

Date of Report:07/29/2013

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: West Fork/Papoose

B. Fire Number: CO - SJF - 000285

C. State: CO

D. County: Hinsdale and Mineral

E. Region: 2

F. Forest: RGNF

G. District: Divide Ranger District

H. Fire Incident Job Code: P2HKX5 override 0213

I. Date Fire Started: 06/05/2013

J. Date Fire Contained: 66% contained at time of report

K. Suppression Cost: Approx. \$33.2 million at time of BAER Report.

L. Fire Suppression Damages Repaired with Suppression Funds:

- 1. Fireline (dozerline) waterbarred (miles): 15 (of 15.5 miles constructed)
- 2. Fireline seeded (miles): 15
- 3. Handline: 9 miles of handline constructed, 9 miles repaired (covered, scarified, and waterbarrered)

M. Watershed Setting:

The West Fork and Papoose Burned Areas are located within the upper headwaters of the Rio Grande River. Creeks within the West Fork Burned Area confluence with the main stem of the Rio Grande River above the town of South Fork, CO. The Papoose Burned Area has creeks that are tributary to both the main stem of the Rio Grande river above the town of South Fork and the south fork of the Rio Grande River above the town of South Fork.

Watershed Numbers:

	6th Level HUC	6th Level HUC Name	Acres
Papoose	130100011002	Seepage Creek-Rio Grande	28,318
	130100010303	Spring Creek	20,723
	130100010304	Texas Creek-Rio Grande	17,172
	130100010401	Headwaters Trout Creek	14,797
	130100010301	Squaw Creek	13,918
	130100010302	Little Squaw Creek	11,332
	130100010402	Outlet Trout Creek	10,947
	130100010501	Headwaters Red Mountain Creek	10,718
	130100010502	Middle Creek	5,087
	West Fork	130100010903	Leopard Creek-Goose Creek
130100011106		Outlet South Fork Rio Grande	30,593
130100011008		Blue Creek-Rio Grande	22,833
130100011102		Headwaters South Fork Rio Grande	18,452
130100010901		Headwaters Goose Creek	14,879
130100011105		Trout Creek	14,218
130100011007		Elk Creek	10,439
130100010902		Fisher Creek	10,250

N. Total Acres Burned: Total: 88,724. NFS Acres(88,049). Private (675)

O. Vegetation Types: The Burned area was primarily in the spruce fir zone. Much of this zone was beetle killed standing dead Engelmann spruce. White and subalpine fir were also common in this zone. Upper elevations have high elevation forbs, shrubs, and willows which typically grow above timberline. At lower elevations near the edge of the burned area, small areas of Ponderosa pine and Douglas fir occur. Non-forested openings include un-vegetated areas, upland meadows of Arizona and Thurber's Fescue and riparian areas with grasses, willows and sedges.

Both burned areas were severely affected by Spruce Beetle prior to the fire. It is estimated that approximately 88% of the burned area was comprised of large contiguous areas of beetle killed trees in the "dead and grey" stage. Fire behavior in these areas was generally extreme and soil burn severity was generally moderate or high.

P. Dominant Soils: Forty different soil resource inventory (SRI) units are present within the burned area. Representative soil map units are the Frisco-Agreston association, 2 to 50% slopes, stony and Cryochrepts-Rock outcrop association, 5 to 70% slopes, very stony.

Rock fragment volume in surface layers is commonly in the 30% to 40% range and subsurface rock fragment volume are commonly in the 45% to 50% range. Most soils in the area have a soil texture of loam with small amounts of sandy loam and silt loam textured soils. With the exception of the Cryochrepts-Rock outcrop soil map unit, all SRIs have organic matter on the surface (an O horizon) ranging from 5 to 10 cm in depth. Rock outcrops are common within the burn area and are associated with ridgelines and steep canyon/valley walls.

Soil cover in the form of organic matter (litter, duff and woody debris) serves to protect soils from erosion and to cycle nutrients. The litter/duff layer depth was variable and was absent in some locations. Removal of this protective layer by the wildfire greatly increased the risk of soil erosion over most of the moderate

and high soil burn severity areas. Additionally, soil nutrient cycling has been modified by consumption or removal of above ground organic materials and organic materials contained within the surface layer of soil.

Q. Geologic Types: The majority of the geology in the area (~89%) consists of ash-flow deposits, primarily tuff but including inter-ashflow andesites, rhyolites, breccias, basalt, volcanic conglomerates and quartz latites. Alluvial deposits including glacial till make up approximately 7% of the burned area and igneous intrusions of granodiorite, granite and quartz monzonite make up the remaining 4%. The volcanic materials are not generally susceptible to mass movement. The Soil Resource Inventory list two units having high mass movement potential within the fire area. They constitute 3% of the fire area. These two units were generally not affected by the fire and both are non-forested sites. One is located in alpine climatic zone. The other is an un-vegetated rubble land-rock out crop unit. The mass movement concern in both units is associated with rock fall, not sliding or slumping. The risk for mass movement will not increase significantly as a result of the fire.

R. Miles of Stream Channels by Order:

Stream Order	Miles of Stream	
	Papoose	West Fork
1	156	136
2	50	30
3	29	17
4	25	22
5	8	7
7	8	0

S. Transportation System: Trails: There are 104 miles within the burned area perimeter and 37 miles within moderate and high soil burn severity polygons. Twenty two miles of these trails are within the wilderness area boundary. **Roads:** 52 miles of system and non-system roads were assessed with 41 miles affected by moderate or high severity burns.

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

Burn Severity	Acres	Percent of Area
Unburned	15,360	17%
Low	20,382	23%
Moderate	42,936	49%
High	10,045	11%

Based on ground observations, ground cover removal and increased potential for erosion was similar in both moderate and high burn severity polygons. Regardless of whether they are mapped as moderate or high soil burn severity, significantly higher rates of erosion are expected to occur on these burned hill-slopes.

