

Date of Report: 9/19/13

**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 Names: Emigrant & Sheep  
(Miner-Paradise Complex)
- B. Fire Number: MT-GNF-000111 (Miner-Paradise Complex)
- C. State: MT
- D. County: Park
- E. Region: 01
- F. Forest: Gallatin
- G. District: 04 (Emigrant) & 03 (Sheep)
- H. Fire Incident Job Code: P1HVZ4 (Miner-Paradise Complex)
- I. Date Fire Started: 07/21/2013 (Emigrant)  
08/12/2013 (Sheep)
- J. Date Fire Contained: estimate: 10/25/2013 (Emigrant)  
8/28/13 (Sheep)
- K. Suppression Cost: \$7,718,000 (for Miner-Paradise Complex) as of 09/13/2013
- L. Fire Suppression Damages Repaired with Suppression Funds  
    1. Fireline waterbarred (miles): Emigrant-3.4 mi., Sheep-4.9 mi. as of 9/18/13  
    2. Fireline seeded (miles): Emigrant-1.9 mi.(planned), Sheep-2.5 mi.(planned) as of 9/18/13  
    3. Other (identify): 2.5 miles of handline rehabilitated on Sheep Fire as of 9/18/13
- M. Watershed Numbers: Emigrant: 100700020205, 100700020206   Sheep: 100700020105, 100700020106
- N. Total Acres Burned: Emigrant – 11,913 acres\*: NFS Acres(11,878) Other Fed (0) State (0) Private (35)  
\*Acreages for the Emigrant fire were determined based on a burn severity map created for the BAER effort based on detailed aerial and ground-based assessment by the BAER team soil scientist and technicians.
- Sheep – 570 acres: NFS Acres(520) Other Federal (0) State (0) Private (50)

O. Vegetation Types: Emigrant - Lodgepole pine/Douglas fir (70%), Whitebark Pine (10%), Grassland (20%)  
Sheep - Lodgepole pine/Douglas fir (60%), Grassland (40%)

P. Dominant Soils:

Emigrant – Soils throughout the burn area are primarily sandy-skeletal Entisols and Inceptisols formed on steep to extremely steep, erosive mountain slopes and associated active deposition areas along primary drainages. Some soils may classify as loamy-skeletal (family level of Soil Taxonomy) due to local variations in parent materials but overall sandy soil textures predominate in the fine-earth (non-rock) fraction of most soil profiles. All soils in the area have abundant rock fragments throughout. Soil fertility and site productivity are generally low as these soils have a limited capacity to store water or nutrients. Extensive areas of shallow soils are present on mountain slopes in association with rock outcrops and on convex slope positions. Soil erosion potential that is high normally on the steep mountain slopes becomes extremely high in areas where the vegetative cover has been lost. A high potential for rock slides and debris flows exists. The likelihood of slumps or other landslides associated with geologic instability occurring is low. Primary landscape forming processes in this area are soil erosion, dissection by steep gradient drainages, and rock slides originating on extremely steep mountain slopes.

Sheep – Loamy-skeletal Entisols and Inceptisols

Q. Geologic Types:

Emigrant – Geologic materials throughout the headwaters of the Emigrant Fire are hard volcanic rock comprised mainly of dacite porphyry (dacite that contains large, conspicuous crystals in a finer grained groundmass). Lesser amounts of a wide variety of other volcanic rock types may be present in volcanic areas, including basalt, andesite, and rhyolite flow rocks. Bedrock on mountain slopes closer to the origin of the fire in the northwest quadrant of the burn area has been mapped as Precambrian mylonite (Berg, et.al. 1999). Mylonite is a low grade, metamorphic rock, often dark colored, associated with tectonic movement. The weak degree of metamorphism is caused by large shear pressures at fairly low temperatures acting for short periods of time (American Geological Institute 1967). Associated with areas of mylonite there appeared to be a substantial amount of schist-like, flat rocks on the ground surface. These contained substantial amounts of mica. Deposition areas throughout the burn area contain mainly glacial till of local origin and lesser amounts of local alluvium. Soil textures in these areas are also sandy-skeletal but soil depths are substantially greater than on bedrock controlled, mountain slopes. Burned areas show substantial evidence of past rock slides as well as some clear evidence of current rock or rock and sand slides that have occurred since burning.

Sheep - Andesite

R. Miles of Stream Channels by Order or Class: Emigrant – 1<sup>st</sup> order (22.5 mi), 2<sup>nd</sup> order (5 mi), 3<sup>rd</sup> order (4 mi)  
Sheep – None

S. Transportation System

Trails: 12.9 miles (Emigrant)  
0 miles (Sheep)

Roads: 1 miles (Emigrant)  
0 miles (Sheep)

### PART III - WATERSHED CONDITION

- A. Burn Severity (acres): Emigrant: 1,330(low) 3,393 (moderate) 6,859 (high)  
Sheep: 224(low) 173 (moderate) 49 (high)
- B. Water-Repellent Soil (acres): Emigrant: 10,252 Sheep: 222
- C. Soil Erosion Hazard Rating (acres): Emigrant: 332 (low) 1330 (moderate) 10,252 (high)  
Sheep: 123 (low) 224 (moderate) 222 (high)
- D. Erosion Potential: Emigrant - 10-26 tons/acre (ERMiT, 10% exceedance value)  
Sheep – N/A
- E. Sediment Potential: Emigrant - 27 tons/square mile (assuming no debris flows)  
Sheep – N/A

### PART IV - HYDROLOGIC DESIGN FACTORS

- A. Estimated Vegetative Recovery Period, (years): Emigrant - 2 grass/shrubs 20-50 conifers  
Sheep - 2 grass/shrubs 20-50 conifers
- B. Design Chance of Success, (percent): Emigrant - 80  
Sheep – N/A
- C. Equivalent Design Recurrence Interval, (years): Emigrant – 25-yr post-fire  
Sheep – N/A
- D. Design Storm Duration, (hours): Emigrant – N/A (USGS regression equns for streamflow used in hydrologic analysis)  
Sheep – N/A
- E. Design Storm Mag., (inches): Emigrant - N/A (USGS regression equns for streamflow used in hydrologic analysis)  
Sheep – N/A
- F. Design Flow, (cubic feet / second/ square mile): Emigrant – 16 cfs/mi<sup>2</sup> ( $Q_{25}$  pre-fire)  
Sheep – N/A
- G. Estimated Reduction in Infiltration, (percent): Emigrant - 50  
Sheep – N/A
- H. Adjusted Design Flow, (cfs per square mile): Emigrant – 35 cfs/mi<sup>2</sup> (bulked) ( $Q_{25}$  post-fire)  
Sheep – N/A

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

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

On August 16, 2013 the Emigrant, Sheep, North Eightmile, and Horsetail Fires were assigned the name Miner-Paradise Complex and placed under the management of a Forest Service Type 2 organization. On September 9<sup>th</sup> a Type 3 team took over management of the Emigrant, Sheep, and North Eightmile Fires and management of the Horsetail Fire was turned over to Bozeman Ranger District fire personnel.

