

**BURNED-AREA REPORT**  
(Reference FSH 2509.13)**PART I - TYPE OF REQUEST**

## A. Type of Report

- ☒ 1. Funding request for estimated emergency stabilization funds  
☐ 2. Accomplishment Report  
☐ 3. No Treatment Recommendation

## B. Type of Action

- ☒ 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: CascadeB. Fire Number: MT-CNF-000505C. State: MontanaD. County: CarbonE. Region: Northern (R1)F. Forest: CusterG. District: BeartoothH. Fire Incident Job Code: P1EDZ4I. Date Fire Started: 07/26/2008J. Date Fire Contained: Not contained yet (85%)K. Suppression Cost: \$8 million

## L. Fire Suppression Damages Repaired with Suppression Funds

## 1. Fireline waterbarred (miles):

Miles of Line	Completed Waterbars	
	dozer line	hand line
	2	1.4

Temporary Waterbars	
dozer line	hand line
3	2 1/4

2. Fireline seeded (miles): Not completed3. Other (identify): Hand piles of slash on suppression lines throughout the fire area.M. Watershed Number: 100700060904, 100700060905, 100700061001, 100700061002N. Total Acres Burned: 10,200NFS Acres( **94%**) Other Federal ( ) State (6%) Private ( )

Ownership	unburned, low intensity	moderate intensity	high intensity	Total
State (MT)	304	93	227	623
USFS	3338	1663	4564	9566
Total	3642	1756	4791	10189

O. Vegetation Types: Aspen, grassland, sagebrush-steppe, Douglas-fir/lodgepole, limber pine, whitebark pine, mixed upper subalpine fir, subalpine fir/Engelmann spruce

P. Dominant Soils: Dominantly sandy skeletal and loamy skeletal families with surface textures of sandy loams and loams, with surface rocks ranging from 40-70%. Rocks are rounded boulders, cobbles and gravel, with granitic composition.

Q. Geologic Types: : Archean-aged granitic gneiss, , felsic dikes, tertiary-aged felsic porphyry dikes, archean ultramafic dikes, mafic and felsic dikes. Ultramafic rock contain minerals such as chromium, aluminum, magnesium, iron, titanium, and nickel. Felsic dikes contain more silica and lesser amounts of these same minerals. This drainage is a prominently-featured glacial trough, and has been recently glaciated (>8,000 ybp). It is geomorphically active, with aggrading alluvial fans, active talus slopes, and recent unvegetated slough/debris avalanche scars.

R. Miles of Stream Channels by Order or Class:

Stream order	unburned, low intensity	moderate intensity	high intensity	Total
1	4.6	1.5	6.0	12.1
2	1.1	0.7	1.3	3.0
3	0.8	1.8	3.1	5.7
4	1.6	0.9	0.8	3.2
Total	8.1	4.8	11.2	24.0

S. Transportation System

Trail #	unburned, low intensity	moderate intensity	high intensity	Total
1	0.26	0.40	1.36	2.02
12	0.23	0.32	2.67	3.22
12A	0.04	0.04	0.31	0.39
16	0	0.50	1.24	1.80
1A	0	0.17	0.85	1.02
61	0	0	0.24	0.24
8	0.06	0.18	0.27	0.52
Total	0.66	1.61	6.93	9.20

Road #	unburned, low intensity	moderate intensity	high intensity	Total
2071	2.81	1.30	0.66	4.77*
Spurs	1.66	0.48	0.01	2.15
Total	4.47	1.78	0.67	6.92

\*Only this road was used in treatment development

### **PART III - WATERSHED CONDITION**

A. Burn Intensity (vegetation effects) (acres): 3,642 (low/unburned) 1,756 (moderate) 4,791 (high)  
 Burn Severity (soil and ecological effects) (acres): 4,288 (low/unburned) 4,943 (moderate) 958 (high)  
 See the attached graphic for a view of the burn distribution.

B. Water-Repellent Soil (acres): 10,189

C. Soil Erosion Hazard Rating (acres):  
6,822 (low/moderate) 3,343 (high)

D. Erosion Potential: 11.5 - 19 tons/acre

E. Sediment Potential: 8.8 cubic yards/square mile 1<sup>st</sup> year, 5.5 cy/sq.mi 2<sup>nd</sup> year.

#### **PART IV - HYDROLOGIC DESIGN FACTORS**

A. Estimated Vegetative Recovery Period, (years):	<b>5</b>
B. Design Chance of Success, (percent):	<b>80</b>
C. Equivalent Design Recurrence Interval, (years):	<b>25</b>
D. Design Storm Duration, (hours):	<b>½ hour</b>
E. Design Storm Magnitude, (inches):	<b>1.4</b>
F. Design Flow, (cubic feet / second/ square mile):	<b>85</b>
G. Estimated Reduction in Infiltration, (percent):	<b>27</b>
H. Adjusted Design Flow, (cfs per square mile):	<b>108</b>