A BARC image was obtained on 07/03/2013. The imagery was field verified and found to be reasonably accurate for the purposes of determining post wildfire erosion and runoff. Due to cloud cover, smoke cover and ongoing wildfire, manual soil burn severity mapping was used to correct approximately 15,000 acres of the imagery in the headwaters of Trout Creek Drainage and two other locations. No need for systematic adjustments to the BARC was determined. Soil burn severity observations and mapping were based on criteria outlined in the Field Guide for Mapping Post Fire Soil Burn Severity.

Interpretation of the Soil Burn Severity Map

Fire has the potential to significantly alter watershed and stream flow response to precipitation events. Within any given ecotype, the magnitude of these alterations is driven by two primary factors:

- 1) The portion of the watershed that was burned
- 2) The severity of fire impacts on soils within the burned area

In general, low soil burn severities do little to alter the hydrologic response of watersheds. Higher proportions of moderate and high soil burn severities lead to increases in watershed hydrologic response. Post fire watershed responses include reduced infiltration and canopy interception, increased erosion and larger/flashier peak flows.

B. Water-Repellent Soil (acres): 21,192. (Water repellency was observed in the field under moderate and high soil burn severity in forest vegetation types. It was estimated that 40% of the high and moderate severity burn is repellent.)

C. Soil Erosion Hazard Rating (acres)

Erosion Potential	Acres	% of Total
High	13,563	15
Moderate	72,668	82
Low	342	1
Not applicable (n/a) [±]	1969	2

[±] examples of n/a areas include rock outcrop and water.

The soil erosion hazard rating is based on soil properties such as texture and slope. Generally rates of erosion are low on unburned hill-slopes under closed canopy forests. Due to ground cover removal in high and moderate soil burn severity areas, actual rates of erosion will increase significantly following the fire.

D. Erosion Potential: The Erosion Risk Management Tool (ERMiT) model was used to predict erosion from burned and unburned hill-slopes within the burned area. The BAER Team Soil Scientist made ERMiT runs for burned area slopes and soil burn severities as shown in the following table.

ERMiT Erosion Model Outputs for the First Year Following the Fire

Slopes	Potential Soil Erosion (tons/acre) by Soil Burn Severity			
	Unburned	Low	Moderate	High
Slopes 0 – 5%	0 – 0	0 – 0	0 – 0	0 – 0
Slopes 5 – 20%	0 – 0.2	0 – 0.2	0 – 0.2	0 – 0.2
Slopes 20 – 40%	0.2 – 0.4	1 – 2	2 – 3	2 – 5
Slopes 40 – 60%	0.4 – 0.6	2 – 4	3 – 7	3 – 10
Slopes 60+	0.6	4	7	10

The ERMiT model is storm event based; outputs represent a single event rather than over-winter. Model accuracy assumes +/- 50%.

E. Sediment Potential: 5568 cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORS

- | | |
|---|---|
| A. Estimated Vegetative Recovery Period (years): | 3-5 years (recovery of hill-slope stability) |
| B. Design Chance of Success (percent): | 80% (assuming damaging storm does not occur before treatments are in place) |
| C. Equivalent Design Recurrence Interval (years): | 10 |
| D. Design Storm Duration, (hours): | 1 |
| E. Design Storm Magnitude, (inches): | 1 |
| F. Design Flow, (cubic feet / second/ square mile): | 17 (averaged across all watersheds) |

G. Estimated Reduction in Infiltration, (percent):

40 (based on limited field observation of hydrophobic soils conditions)

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

20 (averaged across all watersheds)

Post-fire Modeling of Watershed Hydrologic Response

	Watershed Name	Area (acres)	% of the Watershed burned at Moderate and High Severity	Pre-fire Estimated Discharge (cfs)	Post-fire Estimated Discharge (cfs)	% of Pre-fire flow	% of the Pre-fire 100 year flood
West Fork Fire	Metroz Lk	3271	70%	93	131	141%	68%
	Hope and Kitty	7079	58%	287	379	132%	77%
	Lake Ck	6786	49%	222	287	129%	70%
	Goose at Fisher	14868	33%	542	640	118%	71%
	Goose CK	60548	17%	1290	1397	108%	60%
	South Fork	71806	11%	1990	2096	105%	65%
Papoose Fire	Workman	1320	92%	24	35	146%	56%
	Trout	21636	45%	534	656	123%	66%
	Lt Squaw	11330	19%	249	277	111%	54%
	Rio Grande at the Box	135567	4%	2770	2833	102%	60%
	Rio Grande at Lt Squaw	129359	2%	2730	2760	101%	60%

Peak flows at 11 points of interest corresponding to specific VARs were modeled. Modeling peak flows at specific points of interest allowed the BAER Team to more accurately assess the flood threat. As previously mentioned, proportion of the watershed burned strongly influences model outputs.

Flood Hazard:

- It is expected that areas which were flood prone under pre-fire conditions will see an increase in the magnitude and frequency of flood events.
- The flood hazard is predicted to increase within and immediately downstream of the burned area.
- Many of the drainages burned are tributary to much larger watersheds whose channel capacity can readily accommodate increased post-fire flows from burned tributaries.
- Specific areas of concern (e.g. FSR 430 at Hope Creek, Recreation Residence at the mouth of the Rio Grande Box Canyon) have been identified.

Debris Flow Hazard:

The debris flow hazard is expected to increase within and immediately downstream from the burned area.

- In upper portions of burned drainages, severe localized storm events will likely introduce debris flow material to transport stream reaches. However, in many cases downstream values at risk are isolated from these transport reaches by depositional environments.
- In some cases the existing infrastructure is not adequate to accommodate anticipated debris (e.g. Lake Fork Trail footbridge).
- In specific geographic locations there is a substantial risk to life and property (e.g. FSR 410 and 430)

Road Washout Hazard:

The road washout hazard is expected to increase significantly as a consequence of the fire.