#### **North Eightmile and Horsetail Fires**

The North Eightmile and Horsetail Fires burned 414 and 143 acres, respectively. Through aerial assessment and discussion with the District Rangers and fire resource advisors it was determined that there were no critical values at risk associated with these fires. In addition they were below the 500 acre threshold which triggers BAER assessment. No further examination of these fires was carried out.

#### **Emigrant Fire**

The Emigrant Fire started by lightning on July 12, 2013 in the Emigrant Creek watershed. The fire slowly increased in size for several weeks, burning primarily at low-to-moderate intensity. By August 20<sup>th</sup> it had reached approximately 628 acres in size. On the afternoon of August 20<sup>th</sup> the area experienced a major wind event which caused the fire to jump its lines and rapidly burn through Sixmile Creek drainage, and intrude slightly into the Cedar Creek and West Fork Mill watersheds, while growing in size to approximately 10,250 acres. Slower growth since August 20<sup>th</sup> has increased the Emigrant Fire size to its current 11,913 acres, which includes 11,878 acres of NFS lands and a 35 acre private inholding.

Two attempts were made to obtain a BARC map for the Emigrant fire prior to the BAER assessment effort. Both attempts were foiled by heavy cloud cover, so a burn severity map was created for the BAER effort based on detailed aerial and ground-based assessment by the BAER team soil scientist and technicians. The resulting map (Figure 1) was used for the analysis presented in this report. Shortly before submission of this report, a partial-coverage BARC map of the Emigrant burn was obtained. Data gaps in the Landsat 7 Imagery left approximately 40% of the fire area blacked out (in stripes) on the BARC map. However, examination of available information on the BARC map shows close correlation between burn intensity shown on the partial BARC map and burn severity shown on the severity map developed by the BAER team.

Much of the area burned during the period of rapid fire expansion on the afternoon of August 20<sup>th</sup> experienced high severity burn impacts. The fire burned with high intensity through steep lodgepole pine and Douglas-fir uplands in the Main Fork Sixmile drainage. Significant portions of the middle and upper North Fork Sixmile Drainage also burned with high intensity. Table 1 displays burn severity acreages for all affected watersheds. Table 2 presents additional severity information for the Sixmile watershed. Most of the moderate and high severity sites examined in the field displayed hydrophobic soil conditions.