#### **PART V - SUMMARY OF ANALYSIS**

##### **A. Describe Threats and Critical Values/Resources At-risk:**

The Cascade Fire resulted in large contiguous slopes of high intensity burn as well as mosaic burn patterns (long narrow runs separated by areas of low and no burn). A significant amount of valley bottom/riparian corridor burned with high intensity, thereby reducing filter capacity for sediment delivered from upslope sources. Areas of low intensity ground fire occurred under lodgepole forest canopy. Though the burned proportion of the West Fork watershed is low, the percentage of small tributaries burned is relatively high. Soil Burn severity was low and moderate across 90 percent of the burn, but water repellency was strong and continuous throughout the area (including unburned areas). Soil erosion potential is high over most of the area, because of steep, concave slopes, lack of vegetation, and coarse soil texture.

Anticipated post-fire landscape responses from high intensity storm events include increases in flood magnitude, mass wasting, channel erosion and bedload mobilization, and surface erosion and downslope transport. Low to moderate increases in flood magnitude are anticipated in larger watersheds, while substantial increases in five of six smaller tributaries can be expected. Increased flood magnitude in tributaries will increase channel erosion, may increase mass wasting potential by cutting toe slopes, both of which will increase bedload mobilization and transport. Alluvial fans are at the bottom of most tributary drainages. Bedload deposition on those landforms has a high potential to cause channel aggradation and channel rerouting.

Potential values at-risk associated with these landscape responses include bridges, culverts, roads, trails and structures (including houses, bridges and irrigation ditch headgates) on alluvial fans and floodplains.

Numerous private domestic water supplies as well as the City of Red Lodge municipal supplies are hydrologically connected to West Fork surface waters. Because of mineralization in the area, they may also be at risk from soluble metals in ash and surface soils, and high turbidity levels.

Other issues include hazard trees, instream large woody debris, and noxious weeds. Hazard trees are a safety concern for trail crews installing BAER treatments, but also a potential damaging impact to recreation

residences, campground infrastructure, powerline and cultural resources. Instream large woody debris has the potential to damage road prisms and bridges on a limited basis by diverting flows or reducing bridge capacity. Dozer line construction across known spotted knapweed and oxeye daisy infestations has a high potential to expand these invasive species.

**Roads:** The road system is particularly vulnerable to these changes, since it follows the base of the drainage, is close to live water, and bisects many perennial and intermittent stream channels along alluvial fans. There are about seven miles of USFS roads in the burned area, and 4.8 miles are at significant risk from hydrologic events.

**Values on other lands:** Initial reconnaissance indicated numerous downstream values near to the West Fork and in the main Rock Creek stream channels and on adjacent flood plains. These were on private and municipal lands. The Natural Resource Conservation Service (NRCS) was requested to provide expertise and analysis. Their report indicated a total of 15 homes, bridges, water intakes, ponds, ditch structures, and a treatment plant were at some level of risk. Modeling of potential flows and field surveying indicated there were low to moderate risks to these values. A section (640 acres) of Montana State Trust land was burned. A small segment of stream channel on this section will potentially threaten the USFS road system.

**Noxious weeds/invasive plants:** Noxious weeds/invasive plant species pose a serious threat to the composition, structure, and function of native plant communities. Depending on burn severity and site potential, fire as a disturbance process has the potential to greatly exacerbate infestations of certain noxious weed species. Soil disturbance resulting from all levels of burn intensities of a wildfire event and fire suppression related activities (hand lines, structure protection, drop spots, camps, etc.) that cause vegetation and soil alteration provide the optimum conditions for noxious weed invasion. Road and trail corridors, as well as trailheads and campgrounds, are vulnerable to noxious weed invasion.

Though generally the West Fork environment is not conducive to significant weed spread, the potential is high in some areas. There is a potential for accelerated expansion of noxious weed species within the fire perimeter, where noxious weeds populations were established prior to the fire event and where fire suppression activities disturbed soil and vegetation. Moderate to high intensity burn areas near these areas provide ideal conditions for noxious weed establishment due to reduction or elimination of competition from native vegetation.

**Trails:** Within the Cascade fire perimeter about 10.5 miles of NFS system trails were burned over by moderate to high intensity wildfire. The trail system provides access to the Absaroka-Beartooth Wilderness portion of the Beartooth Ranger District, as well as access year around recreation opportunities, hunting opportunities, fire suppression, wildlife surveys, and culturally significant sites.