- Portions of the existing USFS transportation network do not have sufficient capacity to safely pass anticipated post-fire peak flows or sediment delivery.
- The design flood recurrence interval of major stream crossings on HWY 160 in the vicinity of the West Fork Fire is 100 years. This capacity is modeled to be sufficient for post-fire peak flows and sediment transport. However, the risk of plugging stream crossing structures with debris exists. Treatments have been prescribed to reduce this possibility to the extent feasible.

- In specific cases road washout and failure could result in trapping people in upper portions of drainages with no access to emergency services for prolonged periods (e.g. FSR 410).

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:

HUMAN LIFE/SAFETY and PROPERTY

Summary of Life/Safety Values at Risk: Threats to life and safety and property exist in valley bottom areas, in steep burned gulches and adjacent to steep burned hill-slopes throughout and downstream from the burned area. Residents, road users and recreational users will be exposed to increased risk of flooding or debris flow. The threat of fire weakened hazardous trees is also common throughout most of the burned area. Post wildfire watershed responses, that may impact life and safety, likely to occur within or adjacent to the burned area include:

- Debris flows within steep areas
- Rapidly rising creeks, flooding (particularly in confined channel reaches) and debris transport
- Channel migration in lower gradient, sinuous reaches in wide valley bottoms
- In comparison to the smaller creeks with the burned area, the threat of high flows and/or rapidly rising stage within the larger river channels (Rio Grande and South Fork) is low. However, increased movement of floatable woody debris through these reaches is likely and clogging could cause localized flooding or other impacts to values at risk in these areas.

Areas where life/safety and/or property could potentially be impacted include roads and trails (particularly near stream crossings), popular fishing areas, recreational residences, campgrounds located in flood prone areas, homes, driveways and reservoirs. Direct impacts to life/safety are possible in many places but the probability of impacts is generally low because it depends on people being in harms way if/when a damaging runoff event occurs. Indirect impacts such as loss of access/egress are more likely to occur.

The BAER team identified and described numerous specific locations where threats to life/safety and property exist throughout the burned area. These locations, descriptions of VARs, threats and recommended treatments/actions are described in detail in the West Fork and Papoose Burned Area Values at Risk (VAR) Spreadsheet, available in the project file. The value at risk spreadsheet is a dynamic tracking document that contains sufficient detail to guide the BAER Implementation team. As reflected in the VAR Spreadsheet, life/safety and property values at risk are often co-located. However, in all cases, the BAER Team completed separate risk assessments for life/safety and property.

Emergency Conditions for Life and Safety exist at various locations within both burned areas. The probability of loss ranges from possible to likely and the magnitude of consequences is always major. Therefore, the BAER risk rating is high to very high. Specific locations and risk assessments are described in detail in the VAR Spreadsheet.

Reservoirs and Irrigation Water Diversion/Delivery Infrastructure: Sedimentation of various reservoirs used for irrigation water supply and recreational fishing is likely to occur. Water delivery infrastructure may also be impacted. Loss of capacity or loss of use could occur. Delivery of floatable woody debris to these areas is more difficult to predict but it is also likely to occur in some locations. Modification of reservoir and diversion/delivery infrastructure management strategies may be needed to deal with sedimentation and debris. Reservoirs may also serve to buffer downstream areas from the impacts of flooding, sedimentation and/or debris.

Emergency conditions for impacts to reservoirs and water diversion/delivery infrastructure exist within both burned areas. The probability of loss ranges from likely to very likely and the magnitude of consequences is moderate to major. Therefore, the BAER risk rating is high to very high. Specific locations and risk assessments are described in detail in the VAR Spreadsheet.

Roads: There are fifty-two miles of Forest Service System Roads within burned area. There are forty-one miles of roads within moderate and high soil burn severity polygons. Specific roads that are likely to be affected post fire runoff and/or erosion include:

- FSR 410 Big Meadows 1.9 miles
- FSR 430 Lake Fork 12.7 miles
- FSR 520 Rio Grande Reservoir 32.5 miles
- FSR 521 House Canyon 6.1 miles
- FSR 522 Fern Cr 9.0 miles
- FSR 522.1F Fern Cr 2.9 miles
- FSR 522.1G Fern Cr 1.8 miles
- FSR 523 Middle Cr 16.2 miles
- FSR 524 Copper Cr 1.6 miles
- FSR 525 Gold Bar 2.0 miles
- FSR 533 Sawmill Canyon 4.4 miles

There are numerous stream passage culverts and ditch relief culverts. These structures are inadequate for increased runoff, erosion and debris. It is likely to highly likely that these structures will fail in many locations due to increased post wildfire runoff and debris. Loss of structures and erosion road surfaces is likely to occur. It is possible that life and safety of road users could be impacted and likely that loss of access/egress will occur. Road failures can also exacerbate flooding and sedimentation issues downstream.

Big Meadows Road (FSR 410) where Hope Creek enters the South Fork of the Rio Grande is a specific area of concern. This road lies on the south side and adjacent to the Rio Grande in a constricted canyon with a very narrow flood plain. Hope Creek and Kitty Creek, the principle contributing watersheds, burned in a mosaic pattern with a high proportion of moderate and high soil burn severity. Many downed trees could be recruited and entrained in post wildfire flows. Given a large rain event and movement of woody debris, it is likely that the culvert will plug and dam the stream. The high fill material may breach and erode or may become saturated and fail catastrophically. The probability of some form of failure is high and consequences could be major.

Throughout the burned area, the BAER team identified and described numerous specific locations where roads will likely be impacted. Roads, life and safety of road users and downstream values at risk were considered by the BAER Team. Locations, descriptions and recommended treatments/actions are described in detail in the West Fork and Papoose Burned Area Values at Risk (VAR) Spreadsheet, available in the project file.