Figure 1. Burn Severity Map for Emigrant Fire

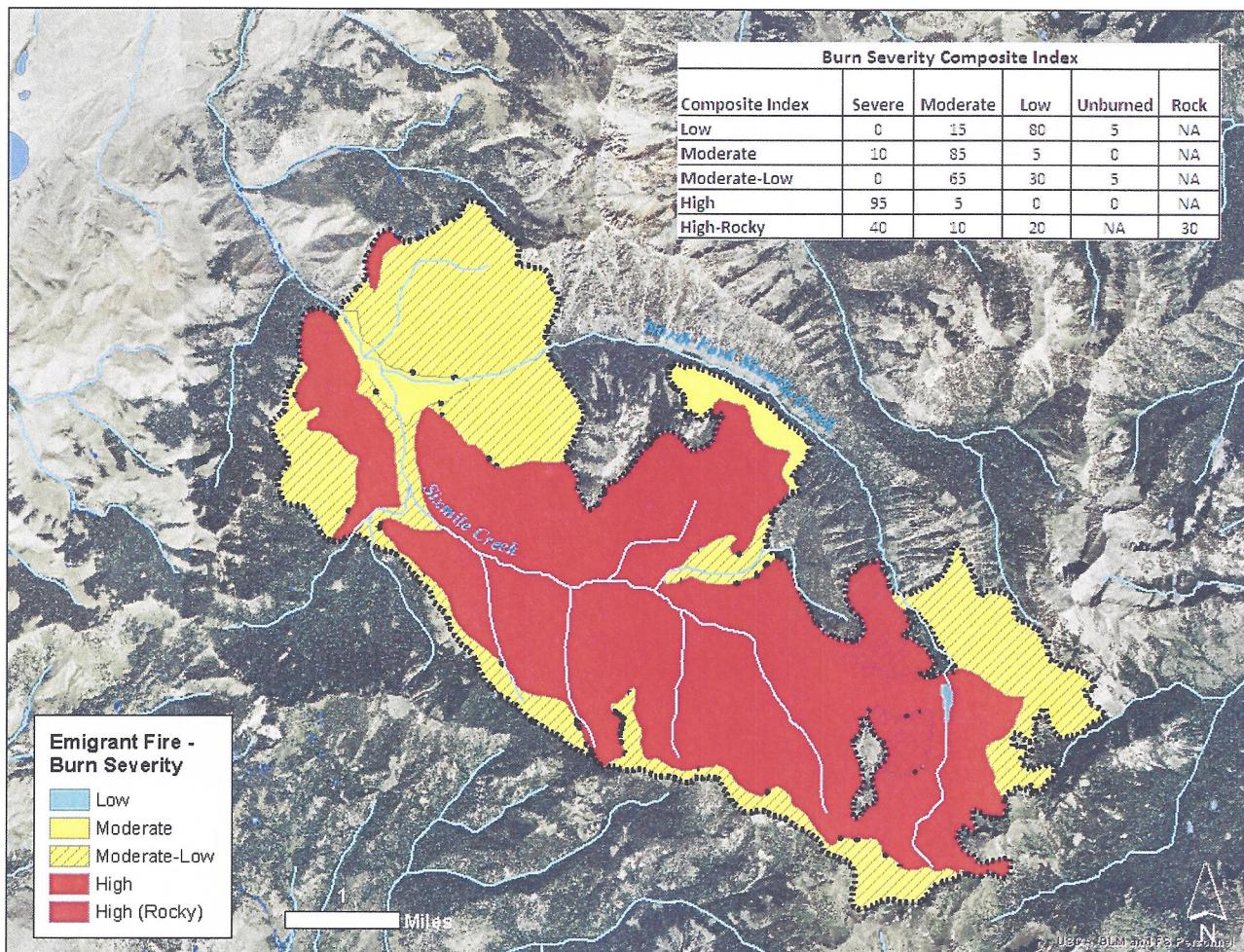


Table 1. Emigrant Fire Soil Burn Severity Area Estimates (acres)

Watershed	Low Severity	Moderate Severity	High Severity	Total
Sixmile Creek	1236	3190	6842	8629
Emigrant Creek	7	15	0	22
Cedar Creek	6	13	0	19
West Fork Mill Creek	80	175	17	272

Table 2. Sixmile Watershed Soil Burn Severity Areas (Percent of Watershed)

Location	Area (acres)	Percent of Watershed			
		Unburned	Low Severity	Moderate Severity	High Severity
Sixmile Creek Watershed above FS Road #348 Bridge	21,602	46%	6%	16%	32%
Sixmile Creek Watershed above Confluence of Main Fork Sixmile and North Fork Sixmile Creeks	16,310	37%	6%	17%	40%
Main Fork Sixmile Creek Watershed above Confluence of MF Sixmile and North Fork Sixmile Creeks	9,000	28%	4%	13%	55%

In the Emigrant, Cedar, and West Fork Mill Creek watersheds the fire affected very small proportions of the total catchment areas in remote locations with no associated values at risk identified. No further analysis or assessment was carried out within these watersheds.

Sixmile watershed, where hill slopes average slightly over 50%, is now highly susceptible to extensive erosion which poses a risk to soil productivity, water quality, fisheries, and the trail system. The predominant soil types in the drainage are sandy-skeletal Entisols and Inceptisols with high erosion potential (extremely high where there is loss of vegetative cover). The potential for rock slides is high. In addition, a number of high-gradient 1<sup>st</sup>-order tributaries to Sixmile Creek are at high risk for debris flows (Figure 2). Farther down the Sixmile drainage the highly elevated post-fire peak flows pose a risk to the bridge on Forest Service Road #348.



**Figure 2.** Fresh sediment deposits in lower end of draw along Main Fork Sixmile Trail #61 after the burn area received approximately  $\frac{1}{4}$  inch of rain during a post-fire convective storm.

### Sheep Fire

The Sheep Fire was started by lightning on August 12, 2013 and was declared contained on August 28<sup>th</sup>. Final fire size was 570 acres, which included 520 acres of NFS land and 50 acres of private land. The fire was confined almost entirely to a steep and rocky ridge system and did not directly affect any roads, trails, streams, or other infrastructure or discrete resource features. An initial assessment of potential values at risk (VAR's) and potential fire-related watershed impacts/reactivity concluded that, due to the small size of the fire compared to the sizes of watersheds affected and general absence of VAR's (with the exception of native vegetation communities threatened by post-fire weed proliferation), detailed hydrologic or soils investigations were not necessary. The BARC map for the Sheep Fire is shown in Figure 3. Table 3 displays burn severity acreages.

