” pipe is too small and recommended to be replaced with a 48” pipe
- Lower Wicked Road 3725 at the Wicked Creek crossing where a 26 ’fill over an undersized pipe poses considerable impoundment breach risk and sediment source to Wicked Creek and Mill Creek.

- Upper Wicked Creek Road at 2 crossings where 14' and 19' fills over undersized pipes pose impoundment breach risk and sediment risk to Wicked Creek.
- Mill Creek Road #486 at Milepost 16.3 (Anderson Creek) where the 6' pipe is too small to carry a burned Q10 event and proposed to be replaced with a 12' pipe designed to carry a Q25 burned event and allow for aquatic/fish passage.

The Anderson Creek culvert, if washed out would cutoff access to the upper 3.9 miles of trail and access to the Collery Creek trail, Lambert Creek trail, and to Road #2508 which has access to the Passage Creek access road and inholding – a private land area with a 5 parces - 52 acre private land area inholding with and 26 landowners.

The culvert replacement will consist of excavating and removing the existing undersized culverts, installing 48" diameter round corrugated steel culverts, placing and compacting fill to provide a 12" cover of subgrade material over the culvert, cover disturbed subgrade with a 4" compacted layer of 1-1/2 inch minus road mix gravel, and placing class II riprap at inlets and outlets to reduce scour risk. The 12' Anderson Creek replacement cuvert will be buried 3-4 feet into the stream substrate to allow steam simulation and substrate complexity and associated velocity reduction to meet R1 Aquatic passage criteria.

Three stream crossings (culverts) on Wicked Creek with deep fills will be removed to eliminate the substantial risk of culvert plugging, ovetopping, breaching, and channel scour. The work will consist of fill removal, removing existing culverts, and re-creating a 15' wide stream bottom area. Excavated fill material will be placed in compacted lifts against existing road cut faces and existing roadside ditches rerouted around the base of compacted spoil slopes. A maximum 1.5:1 (horizontal:vertical) slope will be stabilized with lodgepole pine placed horizontally in continuous 10' space rows. The slopes will then be seeded and mulched. The channel bottom will be stabilized by arranging bed material to create a step pool type channel and installing of clean sand and gravel mix to seal voids and prevent water from subsurfacing through the newly constructed stream segment. Straw bales will be countersunk and staked to provide sediment filtration between the channel and overlying earthen slopes. A 40' long trail bridge and abutments will then be installed at each site to avoid stream channel disturbance. The resulting BAER treatments will leave the Wicked Creek channel unincumbered to handle post fire runoff events and are less expensive and with considerably higher probability of success than Wicked Creek culvert replacement. Culvert replacement would require fish passage design and culvert upsizing to meet R1 Aquatic habitat standards and pulling then replacing the fill material and adding additional rock on the upstream and downstream sides of the culvert. The culvert replacement option was estimated to cost $9,200 more than the requested fill removal/trail bridge option.

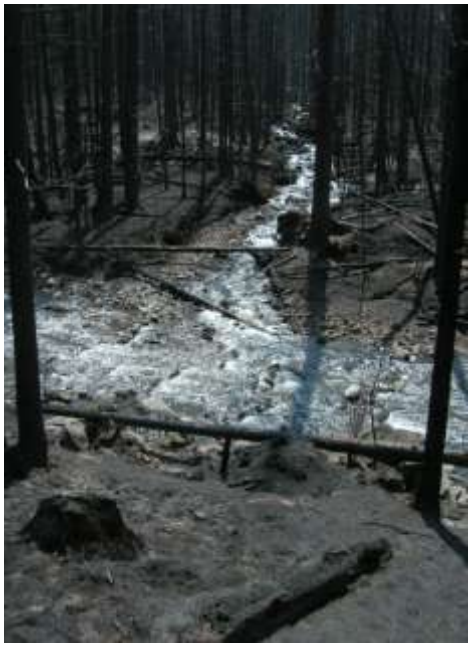
Trail Treatments:

Trail treatments will consist of removing 1600 hazard trees in the Absaroka Beartooth Wilderness and 570 hazard trees outside the wilderness in accordance with EM-7720-102 standard specification for construction of trails. This will allow reasonably safe access for BAER trail rehab crews. The trail work in the AB Wilderness will require the use of hand saws which substantially increases unit cost. A total of 36.7 miles of trails will be treated. A total of 719 drainage structures (water bars, check dams, and/or drain dips) will then be constructed on the 36.7 miles of trails. Non-BAER funds will be sought for trail work not appropriate with BAER funds including additional hazard tree removal, trail tread stabilization, Passage Creek trail #58 bridge (3) replacement, Passage Creek trail #58 culvert replacement, and trail sign replacement. All wilderness treatments are consistent with the 5/2003 Wilderness BAER guidance paper per discussions with RO and GNF Wilderness staff.

I. **Monitoring Narrative:**

Storm patrols: After rain events during June – August, Livingston District staff will patrol the Mill Creek Road 482 and Passage Road 2508 for potential BAER treament need maintenance needs particularly at road stream crossing and drainage dips.

Stream Reference: Stream reference sites will be established on Wicked Creek, Anderson Creek, Colley Creek, Passage Creek, and Mill Creek @ Snowbank Campground. Pre and post snowmelt runoff and summer rain event channel cross-sections and gradients will be surveyed to validate runoff modeling projections made. Using non BAER program funds pre and post runoff Wolman pebble counts and will be measured. This monitoring will be augmented with suspended sediment and bedload monitoring (non-BAER funds) during the snowmelt runoff of 2008 to establish post fire sediment yields and compare to extensive pre-fire sediment monitoring in Mill Creek and tributaries. Data will also be collected during the fall of 2008 to measure post summer stormflow effects on channel geomorphology.



Stream reference site at Colley Creek confluence with Mill Creek. The effectiveness of BAER treatments and overall geomorphic response of the Wicked Creek Fire will be monitored at Colley Creek and 4 other sites with elevation XS's, and stream substrate monitoring. This monitoring will be augmented with non-BAER sediment water quality monitoring in 2008 to measure sediment responses of the Mill Creek stream to the Wicked Creek Fire and BAER treatments.

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 treatment- Wicked Creek Fire	AC	70	517	$36,028	$0		$0		$0	$36,028
weed treatment- Hicks Park Fire	AC	70	30	$2,100						
Subtotal Land Treatments				$38,128	$0		$0		$0	$36,028
B. Channel Treatments										
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Channel Treat.				$0	$0		$0		$0	$0
C. Road and Trails										
ROADS										
clean culverts and ditches	miles	2,247	10	$22,476	$0		$0		$0	$22,476
road culvert replacement, 3@48" pipes	each	13371	3	$40,114			$0		$0	$40,114
fill and culvert removal, slope stabilization, stream stabilization, trail bridge placement	each	42913	3	$128,739			$0		$0	$128,739
Anderson Creek culvert replacement with 12' by 42' CMP	each	31500	1	$31,500						$31,500
TRAILS				$0	$0		$0		$0	$0
install/maintain drainage structures	water ba	135	719	$97,065			$0		$0	$97,065
hazard trees (36.7miles of trails)	each	54.903	2000	$109,806			$0		$0	$109,806
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road & Trails				$429,700	$0		$0			$429,700
D. Protection/Safety										
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Structures					$0		$0		$0	$0
E. BAER Evaluation										
assessment (person days)	DAYS	600	30		$18,000		$0		$0	$18,000
							$0		$0	$246
implementation administration		500	16	$8,000						$10,000
Insert new items above this line!				---	$0		$0		$0	$0
Subtotal Evaluation				$8,000	$18,000		$0		$0	$28,246
F. Monitoring										
storm patrol	each	400	5	$2,000						$2,000
water monitoring	site	500	5	$2,500						$5,000
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Monitoring				$4,500	$0		$0		$0	$7,000
G. Totals					$18,000		**$0**		**$0**	$500,974
Previously approved					$0					
Total for this request				**$498,328**						**$512,408**

PART VII - APPROVALS

1. /s/ Thomas Puchlerz 9/5/07

   Forest Supervisor (signature) Date

2. _____ _____

   Regional Forester (signature) Date