Emergency Conditions for life and safety exist at various road locations within both burned areas. The probability of loss ranges from possible to likely and the magnitude of consequences is always major. Therefore, the BAER risk rating is high to very high. Specific locations and risk assessments are described in detail in the VAR Spreadsheet.

Emergency conditions for impacts to forest roads exist at various locations within both burned areas. The probability of loss ranges from likely to very likely and the magnitude of consequences is moderate to major. Therefore, the BAER risk ratings are high to very high. Specific locations and risk assessments are described in detail in the VAR Spreadsheet.

Trails: Sixteen trails (total of 37 miles) are routed through areas of high and moderate soil burn severity. Approximately 18 miles of affected trails are within the Weminuche Wilderness Area. All of these trails are highly likely to be impacted by runoff, erosion, flooding, debris flow or rolling rocks. The trails at greatest risk include: Trout Creek (Creede), Hope Creek, Kitty Creek, Goose Creek, Lake Fork, Shaw Lake Loop, Decker, Highline and Tie Hill. Prior to the fire hazardous trees were common on all of these trails due to extensive areas or dead standing beetle killed spruce trees. These trees are now fire weakened and the risk has increased. Footbridges over Lake Fork Trail and Squaw Creek Trail Foot near are likely to either

capture wood debris and increase the risk of channel clogging or wash out and become entrained in debris laden flows.

Table 1 - Trails Impacted by Moderate to High Burn Severity

Trail Name - Number	Trail Type	Total Trail Length (miles)	Miles of Moderate to High Burn Severity
Hope Creek – 838	non-motorized	6.1	4.8*
Kitty Creek – 837	non-motorized	4.7	2.3*
Lake Fork – 836	non-motorized	2.7	1.3
Shaw Lake Loop – 893	non-motorized	1.1	1.0
Tie Hill – 835	non-motorized	7.9	4.1
Decker – 834	non-motorized	7.9	3.5
Highline- 832	non-motorized	8.4	2.3*
Trout Creek – 831	3 miles single track motorized, 6.7 miles ATV	9.7	0.6
Raspberry – 830	non-motorized	4.9	1.2
Elk Creek – 833	non-motorized	4.6	0.9
Goose Creek – 827	non-motorized	12.9	4.4*
Sawtooth – 828	non-motorized	2.8	0.8*
Trout - (Creede) – 811	non-motorized	5.8	3.3*
West Trout – 895	non-motorized	4.4	1.7*
East Trout – 810	non-motorized	7.0	2.8*
Fern Creek – 815	motorized ATV 4.5 miles, 8.3 non-motorized	12.8	2.2
Totals:		103.7 miles	37.2 miles

* Denotes Wilderness Trails

Emergency Conditions for life and safety exist at various trail locations within both burned areas. The probability of loss ranges from possible to likely and the magnitude of consequences is always major. Therefore, the BAER risk rating is high to very high. Specific locations and risk assessments are described in detail in the VAR Spreadsheet.

Emergency conditions for impacts to forest trails exist at various locations within both burned areas. The probability of loss ranges from likely to very likely and the magnitude of consequences is moderate to major. Therefore, the BAER risk ratings are high to very high. Specific locations and risk assessments are described in detail in the VAR Spreadsheet.

Recreation Resources:

Developed Recreation

1. As described in the Roads Section (above), FSR 410 and FSR 430 will likely be impacted by post wildfire runoff and debris. Both roads provide access to the Forest's busiest campground and popular picnic and boating areas as well as numerous trails. Because public use of these roads and these facilities is high in this area, the probability of impacts to life and safety is high relative to lower use areas.
2. Hope Creek Trailhead is within a moderate/high soil burn severity area. The probability of falling snags and increased post wildfire runoff and debris is high in this area.
3. River Hill Campground is located on a flood prone area next to the Rio Grande River and near the confluence with Little Squaw Creek. The BAER Team determined that the area is at risk for flooding due to increased runoff and debris from Little Squaw Creek. Snags, common throughout the campground, could fall and injure people or block emergency access.

Special Uses

1. Little Squaw Resort sits on a stable alluvial fan at the mouth of the Little Squaw drainage. Increased threat from flooding and debris flow exists at this location. One cabin (Building 12) is at risk higher risk than the other cabins.
2. Rio Grande Summer Home Group has one recreation residence that could be impacted by flooding and/or debris from the Rio Grande River. This residence is located nearest to the mouth of Box Canyon.

Wilderness

No emergency determination for the Weminuche Wilderness was determined. However, potential treatments could result in irretrievable damage to the Wilderness character.

Economic Loss

Recreational impacts from both fires have and likely will continue to have impacts to the economy of the area.

Emergency Conditions for life and safety exist at recreation locations within both burned areas. The probability of loss ranges from possible to likely and the magnitude of consequences is always major. Therefore, the BAER risk rating is high to very high. Specific locations and risk assessments are described in detail in the VAR Spreadsheet.

Emergency conditions for impacts to developed recreation sites exist within both burned areas. The probability of loss ranges from possible to likely and the magnitude of consequences is moderate to major. Therefore, the BAER risk ratings are high to very high. Specific locations and risk assessments are described in detail in the VAR Spreadsheet.