Figure 3. BARC Map for Sheep Fire

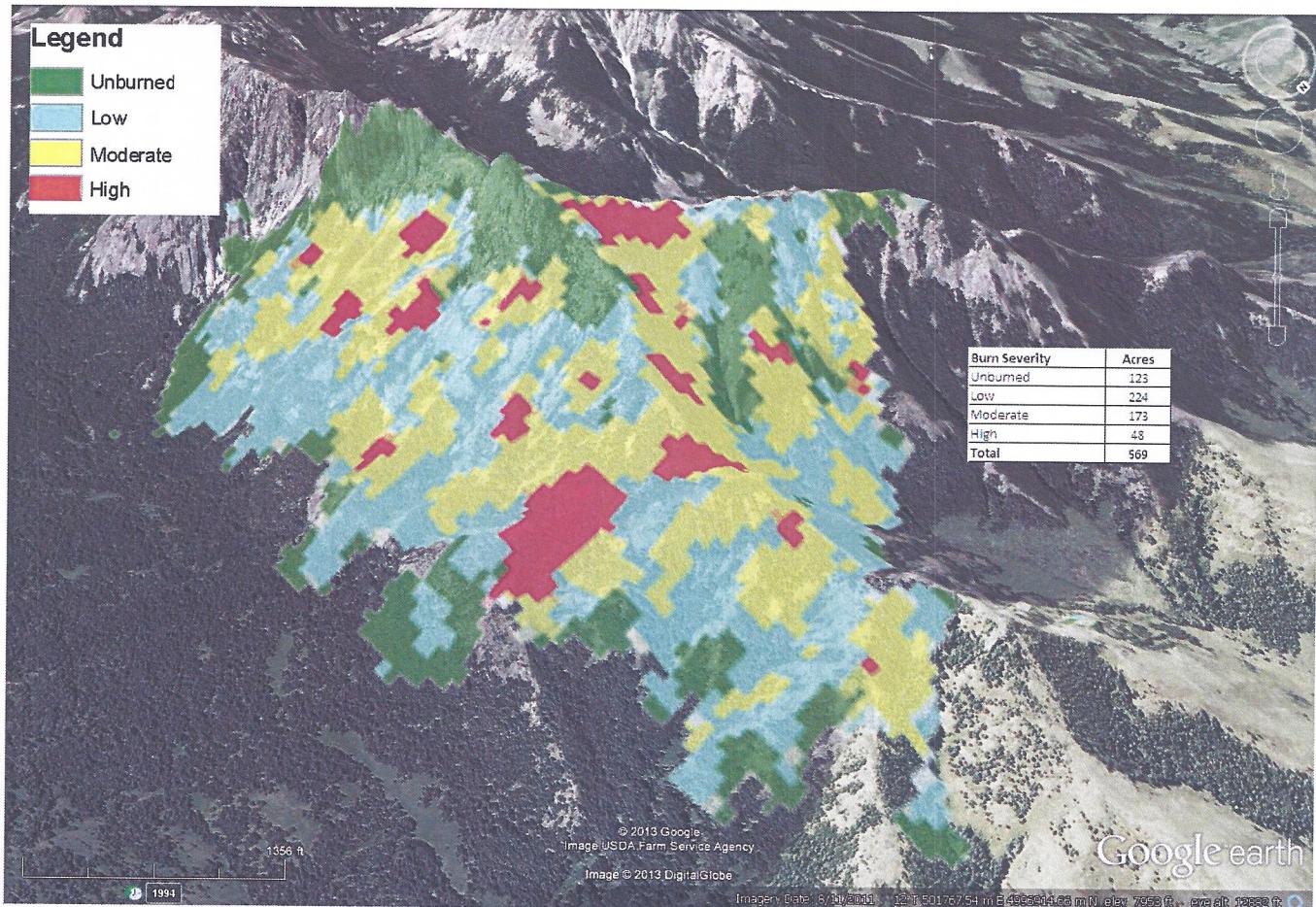


Table 3. Sheep Fire Soil Burn Severity Area Estimates (acres)

Area	Unburned	Low Severity	Moderate Severity	High Severity	Total
Sheep Fire	123	224	174	50	570

#### Values at Risk

A summary of values at risk and threats identified on the Emigrant and Sheep Fires is shown in Table 4. More detailed descriptions are presented in the following text.

**Table 4. Emigrant and Sheep Fire Values at Risk and Potential Threats**

Fire	Value at Risk	Potential Threats
Emigrant	Trails: North and Main Fork Sixmile Creek Trails	Trail tread erosion and deposition, as well as safety concerns for BAER implementation crews due to existing and potential hazard trees immediately adjacent to the trail. Illegal ATV use would exacerbate trail erosion.
Emigrant	Roads: NFS Road #348 Bridge	Potential for bridge and road prism washout which would pose a safety risk, erosion and sedimentation impacts to Sixmile Creek, would sever access to the private inholding/residence and trailheads on Sixmile Creek Road, and could potentially contribute to failure of County bridges located downstream.
Emigrant	Water Quality: Sixmile Creek is on the Montana 303(d) list of impaired streams due to elevated sediment	Erosion from the trail system and the road within the burn perimeter could add considerable anthropogenic sediment load to an already impaired system. Illegal ATV use would exacerbate sediment load. Failure of the bridge crossing would also result in additional sediment loading.
Emigrant & Sheep	Lands: Ecological Integrity (Weeds)	Potential loss of ecological integrity due to weed infestation and spread

**Road System:** There are no roads impacted by the Sheep Fire. The Emigrant Fire perimeter contains a single road along Sixmile Creek (NFS Road #348) with approximately 1 mile of road lying within the fire perimeter. This road provides public access to a private parcel with a cabin, three trailheads, and several mining claims and constitutes the transportation network needed to meet Forest management objectives. This road also serves as the sole access route for six outfitter/guide permittees and one range permittee.

NFS Road #348 extends from the Daly Lake Road (county owned) up Sixmile drainage to the Main Fork Sixmile Trailhead. It crosses private, BLM, and Gallatin National Forest property. The US obtained easement to operate and maintain Road #348 subject to grantor reservations for himself and heirs for continued use and access on this road.

NFS Road #348 runs directly adjacent to the main stem of Sixmile Creek for approximately three quarters of a mile. The road fill in several locations is being eroded by the stream and is susceptible to washout with projected increases in post-fire runoff. This issue is already being addressed using ERFO funds associated with flooding in 2011 and accordingly does not require BAER treatment.

NFS Road #348 crosses Sixmile Creek at one location via a timber bridge (Figure 4). Bridge capacity was estimated using HY-8 Culvert Hydraulic Analysis Program. Peak flow discharges generated for the bridge site are shown in Table 5. For any given return period the predicted post-fire peak flows are roughly double the pre-fire peak flows at the bridge site. Strong response to runoff is projected over the next three to five years or possibly longer. Persistence of elevated runoff response will depend on rates of vegetative recovery as well as rate at which hydrophobicity breaks down within the upper soil profile.

Figure 4. Bridge on Sixmile Creek Road (FS Road #348)



Table 5. Peak flow discharge estimates for two locations within and adjacent to the Emigrant Fire.

Location of interest	Model input parameters			Discharge by recurrence interval (cfs)							
	Drainage area (mi <sup>2</sup> )	% above 6000'	% area burned mod/high severity	Q <sub>2</sub>	Q <sub>5</sub>	Q <sub>10</sub>	Q <sub>25</sub>	Q <sub>50</sub>	Q <sub>100</sub>	Q <sub>200</sub>	Q <sub>500</sub>
Sixmile bridge	33.8	97.4	47.1	171	297	400	552	679	813	955	1159
Pre-fire peak flow				359	623	840	1159	1425	1706	2005	2432
Post-fire peak flow				136	238	323	448	553	664	783	953
Private inholding cabin	25.5	99.8	56.4	314	552	748	1038	1281	1538	1812	2206
Pre-fire peak flow				136	238	323	448	553	664	783	953
Post-fire peak flow				314	552	748	1038	1281	1538	1812	2206

HY-8 model results indicate that the Sixmile bridge will overtop at approximately 1300 cfs (Table 6). Region 1 FS bridge standards stipulate that a design discharge should be passed with two feet of freeboard. Under post-fire Q<sub>10</sub>, the water surface would touch bottom of bridge stringers. Based on recent post-fire events in the region, a more prudent design discharge for this crossing is the post-fire Q<sub>25</sub>. At this discharge the water surface would be near to the top of the bridge deck (i.e., most of the bridge structure would be submerged). In neither of these cases would USFS R1 bridge design standard requiring 3 feet of freeboard between the design water surface and the bottom of bridge stringer be met, and the bridge would be susceptible to damage or failure due to expected high stream discharge, sediment load, and debris load. Failure of the road prism or bridge would endanger the safety of public and FS personnel, sever access to private inholding, mining claims, and trailheads in the Sixmile Creek drainage, result in erosion and sediment impacts to Sixmile Creek, and potentially contribute to failure of County bridges and diversion structures lying downstream.