Most of these trails are on steep side slopes that are susceptible to erosion events during normal runoff years. A large fire event such as the Cascade fire makes the trails system susceptible to washouts, gullying, and rilling during the upcoming fall and spring runoff events, as well as during the summer months when thunderstorms are intense. Most constructed erosion control structures have burned. The increased erosion associated with the fire event has increased the risk to ecological health and the trail resource. In one case, predicted trail erosion will impact recreation residences and the road system. Loss of above ground vegetation (over and understory) along the trail corridor increases noxious weed establishment potential and noxious weed vector establishment from the West Fork Rock Creek Road into the Absaroka-Beartooth Wilderness area, which was relatively weed free prior to the Cascade fire.

**Recreation:** Five developed recreation sites are within the Cascade fire perimeter and one site is nearly surrounded by the fire perimeter. Developed sites affected by the fire include Cascade Campground, Basin Campground, Basin Lakes Trailhead, Timberline Lakes Trailhead, Senia Creek Trailhead and the West Fork Rock Creek Trailhead.

Eighty percent of the Cascade Campground was affected by low intensity fire. The following developed sites incurred no infrastructure damage or destruction as a result of the Cascade Fire: Basin Campground, Basin

Lakes Trailhead, Timberline Lakes Trailhead. 95% of forest vegetation was killed in the area surrounding the Timberline Lakes, Senia Creek, and West Fork Rock Creek Trailheads were killed by the fire event.

Three recreation residence tracts comprising 22 recreation residences are within the Cascade fire perimeter; Many of the fire killed trees surrounding the recreation residences are a medium-term threat to these historic structures with some immediate threats (see Cultural Report and associated hazard tree specifications for further information). Rill and gully erosion from the Senia trail is resulting in sediment deposition that threatens the recreation residence located on lot #C-2.

A 7.2 KV electric power-line permitted to Beartooth Rural Electric Co-operative provides power up to Camp Senia and Porcupine Creek recreation residences. Approximately 3  $\frac{3}{4}$  miles of overhead power-line on treated poles is within the fire perimeter; and was affected to some degree by fire.

The West Fork Rock Creek Road and associated spur roads provide access to all developed recreation sites, residences, powerlines, and trail systems within the West Fork Rock Creek watershed. The main road is at risk from storm events that produce high flows, post-fire erosion, and debris jams. The powerline is threatened by hazard trees, but not in the immediate future.

**Heritage:** Culturally significant heritage resources are abundant in the West Fork Rock Creek watershed. Several resources were burned by the Cascade fire and/or occur within the fire perimeter. Many of the resources within the fire perimeter were exposed to moderate to high intensity fire. One cultural area is now exposed to view, and has been recently vandalized. Fire killed trees around historic cabins (recreation residences) post a significant threat to these cultural resources.

#### B. Emergency Treatment Objectives:

Emergency treatments are designed to control and monitor the anticipated landscape responses and thereby reduce the anticipated impacts to the values identified above.

**Channel/Road Drainage:** The objective of channel and road treatment is to protect the road system and downstream values from increased stream flow, potential changes in channel locations, debris flows, the effects of increased bedload, and the effects of log jams. This involves up-sizing culverts to handle the anticipated flows, increasing cross-drain frequency and ditch efficiency to reduce overtopping flow, installing armored vents and fillslopes to provide drainage in the event of culvert-plugging, removal of selected log jam material, and patrolling during and after storm events.

**Values on Other Lands:** The objective of the NRCS analysis and treatment for private and municipal values was to alert landowners to risks associated with burn-related hydrologic events. A field review with State officials revealed no threats to State lands, but an identified treatment objective is to protect USFS roads from potential flooding originating on State land.

**Noxious Weeds/Invasive Plants:** Manage known noxious weed populations to for pre-fire conditions, treating chemically or biologically to contain existing populations and deter population expansion.

**Trails:** The objective of trail treatment is to protect the trail resource, down slope recreation residences near the Senia Trail. Without treatment these sites and routes will be at high risk of washing out, resulting in a loss of travel route investment and contributing sediment, damage to recreation residences and disturbance to the stream ecosystem.

**Recreation:** Protect a recreation residence (#C-2) from water and sediment damage and direct overland flows outside of the loop road to locations where dissipation will not affect the structure. Hazard trees threatening recreation resources are included in the Heritage sections below.

**Heritage:** Protect heritage resources (including historical cabins) from fire killed hazard trees of immediate danger, and protect exposed sites from looting during the first year.