NATURAL RESOURCES

Water Quality: (Water used for municipal, domestic, hydropower, or agricultural supply or waters with special state or federal designations on or in close proximity to the burned NFS lands): The magnitude of post-fire impacts to water quality are dependent on the size, intensity, and severity of the fire. In general the following effects are observed in post wildfire conditions:

- Accelerated rates of erosion and channel scouring can deliver large amounts of sediment to neighboring water bodies. As a result, suspended sediment concentrations and turbidity will increase in surrounding rivers and lakes (Literature values of 10X pre-fire conditions have been reported). Post-fire increases in suspended sediment and turbidity are expected to be most evident in the first year following the fire, and to return to levels similar to pre-fire conditions within 3-5 years.
- Sediment delivery is largely a function of hill slope and channel gradient, with steeper hill slopes delivering more sediment to water bodies, and steep streams acting as transportation conduits to lower gradient depositional areas. The steep gradients of many of the smaller tributaries in the burned area indicate that substantial transport and deposition will occur, likely depositional areas include: the Rio Grande River (above and below the Box Canyon constriction), Trout Creek (near the confluence with the Rio Grande), and the South Fork of the Rio Grande (from the confluence with Beaver Creek to the confluence with the Rio Grande).
- Increased concentrations (in water bodies) of nitrogen, phosphorus, sulfur, chloride, bicarbonate, and heavy metals all have the potential to occur following fire events. However, documented cases of exceeding National Primary and Secondary Drinking Water Standards are rare (USDA Forest Service Gen. Tech. Rep. RMRS-GTR-42-vol. 4. 2005).

Irrigation Water Quality: Impacts to irrigation water quality could occur downstream of the burned area. These impacts are would occur in direct response to heavy rain events and subside quickly following storm

generated peak flows. Irrigation water providers and users may need to test periodically to ensure water quality meets standards for irrigation.

Municipal/Domestic Drinking Water Quality: Post-fire water quality is not anticipated to impact municipal/or domestic water supply significantly, due primarily to usage of well fields rather than surface supply intakes.

Irrigation Water Quality: *The probability of loss is possible and the magnitude of consequences is moderate. Therefore the BAER risk rating is intermediate.*

Soil Productivity (Soil productivity and hydrologic function on burned NFS lands): No Emergency for long term soil productivity was determined.

Critical Habitat (Critical habitat or suitable occupied habitat for federally listed threatened or endangered terrestrial, aquatic animal or plant species on or in close proximity to the burned NFS lands):

Plants: There are no known occurrences of threatened or endangered plant species within the burned area at this time. There are no known occurrences of sensitive plant species within the burned area at this time. There is suitable habitat for sensitive species within some of the burned areas. A table of these suitable species can be found in the Range, T&E specialist report.

Wildlife: Federally-listed and potentially proposed species, R2 sensitive species, Forest Management Indicator Species, and FWS Birds of Conservation Concern occur in and around the fire area. Federally-listed or proposed species that are known to occur and/or have potential habitat in or adjacent to the fire area include: Canada lynx (T), and North American wolverine (P). For the wolverine, *potential but unoccupied* habitat is believed to be involved. There are 14 R2 sensitive species that occur or have potential habitat present within the fire area.

The BAER Team Biologist determined that habitat quality has been severely compromised by the fire, particularly for the Canada lynx, a federally-listed species that occurs within the area. However, no BAER emergency was determined for effects of post wild processes on terrestrial wildlife species.

Fisheries: There are 3 high elevation lakes/reservoirs that support Rio Grande cutthroat trout populations within or adjacent to the fire perimeter. These 3 populations are considered recreation populations and are supported by CPW hatchery stockings. Rio Grande cutthroat trout are forest sensitive species and a federal candidate for listing. There are no RGCT stream fisheries within the burn area. RGCT are stocked in Big Ruby Lake, Little Ruby Lake and Jumper Lake.

Most perennial streams within the fire perimeter support self-sustaining non-native trout populations. There are also 3 high value public land reservoirs that provide recreational fishing for non-native trout and are supported by CPW hatchery stockings. Recreational fishing lakes are: Regan Lake, Road Canyon Reservoir, and Shaw Lake. There are also several private lakes and trout stream fisheries downstream of the forest boundary. The recreational fisheries are important to the local economy.

Depending on the severity of the burn within the drainage and the percent of the drainage burned, fish may have been impacted by elevated water temperatures, poor water quality, and degraded stream habitat during the fire. The streams are now susceptible to continued degradation of habitat with erosion and debris flows along with poor water quality especially during times of localized high intensity rain events and high spring flows. Downstream fisheries outside of the immediate burn area will also be susceptible to degraded stream/reservoir conditions during major rain events and high spring flows.

The BAER Team recognizes the importance of the recreational fisheries upon the local economy and the users of the resource. However, BAER treatments are not intended to restore or replace lost populations or damaged habitat if federally listed species are not present. Therefore the BAER Team has concluded that there is **no emergency** determination for the fishery resources because there are no federally listed

threatened or endangered fish or designated critical habitat found within the burn area or directly downstream of the burn.

Native or Naturalized Plant Communities (Native or naturalized communities on NFS lands where invasive species or noxious weeds are absent or present in only minor amounts)

There are many areas currently under management for noxious weed infestations within and near the burned area. Known weed infestations are concentrated around roads, trails, campgrounds, and parking areas. Noxious weeds are capable of aggressive colonization in disturbed areas and compete strongly against native plant communities in the forest and range cover types found in the burned area. Fire impacted soil, soil disturbance, erosion, increased nutrient availability, fire stressed native plant community, and possible introduction of noxious weed seed from suppression and fire recovery efforts will increase the likelihood of spread and colonization of noxious weeds in the burned area. This threat will persist until native plants have had a chance to recolonize the burned and disturbed areas. This could take several years.

It is likely that existing weed infestations will increase, particularly in moderate to high soil burn severity areas, due to conditions favorable to accelerated growth and reproduction, and release from competition with native plant communities.

In addition, the unintentional introduction and dispersal of invasive weeds into areas disturbed by fire suppression and/or potential erosion control methods has the potential to establish persistent weed populations.

It is expected that most native vegetation will recover if weed invasions are minimized.

There is an emergency situation for the recovery of native vegetation due to significant threats of noxious weed establishment and/or spread affecting natural plant community integrity, wildlife habitats, and watershed values. The BAER risk rating is high to very high.