Table 6. HY-8 headwater elevation and corresponding discharge for Sixmile bridge.

Headwater elev (ft)	Total Q (cfs)	Bridge Q (cfs)	Roadway Q (cfs)
88.1	0	0	0
89.71	140	140	0
90.65	280	280	0
91.46	420	420	0
92.18	560	560	0
92.86	700	700	0
93.52	840	840	0
94.18	980	980	0
94.88	1120	1120	0
95.09	1160	1160	0
96.36	1400	1385.98	13.96
96	1325.38	1325.38	0

**Trails:** There are no trails impacted by the Sheep Fire. Approximately 12.89 miles of heavily used Gallatin National Forest system trails within the Emigrant Fire perimeter are at risk of erosion and sediment delivery. Two national forest system trails are located in the interior of the Emigrant Fire perimeter: North Fork Sixmile Trail (#606); and Main Fork Sixmile Trail (#61). There are approximately 4.4 miles of Trail #606 and 8.5 miles of Trail #61 within the fire perimeter.

The critical trail resource threat is from upland slope erosion and runoff being deposited on or entering the trail. The trails were not designed for the increased overland flow that will occur from the burned hillslopes. This would likely cause severe erosion of the trail surface and fill-slopes. Failure of drainage dips and water bars may cause runoff capture onto trail surface area, causing severe erosion, including loss of the trail by rilling and gullying (Figures 5 & 6). The South Fork Sixmile Trail contains one burned out puncheon bridge which, if not reconstructed, will result in damage to sensitive wetland habitat (Figure 7). Jackleg fence at Main Fork Sixmile Creek Trailhead to enforce motorized area closure was completely burned in fire, and absence of fence will likely result in ATV trespass which will exacerbate trail sediment and weed problems. Concentrated runoff from trail surfaces would deliver sediment to stream channels where trails are adjacent, impacting water quality in this sediment-impaired stream.



Figure 5. Scene from Main Fork Sixmile Creek Trail Number #61. The critical trail resource threats are from upland slope erosion and runoff being deposited on or entering the trail, erosion of the trail surface and fill slopes, and failure of the drainage system to protect trail structure and prevent sediment from entering stream channels.



**Figure 6.** Treated log crib or rock retaining wall should be constructed below trail tread along numerous sections of trail located immediately adjacent to and above the stream to prevent sediment delivery from sloughing material upslope. Additionally, the burned out trail tread with the addition of sloughing material, has resulted in a non-existent trail that is very difficult and hazardous to travel on these steep side slopes.

In many sections of trail on high ridges and steep slopes the tread is indiscernible due to the intensity of the burn. Loss of tread and blazed trees could result in trail braiding in some trail sections. If the system trail is not apparent, visitors will venture off the main tread and potentially cause more erosion by developing trail braids and reroutes. Warning signs also need to be installed at trailheads or trail portals. Signs at portals will provide information for recreational users about the hazards of a burned over landscape. Warning signs are needed at trail access points for the North and Main Fork Sixmile Creek Trails. Safety concerns for BAER crews working to improve trail drainage in the Emigrant Fire are relevant regarding hazard trees and/or tread failure.



**Figure 7.** Burned puncheon bridge requiring reconstruction to protect wetland area.

**Heritage Resources:** The Gallatin National Forest Archeologist has determined there are no known heritage resources at risk as a result of the Emigrant or Sheep Fires.

**Sensitive Plant Populations:** There are no known sensitive plant populations at risk as a result of the Emigrant or Sheep Fires.

**Fisheries:** On the Emigrant Fire, Three streams in the burned area, Sixmile Creek (Main Fork), North Fork Sixmile Creek, and Big Pine Creek are inhabited by Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*). Sixmile Creek flows into the Yellowstone River. However, irrigation diversion and dewatering limit connectivity and potential for spawning by Yellowstone River fish. Sixmile Creek and its tributary streams are considered a Yellowstone cutthroat trout (YCT) conservation population by agencies managing the species. Fish distribution

data indicate that rainbow trout occur only downstream of the National Forest boundary. This is probably due to an irrigation diversion structure limiting the upstream passage of rainbow trout (Scott Opitz MFWP Personnel Communication). Above the Forest boundary, genetically pure YCT, sculpin and brown trout are present. Big Pine Creek, tributary to Sixmile Creek has only YCT present. Because a relatively small proportion of Big Pine Creek was severely burned, this stream would serve as a refugium from which the connected populations in Sixmile Creek and North Fork Sixmile Creek could be re-established following any high-mortality peak flow events. For this reason as well as the extremely high projected cost of aerial mulching, no BAER funds are being requested to protect YCT or their habitat.

On the Sheep Fire, Tom Miner Creek and its tributary Horse Creek are the only streams with potential to be affected by the Sheep Fire. Tom Miner Creek supports YCT, Rainbow Trout, brown trout, and mottled sculpin. Horse Creek supports YCT, brown trout, and sculpin. Because of the relatively small proportion of the drainage was severely burned and because there is a wide unburned riparian floodplain, negative post-fire effects to the fishery are unlikely. If a debris flow were to occur, YCT in Horse Creek upstream from the burned area and in Tom Miner Creek upstream from the Horse Creek confluence would be unaffected. Because Tom Miner Creek is connected to Horse Creek (the Tom Miner Road culvert is not a barrier), YCT in Tom Miner Creek would be able to recolonize Horse Creek. Therefore BAER treatments are not warranted to protect YCT or their habitat.