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

Land **100 %** Channel **90 %** Roads/Trails **60 %** Protection/Safety **90%**

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land			
weed spraying	<b>60</b>	<b>70</b>	<b>80</b>
Channel			
instream log removal	<b>70</b>	<b>80</b>	<b>90</b>
channel/berm excavation	<b>60</b>	<b>70</b>	<b>80</b>
Roads/Trails			
road drainage	<b>70</b>	<b>80</b>	<b>100</b>
stream culvert upsize/relief armor	<b>50</b>	<b>70</b>	<b>90</b>
trail drainage	<b>70</b>	<b>80</b>	<b>100</b>
Protection/Safety			
hazard tree removal	<b>100</b>	<b>100</b>	<b>100</b>
hazard signs	<b>90</b>	<b>90</b>	<b>90</b>
Structure protection	<b>70</b>	<b>80</b>	<b>90</b>
Heritage Site protection	<b>90</b>	<b>90</b>	<b>90</b>

E. Cost of No-Action (Including Loss):

F. Cost of Selected Alternative (Including Loss):

**The economic analysis follows Calkin (2007), and a summary is attached below. Individual results show all treatments have positive cost benefit ratios for monetary values. For non-monetary values all implied minimum values (IMV) are, in the opinion of the BAER team, reasonable.**

G. Skills Represented on Burned-Area Survey Team:

<input checked="" type="checkbox"/> Hydrology	<input checked="" type="checkbox"/> Soils	<input checked="" type="checkbox"/> Geology	<input type="checkbox"/> Range	<input checked="" type="checkbox"/> Noxious weeds
<input checked="" type="checkbox"/> Forestry	<input checked="" type="checkbox"/> Wildlife	<input checked="" type="checkbox"/> Fire Mgmt.	<input checked="" type="checkbox"/> Engineering	<input type="checkbox"/>
<input checked="" type="checkbox"/> Contracting	<input checked="" type="checkbox"/> Ecology	<input checked="" type="checkbox"/> Botany	<input checked="" type="checkbox"/> Archaeology	<input type="checkbox"/>
<input checked="" type="checkbox"/> Fisheries	<input type="checkbox"/> Research	<input type="checkbox"/> Landscape Arch	<input checked="" type="checkbox"/> GIS	

Team Leader: Henry F. Shovic

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Phone: 406-587-6714

H. **Treatment Narrative:**

Land Treatments:

**Noxious Weed/Invasive Treatment:** Treat pre-fire noxious weed/invasive species populations within the burned area to manage for containment and help prevent the expansion of weeds into newly disturbed sites. Chemical methods will be used to help prevent the spread and establishment of noxious weeds, especially within the moderate- to high-intensity burn areas. Noxious weed treatment will be implemented in accordance with the 2006 Custer National Forest Weeds EIS.

#### Channel Treatments:

**Channel:** Approximately 20 recent blowdown trees partially span the West Fork (WF) mainstem and are oriented such that high flows will be directed towards road fillslopes. The toe of fillslopes are within 2 to 15 feet from edge of stream. Any floatable debris mobilized through high flow events and trapped by this blowdown will compound this concern. This blowdown will be removed to reduce the potential for creating log jams, diverting flood flows and damaging road infrastructure. Approximately five large floatable logs are located immediately upstream from two bridges and will be removed to reduce the potential for obstructing flows.

A tributary channel originating on NFS land crosses a portion of MT State Trust land before passing underneath the USFS Road #2071. This road and stream crossing culvert are located on State land, but under USFS maintenance jurisdiction. The tributary channel is relatively unstable due to natural (active alluvial fan) and human disturbances (timber harvest, dispersed recreation). Recent aggradation along localized segments of the channel has caused high flows to overtop the channel and route to the USFS road and ditch drainage system. Increased flows and bedload mobilization are anticipated due to the fire and will likely exacerbate this situation. Minor excavation of the aggraded channel and enlargement/extension of an existing alluvial cobble deposit at least 100 feet up-gradient from the road will help to direct flows away from the USFS Road and towards the stream crossing culvert. Since this work would occur on non-federal land, and is not directly on or next to the road, the Wyden Amendment will be invoked to expend BAER funds. Matching funds from MT-DNRC have been verbally ensured.

**Road Treatments:** Roads treatments include improving stream crossing culverts, increasing frequency of crossdrain culverts, pulling ditches and cleaning inlet basins. Existing road drainage (ditch with cross-drain culverts) is insufficient to pass anticipated increases in overland flow from burned hillslopes. Existing ditches will be pulled, existing culvert inlets need to be cleaned and enlarged, and new cross-drain culverts will be installed along 4.8 miles of road.