Range Allotments: There are 9 active grazing allotments, 5 vacant grazing allotments, 1 closed allotment, and one administrative pasture within the burned area. Impacts to these allotments range from 3% to 100% of allotment acres being burned. Many fences and some water developments were destroyed during the fire. Future grazing schedules will have to be modified and some areas will require resting until recovered.

CULTURAL AND HERITAGE RESOURCES

A total of thirty-five previously recorded archaeological sites exist within the West Fork and Papoose burn perimeters and fourteen archaeological sites exist within a mile of the perimeters. Known prehistoric sites within the burn perimeter include a possible Traditional Cultural Property, open lithic scatters and isolated finds. Known historic sites include historic cabins, two CCC outhouses, a logging camp, a sulfur mine, a stage coach road and associated swing station, and an historic ditch. There are likely many historic mining-related sites such as adits and cabins in the burn area that have not been documented. A total of ten eligible or potentially eligible cultural resources were assessed for fire and post-fire effects during this assessment. The following five were considered significant.

- **Very high risk** -Eligible historic property 5HN995
- **Very High Risk** -CCC Outhouses on 30-Mile Resort
- **High Risk** - Potentially eligible historic property 5HN1042
- **Moderate Risk** -Potentially eligible historic property 5HN996
- **Moderate Risk** -Impacted Trails and Trailheads

It is possible that unknown and undocumented archaeological sites in these areas could be threatened two-fold: By erosion and by future vandalism and looting due to their exposure. There will be a need in the future to assess the potential effects to the historic Sulphur Mine and associated cabins. At this time it is uncertain as to which features and/or structures are on Forest Service land and which are on the private in-holding. Safe access conditions and a cadastral survey will be required for a full cultural assessment that will occur outside of the BAER assessment. Within the Weminuche Wilderness there is a potential for exposure of cultural resources. These areas could not be inspected prior to completion of this report due to access hazards such as snags.

The probability that post wildfire runoff from typical high intensity/short duration summer thunderstorms could impact cultural and heritage resources is possible and, if impacted, the consequences would be major. The BAER risk for impacts to these resources is considered to be very high, high and moderate risk.

Summary of BAER Risk Assessment

Threat Identification	Critical Value	Probability of Loss	Magnitude of Consequences	BAER Risk
Roads	Life and Safety/Property	Very Likely	Major	Very High
Impacts to Trails and Recreation	Life and Safety/Property	Very Likely	Major	Very High
Sedimentation/Debris Deposition	Property: Reservoirs	Likely	Moderate	High
Flood Hazard	Life and Safety/Property	Very Likely	Major	High
Debris Flow Hazard	Life and Safety/Property	Very Likely	Major	High
Invasive Species (establishment/spread)	Natural Resources	Likely	Moderate	High
Erosion/Flooding	Cultural Resources	Possible	Major	High

The preceding table contains a general summary of risk assessments conducted as part of the West Fork/Papoose BAER process. Specific values at risk and associated risk assessments are listed on the VAR Spreadsheet, available in the project file.

B. Emergency Treatment Objectives:

Land Treatments

Noxious Weeds: The objective of noxious weed detection and treatment is to lower the risk of impacts to native or naturalized communities on NFS lands where invasive species or noxious weeds are absent or present in only minor amounts. This is achieved by reducing the threat of establishment and/or spread of weeds within the burned area.

Land Survey Monuments Recovery: The objective of this treatment is to locate and mark survey monument sites, not re-survey. It is recommended as a rapid response BAER treatment because post wildfire erosion (deposition) is likely to cover several of these survey monuments, making them difficult to find following rainfall events.

Heritage Site Stabilization: The objective of this treatment is to divert runoff that is adversely affecting the foundation of a cultural site.

Channel Treatments

The objective of channel debris clearing treatments is to remove materials from the channel or flood prone area that could become entrained in post wildfire flows and plug culverts or bridges downstream.

Road and Trail Treatments

The objective of road and trail stabilization treatments is to lower the risk of damage to property (system roads and trails) by lowering erosion of the road/trail surface in severely burned and steep areas or at creek crossings within or downstream from the burned area. In many places, these treatments also lower threats to life and safety associated with flooding, erosion and/or debris flow. Additionally, these treatments may lower runoff and sedimentation issues downstream.

Protection/Safety Treatments

Warning Signs: The objective of installing warning signs near roads, trails and recreation sites is to reduce threats to life/safety of workers and recreational users by warning of hazards associated with the burned area.

Closure Treatments: The objective of temporary closure of roads, trails and developed recreation areas is to reduce risk to human life and safety.

Hazardous Tree Removal: The objective of hazardous tree removal is to lower threat of hazardous trees to the life/safety of workers implementing BAER treatments.

Communication/Notification Actions: Another important objective of the BAER Team is to communicate the findings of this report to potentially affected parties and other groups/agencies involved in post wildfire response or recovery. Through coordination and information sharing with RWEACT, much of this communication has already occurred but ongoing coordination and information sharing will continue following the BAER planning period. The VAR spreadsheet outlines specific recommended communication/notification actions to be implemented following the formation of the BAER Implementation Team.

Cultural Resources Treatments

The objective of cultural resource treatments is to prevent irretrievable loss of archeological information, to prevent looting by informing recreational users of the importance of archaeology and federal laws that prohibit theft of artifacts and damage to historic or prehistoric sites, to prevent erosion and disturbance of archaeological materials, and to divert runoff that is adversely affecting the foundation of a cultural site.

Recommended cultural resources treatments are included in the Treatment Narrative section of this report under lands treatments (heritage site stabilization), channel treatments (channel debris clearing) and protection and safety treatments (closures and warning signs).