**Lands (Weeds):** The values at risk on Sheep and Emigrant Fires with respect to noxious weed infestation and spread are potential loss of native vegetation diversity and ecological integrity in the burn area. If left unmanaged the exponential spread could permanently alter plant communities, wildlife habitats, recreational experiences, and adjacent private land values. Weed detection and integrated pest treatment of fire induced weed spread is needed on 191 acres of known noxious weed infestations on the Emigrant Fire and 30 acres of known noxious weed infestations on the Sheep Fire. For most noxious weed species identified in the fire, disturbed sites and dry potential vegetation types are at greatest risk from invasion and spread. Burned areas will contain high nutrient levels, exposed ground surfaces, and reduced shade. Noxious weeds favor this type of habitat, prevent the reestablishment of desired native vegetation, and can eventually displace already established native plants. If allowed to reach large infestation levels, the resulting weed population will be very difficult and expensive to manage. About 5 acres of ground disturbing fire suppression actions occurred (dozer lines, hand lines, helispots, safety zones, and drop points) on the Emigrant Fire which not only provide a new seedbed for weed invasion, but also act as a spread vector due to potential equipment spreading of weed seed. Ground disturbing fire suppression activities occurred on approximately 2 acres on the Sheep Fire.

Treatment will include known populations on FS and the private inholding using the Wyden authority. An MOU with the landowner is being processed at the time of request. Treatment of land in private inholdings is critical to prevention of weed spread to FS land, as the private lands are most heavily infested and are surrounded by burned FS land.

## B. Emergency Treatment Objectives:

Road treatments - Ensure safety of public and FS personnel when accessing the Sixmile Drainage. Maintain access to private inholding, mining claims, and trailheads in Sixmile drainage. Prevent erosion and sediment impacts to Sixmile Creek which would result from severe damage to, or failure of, the existing road bridge and associated road prism. Protect downstream County bridges and irrigation diversion structures from being damaged due to a failure of the FS bridge.

Trail treatments - Reduce or prevent accelerated trail damage from erosion by diverting, discharging, and dissipating runoff down the trail tread. Prevent trail system from contributing additional anthropogenic sediment load to impaired stream. Provide for safety of BAER trail implementation crews by removing hazard trees adjacent to work areas. Prevent damage to trails by ATV trespass, which would exacerbate trail sediment, water quality, and noxious weed problems.

Land treatments (weeds) - Reduce the risk of expansion of existing infestations of noxious weeds and allow burned native plant communities to recover unimpeded.

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

Land 90 % Channel na % Roads/Trails 70 % Protection/Safety na %

### D. Probability of Treatment Success

**Table 7. Estimated Probability of Treatment Success**

Treatment	Years after Treatment		
	1	3	5
Road (Bridge replacement)	95%	95%	95%
Trail	70%	80%	90%
Land (Weed treatment)	70%	70%	90%
Channel	N/A	N/A	N/A
Protection/Safety	90	90	95

**E. Cost of No-Action (Including Loss): \$1,059,525 (with several ecosystem values not quantified – see Table 8 below for details)**

**Table 8. Estimated Cost of No-Action**

Treatment	Estimated Cost of No-Action	Notes
Road (Bridge)	\$260,000	If emergency mitigation activities are not implemented there is a reasonable chance (estimated 20% or greater) the bridge and/or road prism will be severely damaged or destroyed due to post-fire high stream flows, resulting in potential safety risk to FS employees and the public, loss of access to private inholding land and residence, and resource damage from erosion and sedimentation. Cost of no-action includes cost of installing emergency portable bridge to restore access to Sixmile drainage. Cost of bridge failure could be more than stated here if it contributes to failure of County bridges or diversion structures located downstream.
Trails	\$250,000	If emergency mitigation activities are not implemented the condition of the trails will result in highly elevated erosion and sediment delivery which will grow worse over time as the trail tread and drainage structures continue to degrade. Safety issues related to poor trail tread condition will persist and worsen over time. ATV trespass would exacerbate trail sediment, water quality, and noxious weed problems. Cost of increased sediment delivery to sediment-impaired streams due to failed trail drainage system was not quantified.
Land (Weeds)	\$472,400 (Emigrant)  \$77,125 (Sheep)	If emergency mitigation activities are not implemented the weed problem will expand exponentially and will require future extensive resources to manage. Results of uncontrolled weed spread are well documented. In the next ten years if left unmanaged, populations would more than double and density would go from 25% to 100% without treatment. The costs associated with no weed mitigation results in costs from more herbicide treatment and values lost to altered plant communities, erosion, wildlife habitats, recreational experiences, and adjacent private land values are described in Appendix B of the Weeds and Rangeland Report.
Total	\$1,059,525	

**F. Cost of Selected Alternative (Including Loss): \$370,270**

In accordance with the revised Forest Service manual, the risk matrix below, Exhibit 2 of Interim Directive No.: 2520-2010-1 (Table 8), was used to evaluate the Risk Level for each value identified during the Miner-Paradise BAER assessment. Only treatments that had a risk of Intermediate or above are recommended for BAER authorized treatments.

**Table 9. BAER Risk Assessment Matrix**

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	RISK		
Very Likely	Very High	Very High	Low
Likely	Very High	High	Low
Possible	High	Intermediate	Low
Unlikely	Intermediate	Low	Very Low

For the Miner-Paradise Complex fires the critical values at risk identified included issues related to roads, trails, water quality, soil productivity, and lands. All of the issues identified had risk levels of High or Very High and therefore are recommended for BAER funded treatments (Table 9).

**Table 10. Risk Level of Miner-Paradise Critical Values At Risk**

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	RISK		
Very Likely	Very High	Very High	Low
Likely	Very High	High *Trails, Weeds, Water Quality, Soil Productivity*	Low
Possible	High *Road Bridge*	Intermediate	Low
Unlikely	Intermediate	Low	Very Low