Stream crossing culvert assessments indicate most existing culverts are undersized for anticipated post-fire floodwater discharges. However, due to a high probability that floodwaters will transport high levels of bedload and that channel aggradation and rerouting could occur, three culverts on the north side of the WF drainage were upsized and crossings were designed to overtop and pass water, bedload, and debris (mp281, mp435, and mp529). Two small front facing drainages in the same area burned with high intensity and also require culvert upsizing, but do not require fillslope armoring (mp465, mp406). One of these replacements will require minor channel rerouting to eliminate drainage along the road ditch (mp406).

One culvert was recently upsized through a capital investment reconstruction project (mp185). The lower drainage area for this culvert is wide, relatively flat terrain with multiple channels, springs and wet areas. Bedload deposition in this area is expected, but is not anticipated to arrive at the culvert. Floodwaters are anticipated to be dampened, not flashy, so the existing culvert size should be sufficient. Armoring of the meander bends, the culvert inlet and inlet basin will be necessary. Additionally, excavation of the inside of the meander bend to increase floodplain capacity is necessary.

The drainage area for the last culvert (mp139) was burned in a mosaic pattern, and mass wasting and bedload mobilization is not anticipated. This culvert will be upsized to handle anticipated increases in flow, but the crossing will not be designed to pass bedload.

**Values on Other Lands:** No immediate threats were identified. No emergency treatments are recommended, but letters were sent through the NRCS to all affected landowners advising them of the increased, but moderate risk. Treatments on State lands are described above under channel treatments.

**Trail Treatments:** Detrimental post-fire effects on the trails system will be mitigated by the following treatments: 1) replacing existing and install additional drainage structures (i.e. water bars and drain dips), 2) removing hazard trees blocking the effectiveness of the drainage structures and that pose a physical threat to BAER implementation personnel, 3) temporary trail closure to stock/llama use until native vegetation recovery is sufficient to reduce potential noxious weed spread and protect the watershed from accelerated erosion, and 4) decommission of the lower portion of the Senia trail.

The lower Senia trail (2,270 ft) will be decommissioned. This includes reshaping the slope to an approximation of natural contour, removing of the lower trail berm, and installing permanent drainage structures. This will reduce the effects of erosion and associated risk to recreation residences, stream ecosystems, and the West Fork Rock Creek Road.

The installation and rehabilitation of trail features will be in accordance with EM-7720-102 standard specification for construction of trails.

#### Protection/Safety Treatments:

Vehicle travel along the WF Road will present safety issues during high intensity rain events, particularly along those portions immediately adjacent to hillslopes and tributaries that burned with high intensity; from the State section bridge to the WF trailhead. Four signs warning travelers to these hazards will help to reduce loss of life or property.

**Recreation:** Improve and extend the swale at the top of the loop road on the upslope side of the recreation residence located on lot #C-2 to direct overland flow to undisturbed ground on both sides of the loop road. This will protect the structure from water and sediment damage and direct overland flows outside of the loop road to locations where dissipation will not affect the structure.

Fall and remove fire killed trees around recreation residences and the Timberline Trail footbridge to reduce risk to historic structures as described in the Heritage Resources report.

**Heritage:** Cut and remove standing, leaning and fallen hazard and fire-damaged trees within cultural resource site boundaries that could damage these historic resources. These trees are of immediate hazard to the structures. Trees that pose no immediate threat, but that will fall in the next three years are not included in this request.

Provide periodic site review to identify looting and vandalism for referral to Law Enforcement during the first year before revegetation.

## **I. Monitoring Narrative:**

**Noxious Weed/Invasive Species Detection:** Monitor noxious weed treatment, as described in the specification sheet, in the first year following chemical or biological treatment to determine success of weed control. Monitoring would also include looking for new weed infestations in areas disturbed during fire suppression activities and where sensitive plant populations occur and prescribing appropriate treatments if noxious weed populations are detected in these ecologically vulnerable locations.

**Storm Patrol:** Due to recent wind events in the West Fork drainage, extensive areas of blowdown exist throughout the burned area, and specifically along the valley bottom and stream corridor. Some blowdown was severed from rootwads and is now highly mobile and at-risk of downstream transport during flood events. Blowdown with rootwads and existing large woody debris is relatively frequent throughout the mainstem, which should provide frequent catch members and reduce travel distance of mobilized debris. However, structures are still at-risk from floatable debris including five vehicle bridges and one pack



bridge on forest. Monitoring before, during and after runoff events will help to identify potential blockage issues and any corrective actions at these sites. Additionally, road drainage structures will continue to be at-risk after treatments due to high potential for bedload mobilization, overland flow and channel rerouting. Rocky terrain and alluvial fans make it difficult to identify where bedload and overland flow may be routed. Monitoring (storm patrol) will be critical to determine effectiveness of road drainage treatments and to identify any necessary repairs along 4.8 miles of road.