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

Land 80 % Channel 80 % Roads/Trails 80 % Protection/Safety 80 %

D. Probability of Treatment Success

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

Summary of VARTool Calculations:

- Market Resource Values (direct losses and loss of use): \$4,700,000
- West Fork Treatment Cost: \$573,129
- Expected benefit of treatment \$3,525,000
- Benefit/cost ratio=6.2

The VARTool Calculation Spreadsheet is available in project file. As described in this report, threats to life/safety and non-market cultural and ecological values exist throughout the burned area. These values were described in the VARTool Assessment but not considered in the benefit/cost ratio.

E. Skills Represented on Burned-Area Survey Team:

- | | | | |
|---|--|---|---|
| <input checked="" type="checkbox"/> Hydrology | <input checked="" type="checkbox"/> Soils | <input type="checkbox"/> Geology | <input checked="" type="checkbox"/> Range |
| <input type="checkbox"/> Forestry | <input checked="" type="checkbox"/> Wildlife | <input type="checkbox"/> Public Information | <input checked="" type="checkbox"/> Engineering |
| <input type="checkbox"/> Contracting | <input type="checkbox"/> Ecology | <input checked="" type="checkbox"/> Botany/Weeds/Range | <input checked="" type="checkbox"/> Archaeology |
| <input checked="" type="checkbox"/> Fisheries | <input type="checkbox"/> Lands | <input checked="" type="checkbox"/> Recreation/Special Uses | <input checked="" type="checkbox"/> GIS |

Team Leader: Eric Schroder. Email: eschroder@fs.fed.us. Phone: 303 541 2538

Forest Service BAER Team Members

- | | |
|------------------------------------|---|
| Team Lead | Eric Schroder |
| Assistant Team Lead and Liasson | Debra Mollet |
| Soils | Vaughn Thacker |
| Hydrology | Ben Stratton and Ivan Geroy |
| Hydrology/Affected Interest Liason | Phil Rienholtz, Jim Pitts |
| NoxiousWeeds/Botany | Tanner Dutton |
| Engineering | Gary Frink |
| Recreation | Jody Fairchild, Steve Brigham, Lisa McClure |
| Wildlife | Randy Ghromley |
| Fisheries | Barry Wiley |
| Cultural Resources | Angie Krall, Erin Hegberg |
| GIS | Pete McGee |
| Public Information | Kristie Borchers, Mike Blakeman |

External Partners and Contacts

With the exception of 675 acres of privately owned lands, the fire burned on NFS lands. A group of affected parties and concerned citizens formed a multi-agency collaborative group called Rio Grande Water Emergency Action Coordination Team (RWEACT). The BAER process was conducted in collaboration with

RWEACT. Information on burned area conditions, values at risk, anticipated watershed response and treatments/actions was shared at several coordination/information sharing meetings. The USFS and RWEACT stood together at two public meetings following the fire.

The BAER Team also benefited from local knowledge and expertise by discussing area flooding history and post wildfire issues with many local landowners.

F. Treatment Narrative:

(Describe the emergency treatments, where and how they will be applied, and what they are intended to do. This information helps to determine qualifying treatments for the appropriate funding authorities. For seeding treatments, include species, application rates and species selection rationale.)

Land Treatments

Mulching: Mulching was considered but **not** recommended by the BAER Team.

At the direction of the Forest Supervisor, the BAER Team considered whether mulching would be effective in lowering threats to the down-slope/down-stream values at risk discussed in this report. Mulching site suitability was determined through a GIS intersection of slopes and soil burn severity. These mulching polygons were refined based on landscape features and alignment with values at risk.

The BAER Team determined that:

- Life/safety values at risk were best addressed by closure treatments or notification actions.
- Impacts to roads were addressed by a variety of road treatments, described below.
- Mulching was not a cost effective treatment to address sedimentation of reservoirs used for irrigation water supply and recreational fishing. Based on field review, modeling, review of treatment effectiveness literature and professional judgement, the BAER Team concluded that large scale mulching would likely reduce but not eliminate sediment delivery to reservoirs.

Noxious Weed Detection and Treatment: Noxious weed detection and treatment is recommended for 1200 acres (estimated) adjacent to roads, 400 acres adjacent to trails and 200 acres adjacent to known weed infestations.

These areas will be prioritized, systematically inventoried and treated in the first year following the fire. BAER funds would be utilized to fund a GS-4 weed seasonal, extend the term of a current GS-5 weed seasonal, increase size of existing weed contracts and cover material and equipment necessary to accomplish these tasks.

These treatments are needed to reduce the threat of establishment and/or spread of weeds within the burned area.

Very little noxious weed inventory has been completed in wilderness areas within the burn, but there are some known spots along trails. Due to the remote location, some areas within the burn will be difficult to treat and these areas will require the use of livestock. The task to detect and treat new colonization or current population expansion into the burned area will exceed the current programs funding and abilities. BAER funds will be used for weeds detection and treatment for the first year following the fire. If weeds treatments are conducted after the first year following the fire, regular program funds must be used.

Heritage Site Stabilization: Installation of a sand bag deflector is recommended to lower the risk of impacts to eligible historic property 5HN995. This structure is located in a flood prone area adjacent to the Rio Grande River near the mouth of Box Canyon.

Channel Treatments

Channel Debris Clearing: Footbridges. Removal of two small foot bridges is recommended. The bridges are located at Lake Fork Creek and Little Squaw Creek. Removal of the bridges and placement of the materials outside the flood prone area would lower the risk of woody debris jams and localized flooding at these locations. Additionally, removal of these structures would eliminate the threat of the bridge timbers being washed out and transported downstream as part of the debris laden flows likely to occur in these streams.

Channel Debris Clearing: Woody Debris. Removal of 3 recently cut large trees on the Rio Grande River near the lower end of Box Canyon is recommended. This material is currently readily available to be recruited with bankfull to flood flows. The recommended treatment is to buck up the trees and remove them to higher ground outside the flood prone area. The purpose of this treatment is to lower the risk of this material becoming entrained in post wildfire flows and clogging the river at the bridge, directly downstream.