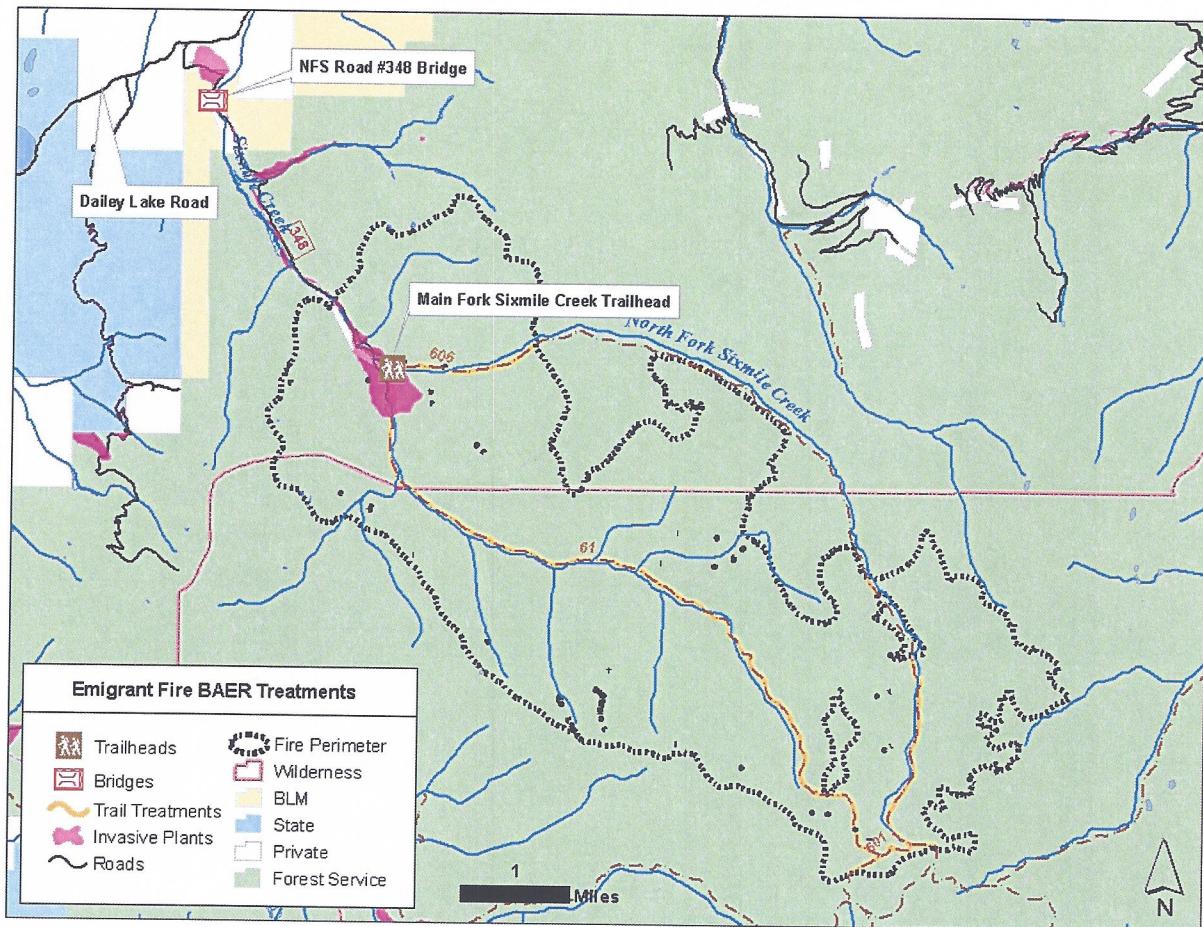
#### G. Skills Represented on Burned-Area Survey Team:

- [x] Hydrology    [x] Soils    [x] Range    [x] Weeds
- [ ] Forestry    [ ] Wildlife    [ ] Fire Mgmt.    [x] Engineering
- [ ] Contracting    [x] Ecology    [x] Botany    [x] Archaeology
- [x] Fisheries    [ ] Research    [ ] Air Quality    [x] GIS

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**H. Treatment Narrative:** Emigrant Fire treatment locations are shown in Figure 5, discussion follows.

Figure 5. Treatment Locations for Emigrant Fire



Road Treatments: The road bridge on NFS Road #348 was identified as being at high risk, with potential emergency situations. The proposed BAER response action is to replace the bridge with a "spill-through" style structure designed to convey the post-fire Q25 (or more) with the R1 standard 3-ft of freeboard below the bridge stringers to allow passage of debris. In addition to the freeboard this structure would provide improved debris conveyance due to its spill-through configuration and 50-ft (estimated) span.

The proposed action would ensure safety of public and FS personnel when accessing the Sixmile Drainage. Maintain access to private inholding, mining claims, and trailheads in Sixmile drainage. In addition, installing a bridge adequate to convey predicted post-fire flooding would prevent erosion and sediment impacts to Sixmile Creek resulting from severe damage to, or failure of, the existing road bridge and associated road prism and would protect downstream County bridges or diversion structures from being damaged due to a failure of the FS bridge.

#### Trail Treatments

Trail treatments to reduce erosion, runoff and sediment delivery, are planned at varying levels for each trail, with a number of factors taken into consideration. These factors include burn severity, soil type and structure, trail grade, side slope, alluviums, topography, vegetative cover, and proximity to critical fish habitat.

Selected hazard trees will be removed on the 12.9 miles of trails within the Millie Creek fire burn perimeter in accordance with EM-7720-102 standard specification for construction of trails. This will allow reasonably safe access for BAER trail rehab crews. Approximately 200 new trail drainage structures will be installed and 100 existing drainage structures will be repaired and/or cleaned out. Trail work will consist of:

1. Removal selected hazard trees and clearing of down trees where work crew access is blocked and in locations where sustained occupancy is necessary to perform trail work.
2. Install adequate drainage structures, repair existing structures as necessary, and clean out all structures during summer 2014 to prevent erosion of trail prism from upslope runoff likely to occur due to rain and snowfall.
3. Construct log crib or rock retaining wall to restore trail tread and protect adjacent stream from receiving direct hillslope sloughing of sediment in a highly constrained segment of South Fork Sixmile Drainage (trail re-route is not feasible).
4. Stabilize trail prism and repair puncheon to provide safe travel routes for BAER rehab crews and protect wetland habitat.
5. Install warning signs at all trail portals to inform BAER rehab crews of associated hazards within a burned landscape.
6. Install jackleg fence at Main Fork Sixmile Trailhead to prevent damage to trails by ATV trespass, which would exacerbate trail sediment, water quality, and noxious weed problems.