**Trails:** Trail drainage treatments will also continue to be at-risk due to high potential for overland flow, surface erosion and blowdown after spring runoff and major storm events during 2009. Monitoring will be critical to determine effectiveness of trail drainage treatments and to identify any necessary repairs. All 10.5 miles of trails within the fire will be monitored for effectiveness of treatments and identification of maintenance needs.

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

Interim #

NFS Lands						Other Lands				All Total \$
Line Items	Units	Unit Cost	# of Units	BAER \$	Other \$	# of Units	Fed \$	# of Units	Non Fed	
<b>A. Land Treatments</b>										
Weed control	ac	\$126	48	\$6,048			\$0		\$0	\$6,048
				\$0			\$0		\$0	\$0
				\$0			\$0		\$0	\$0
				\$0			\$0		\$0	\$0
<i>Subtotal Land Treatments</i>				\$6,048	\$0		\$0		\$0	\$6,048
<b>B. Channel Treatments</b>										
Woody debris removal	ea	\$115	25	\$2,875			\$0		\$0	\$2,875
Channel improvement on State trust land	ea	\$575	1	\$575			\$0	1	\$575	\$1,150
				\$0			\$0		\$0	\$0
				\$0			\$0		\$0	\$0
<i>Subtotal Channel Treatments</i>				\$3,450	\$0		\$0		\$575	\$4,025
<b>C. Road and Trails</b>										
Culvert upsize with armored relief (mp281)	ea	\$54,950	1	\$54,950			\$0		\$0	\$54,950
Culvert upsize with armored relief (mp435)	ea	\$26,167	1	\$26,167			\$0		\$0	\$26,167
Culvert upsize with armored relief (mp529)	ea	\$25,585	1	\$25,585			\$0		\$0	\$25,585
Culvert upsize (mp139)	ea	\$21,027	1	\$21,027			\$0		\$0	\$21,027
Culvert upsize (mp465, mp406, cross drain)	ea	\$13,035	3	\$39,105			\$0		\$0	\$39,105
				\$0			\$0		\$0	\$0
Ditch clean/Inlet basin clean/armor	mi	\$2,776	5	\$13,325			\$0		\$0	\$13,325
Cross-drain culvert install	ea	\$11,750	10	\$117,500			\$0		\$0	\$117,500
Trail protection (waterbar replacement)	mi	\$3,688	11	\$38,724			\$0		\$0	\$38,724
Trail decommission	mi	\$15,778	0	\$6,785			\$0		\$0	\$6,785
<i>Subtotal Road &amp; Trails</i>				\$343,167	\$0		\$0		\$0	\$343,167
<b>D. Protection/Safety</b>										
Hazard tree removal (crew safety, heritage)	ea	\$49	510	\$24,990			\$0		\$0	\$24,990
Flood hazard signs	ea	\$115	4	\$460			\$0		\$0	\$460
Structure protection - diversion ditch	ea	\$920	1	\$920			\$0		\$0	\$920
Heritage Sites - looting/vandalism	ea	\$3,450	1	\$3,450			\$0		\$0	\$3,450
				\$0			\$0		\$0	\$0
<i>Subtotal Protection</i>				\$29,820	\$0		\$0		\$0	\$29,820
<b>E. BAER Evaluation</b>										
Assessment Team	---	---	---	---	\$61,643	---		---		\$61,643
Information system	---	---	---	---	\$7,500	---		---		\$7,500
<i>Subtotal Evaluation</i>				---	\$69,143	---	\$0	---	\$0	\$69,143
<b>F. Monitoring</b>										
Noxious weeds	day	\$287	4	\$1,148			\$0		\$0	\$1,148
Storm patrol	day	\$287	5	\$1,435			\$0		\$0	\$1,435
Trail treatment	day	\$287	5	\$1,435			\$0		\$0	\$1,435
<i>Subtotal Monitoring</i>				\$4,018	\$0		\$0		\$0	\$4,018
<b>G. Totals</b>				\$386,503	\$69,143		\$0		\$575	\$456,221
Previously approved						Note: Exc for roads, all spec sheet costs increased by 15% Implementation cost.				
Total for this request				\$386,503						

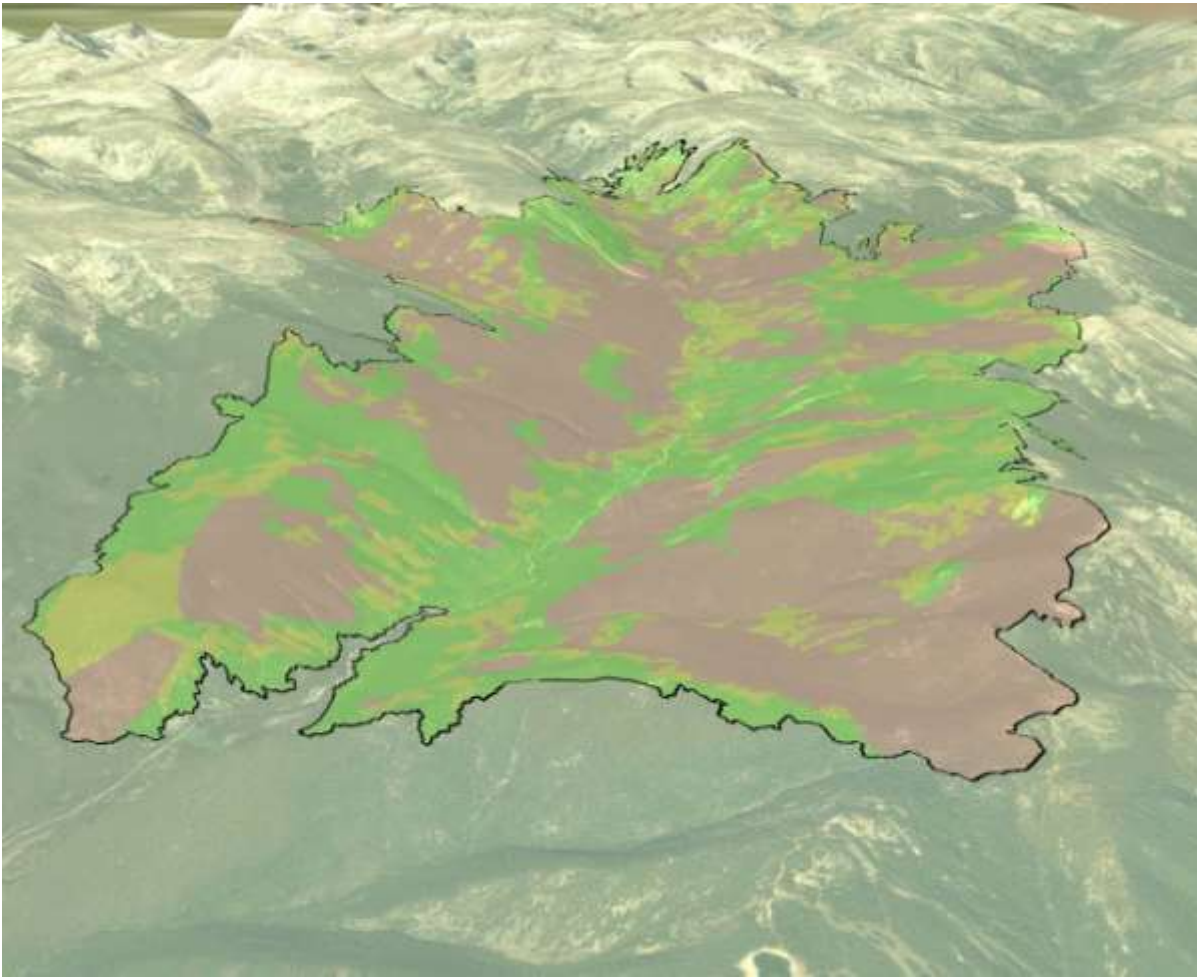
**PART VII - APPROVALS**

1.     \_\_\_\_\_/s/ Steve Williams\_\_\_\_\_  
Forest Supervisor (signature)

\_\_\_\_\_  
08/22/2008  
Date

2.     \_\_\_\_\_  
Regional Forester (signature)

\_\_\_\_\_  
Date



Perspective view of the Cascade burned area with Burn Intensity. Pink is “high” burn Intensity. North is to the right.

<b>Fire Name</b>	Cascade
<b>Location</b>	Beartooth Ranger District, Custer N. F., Red Lodge MT
<b>Date</b>	8/18/2008
<b>Analyst name</b>	Henry Shovic, BAER team leader
<b>Contact Information</b>	<a href="mailto:hshovic@fs.fed.us">hshovic@fs.fed.us</a> 406 587 7614

Briefly describe VAR-Threat relationships for each Map Zone  
(Note: the fields below will auto expand as needed)

<b>Map Zone A</b>	Cascade Trails
<b>Map Zone B</b>	Cascade Roads
<b>Map Zone C</b>	Cascade Heritage
<b>Map Zone D</b>	Channel Treatment
<b>Map Zone E</b>	Cascade Fire Invasives

**Notes (optional):**

All Map zones cover the entire fire, because of its limited size.