The Trail BAER work will be done at 12.9 miles of trails within the Emigrant Fire perimeter. Specific trails include:

- #606 – North Fork Sixmile Creek (4.4 miles)
- #61 – Main Fork Sixmile Creek (8.5 miles)

Trail work is planned to start in October 2012 with 2 additional cleanings during the summer of 2014.

#### Land Treatments (Weeds):

The emergency to the resource caused by the fire is of a high priority, especially in those areas which have highly invasive species concentrations prior to the burn. About 191 acres of the Emigrant Fire is predominately infested with spotted knapweed, houndstongue and Dalmatian toadflax. Sporadic infestations of oxeye daisy, Canada thistle, cheatgrass, and black henbane also exist on the Emigrant Fire. About 30 acres of the Sheep Creek Fire is predominately infested Canada thistle and musk thistle.

The seed banks in the soils associated with noxious weed infestations have long term viability aspects that will take advantage of post-fire conditions. Although the estimated net infested acreage is small in the context of the gross fire area, the entire NFS acre burned area provides a seed bed where weed seeds can become established from several spread vectors and remain viable in the soil for years. Weed seed viability can last up to 12 years for spotted knapweed which can produce up to 40,000 seeds per plant. Canada thistle typically survives growing season fire and sprouts vegetatively from its extensive perennial root system or colonizes bare ground via seedling establishment after fire. After top-kill, plants resume growth from buds located on the roots. Canada thistle can invade riparian, grasslands, and burned forest lands and suppress native plants.

About 6.5 miles of dozer suppression lines were built in the Emigrant fire and 6.5 miles of dozer suppression lines were built in the Sheep fire. Of that, 3.4 miles (Emigrant Fire) and 1.1 miles (Sheep Fire) were built on NFS lands and are considered prime weed beds, especially where there are known seed beds and infestations being in the area and suppression activities possibly moving seed source around suppression lines. Weed wash stations were established, however, suppression activities, such as dozer work, occurred through infestations and made some of the fire area more vulnerable to new weed seed sources.

The fires burned grassland and forest land, and eliminated natural competition for invaders. The fire-caused disturbance created perfect habitat for noxious weed invasion and expansion. If emergency mitigation activities are not implemented, this problem will very likely expand exponentially and will require extensive future resources to manage.

Recommended land treatments to mitigate the emergency are weed detection, herbicide weed treatment, and competitive seeding in critical noxious weed areas to support recovery of native vegetation. Proposed treatments will follow Forest Service regulatory requirements and protocols in accordance with existing 1986 Gallatin Forest Plan and 2005 Gallatin National Forest Weed Management EIS NEPA decisions.

BAER team vegetation experts assessed areas at risk from invasion and potential seed sources into these areas. Locations were identified for continued assessment to determine where treatment within one year of fire containment will be needed to protect vulnerable vegetation resources. These areas will be the first priority for detection assessment and potential future noxious weed treatment. The second priority for detection assessment will be the remainder of the burned area.

The Emigrant Fire burned portions of the Six Mile North and Six Mile South Allotments. However, primary rangelands for permitted grazing on active allotments were not affected by the fires and therefore will not require a grazing deferment strategy for 2014. Six Mile South Allotment had a portion of the primary rangeland burned, but due to its vacant status, there is no need to create a grazing deferment strategy for 2014.

The Sheep Fire burned portions of the Horse Creek/Reeder Creek Allotment. However, primary rangelands for permitted grazing on active allotments were not affected by the fires and therefore will not require a grazing deferment strategy for 2014.

## **I. Monitoring Narrative:**

Monitoring will be conducted to identify any noxious weed populations not effectively treated during initial treatment efforts. Results of this monitoring will be used to prioritize additional treatment in out-years using appropriated funds. Monitoring of trail improvements following high-intensity summer precipitation events will occur to ensure effectiveness of trail treatments.

## VI – Emergency Stabilization Treatments and Source of Funds

A. Land Treatments	Units	Unit Cost	# of Units	BAER \$	Other\$
NFS Weed competitive seeding (Emigrant)	AC	\$213	150	\$32,000	
NFS Weed detection & herbicide treatment (Emigrant)	AC	\$128	196	\$25,000	
Wyden Agreement Private Inholding herbicide and biological treatment (Emigrant)	AC	\$128	35	\$4,500	
Wyden Agreement Private Inholding herbicide and biological treatment (Sheep)	AC	\$128	3	\$400	
NFS Weed detection & herbicide treatment (Sheep)	AC	\$128	32	\$4,100	
<i>Subtotal Land Treatments</i>				<b>\$66,000</b>	
<b>B. Channel Treatments</b>	0	0	0	0	
<b>C. Roads and Trails</b>					
NFS Road #348 Bridge replacement - Design	EA	\$13,000	1	\$13,000	
NFS Road #348 Bridge replacement – Construction	EA	\$140,000	1	\$140,000	
Install new trail drainage structures	EA	\$150	200	\$30,000	
Clean out/repair existing trail drainage structures	EA	\$60	100	\$6,000	
Summer 2014 clean out all drainage structures (twice)	EA	\$60	600	\$36,000	
Construct new log crib or rock retaining wall	SF (face)	\$10	1910	\$19,100	
Construct new puncheon bridge	LF	\$170	40	\$6,800	
Construct new jackleg fence	LF	\$35	300	\$10,500	
Trail hazard Trees	each	\$50	300	\$15,000	
Warning signs	each	\$630	4	\$2,520	
<i>Subtotal Roads and Trails</i>				<b>\$278,920</b>	
<b>D. Protection and Safety</b>	0	0	0	0	
<b>E. BAER Evaluation</b>					
Assessment (person days)	DAYS	\$350	70	\$24,500	
Travel costs	LS	\$850	1	\$850	
<i>Subtotal Evaluation</i>				<b>\$25,350</b>	
<b>F. Monitoring</b>	0	0	0	0	
<b>G. Totals</b>				<b>\$358,020</b>	
Previously approved				\$0	
Total for this request				<b>\$370,270</b>	

## PART VII - APPROVALS

1. \_\_\_\_\_  
 Gallatin NF Forest Supervisor

8/19/13  
 Date

2. \_\_\_\_\_  
 Region 1 Regional Forester