<b>Fire Name</b>	Cascade
<b>Location</b>	Beartooth Ranger District, Custer N. F., Red Lodge MT
<b>Date</b>	8/18/2008

<b>SUMMARY</b>	<b>Total Treatment Cost</b>	\$ 386,043
	<b>Expected Benefit of Treatment</b>	\$ 777,000
	<b>Implied Minimum Value (IMV)</b>	\$ 98,633

<b>MAP ZONE A</b>	<b>Value Type</b>	<b>Value at Risk</b>	<b>Implied Value and/or Benefit Cost</b>
	Life and Safety	Yes	
	Non-Market: Cultural Values	Yes	
	Non-Market: Ecological Values	No	
	Market Values: Direct	Yes	\$ 65,000
	Market Values: Loss of Use	No	\$ -
	<i>Total Market Resource Value</i>		\$ 65,000
	<i>Proposed Treatment</i>		\$ 46,944
	Reduction in Probability of Loss		0.60
	Expected Benefit of Treatment		\$ 39,000
	Exp B/C Ratio of Treatment for Market Resources Only		0.8
	<b>Implied Minimum Value (IMV) of Protecting Non-Market Resource Values</b>		\$ 13,240

<b>MAP ZONE B</b>	<b>Value Type</b>	<b>Value at Risk</b>	<b>Implied Value and/or Benefit Cost</b>
	Life and Safety	No	
	Non-Market: Cultural Values	No	
	Non-Market: Ecological Values	No	
	Market Values: Direct	Yes	\$ 840,000
	Market Values: Loss of Use	No	\$ -
	<i>Total Market Resource Value</i>		\$ 840,000
	<i>Proposed Treatment</i>		\$ 297,658
	Reduction in		0.45

	Probability of Loss		
	Expected Benefit of Treatment		\$ 378,000
	Exp B/C Ratio of Treatment for Market Resources Only		1.3
	Implied Minimum Value (IMV) of Protecting Non-Market Resource Values		\$ -

MAP ZONE C	Value Type	Value at Risk	Implied Value and/or Benefit Cost	
	Life and Safety	Yes		
	Non-Market: Cultural Values	Yes		
	Non-Market: Ecological Values	No		
	Market Values: Direct	No	\$	-
	Market Values: Loss of Use	No	\$	-
	Total Market Resource Value		\$	-
	Proposed Treatment		\$	29,360
	Reduction in Probability of Loss			0.40
	Expected Benefit of Treatment		\$	-
	Exp B/C Ratio of Treatment for Market Resources Only			
	Implied Minimum Value (IMV) of Protecting Non-Market Resource Values		\$	73,400

MAP ZONE D	Value Type	Value at Risk	Implied Value and/or Benefit Cost	
	Life and Safety	No		
	Non-Market: Cultural Values	No		
	Non-Market: Ecological Values	No		
			\$	1,200,000
	Market Values: Direct	Yes		
	Market Values: Loss of Use	No	\$	-
	Total Market Resource Value		\$	1,200,000
	Proposed Treatment		\$	4,885
	Reduction in Probability of Loss			0.30
	Expected Benefit of Treatment		\$	360,000
	Exp B/C Ratio of Treatment for Market Resources Only			73.7

MAP ZONE E	Implied Minimum Value (IMV) of Protecting Non-Market Resource Values		\$ -
	Value Type	Value at Risk	Implied Value and/or Benefit Cost
	Life and Safety	No	
	Non-Market: Cultural Values	Yes	
	Non-Market: Ecological Values	Yes	
	Market Values: Direct	No	\$ -
	Market Values: Loss of Use	No	\$ -
	Total Market Resource Value		\$ -
	Proposed Treatment		\$ 7,196
	Reduction in Probability of Loss		0.60
	Expected Benefit of Treatment		\$ -
	Exp B/C Ratio of Treatment for Market Resources Only		
	Implied Minimum Value (IMV) of Protecting Non-Market Resource Values		\$ 11,993

From Calkin, David E.; Hyde, Kevin D.; Robichaud, Peter R.; Jones, J. Greg; Ashmun, Louise E.; Loeffler Dan. 2007. **Assessing post-fire values-at-risk with a new calculation tool.** Gen. Tech. Rep. RMRS-GTR-205. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 32 p.

and an associated spreadsheet titled: VARWorksheet\_Proto\_V8\_1.xls from Keith Stockman, Region One Economist, USFS.