Channel Debris Clearing: Heritage Structure Removal. Removal of 2 small heritage structures (CCC Outhouses) is recommended. The structures are currently located in a flood prone zone on the 30 Mile Resort. The purpose of this treatment is to protect these heritage resources by removing them to another location outside the flood prone area. Additionally, removal of these structures will lower the risk of them becoming entrained in post wildfire flood flows and contributing to debris jams downstream.

Roads and Trail Treatments:

Road Treatments:

- Armored ford crossings where culverts are removed
- Channel debris clearing
- Culvert inlet/outlet armoring or modification
- Culvert removal or upgrade
- Ditch cleaning/armoring
- Out-sloping roads
- Rolling dips/water bars
- Hazard/warning signs (described in Protection and Safety Treatments, below)
- Road closures (described in Protection and Safety Treatments, below)

Installation of the recommended BAER treatments is more cost effective than repairing road damage caused by expected increased post wildfire runoff.

An extensive review of the road system was conducted in the field by the BAER Team Engineer. Hydrologist's also worked with the Engineer to review several of the areas of concern. Priority roads include the Maintenance Level (ML) Three roads, maintained for passenger car use. On these roads, culvert improvements or removal of culverts and installation of hardened fords is recommended. Fewer treatments are recommended for ML one and two roads. On these roads, treatments will be prioritized by the effect of road erosion on downstream values at risk.

The purpose of the recommended road treatments is to:

- Increase the ability of road drainage structures to handle post wildfire flows and debris
- Lower the impact of post wildfire processes (flooding, debris flow, erosion) on the road system
- Lower threats to the life and safety of road users
- Lower the potential for roads to intercept and divert overland flow or stream channels
- Lower the potential for erosion and runoff from the road system to contribute to flooding and sedimentation downstream

Trail Treatment Background Information: There are 104 miles of trail within the burned area and 37 miles of trail within high and moderate burn severity polygons. It is expected that trails within high and moderate burn severity areas will be impacted by post wildfire scouring or depositional processes.

Funding requested to address these concerns is limited because the BAER Team recognized that treatments would not be needed along every mile of trail, that some trail treatments would be more effective following hill-slope stabilization in 3-5 years, that access into some areas would be limited due to high amounts of hazardous trees and that the window of opportunity for trail stabilization work is approximately two months before snowfall in 2013.

The fire burned through large contiguous areas of beetle killed spruce so hazardous trees were abundant prior to the fire. However the fire has further weakened trees and hazard tree removal to protect workers installing treatments is needed. Funding requested for this treatment is limited to a conservative estimate because trail closure will likely be recommended where extensive hazard tree removal is needed.

Trail Stabilization Recommendations:

- Install trail drainage structures to maintain natural drainage patterns and trail stability over the first winter of potentially damaging spring runoff events. BAER treatments would only be implemented where accelerated post-fire watershed processes could affect the trail.
- Armor key ephemeral drainages and trail water diversion structures to prevent undercutting and loss of trail tread. This will require the placement of rock in a rip-rap fashion below drainages to dissipate the energy of water flows and decrease the possibility of erosion adjacent to the trail.
- Install or improve rolling dips as needed to mitigate damage to trail caused by increased post-fire watershed response. Rolling dips would be installed on sections of trails with sustained grades and no grade breaks. When rolling dips are installed on steep side slopes, frequency of structure placement should increase to lessen the volume and velocity of down-trail water flow. Rolling dips will also be needed to complement existing trail water diversion structures which could be compromised by increased water flows. Existing drainage structures will need immediate maintenance. Installing/improving these trail drainage structures would also reduce detrimental effects to downstream values at risk.
- Berm removal and out-slope the trail where possible.
- To provide for implementation crew safety, hazard trees should be identified and removed. For BAER implementation, hazard trees are any tree considered a safety hazard to the implementation crews. Crosscut saws would be utilized in the Weminuche Wilderness Area.
- Close certain trails within the burned area. To address the values at risk described above, closures would remain effective through the first year following the fire. Monitoring would be conducted to determine if hazardous conditions exist to inform future decisions to re-open the trails.

BAER trail treatments would only be implemented where accelerated post-fire watershed processes will likely affect trails, where cost of treatment is less than cost of repair and/or to lower threats to safety of trail users or BAER Implementation Team Workers.

Protection and Safety Treatments

Road and Trail Closures: Road and trail closures are proposed to lower threats to life and safety in the following areas: Hope Creek, Kitty Creek, Lake Fork, Shaw Lake Loop, Tie Hill, Decker, Highline, Trout Creek (near Trout Mountain, South Fork area), Raspberry, Elk Creek, Goose Creek, Sawtooth, Trout Creek (near Creede), East Trout, West Trout and Fern Creek. Several of these trails may be reopened during the fall of 2013 depending on treatment success. If trails are reopened, warning signs would be placed to inform users of hazards in the burn area. Evaluate trail and watershed conditions during fall of 2013 and the summer of 2014 to determine if hazardous conditions still exist.

Closures would be implemented through the issuance of a forest order or area closure and trailhead signage.

The cost of developing closure orders, purchasing and installing closure signs and monitoring closure treatment effectiveness is included in this funding request.

Heritage Site Closure: Closure of Eligible historic property 5HN995 is recommended to protect life and safety. This structure is located in a flood prone area adjacent to the Rio Grande River near the mouth of Box Canyon.

Recreation Site/Area Closures: Area closures are proposed to lower threats to life and safety in the following areas: Big Meadows Complex, Hope Creek Trailhead, Lake Fork Trailhead, Rio Grande Summer Home Group (one cabin), Box Canyon Dispersed Area, River Hill Campground, Little Squaw Resort (one cabin)

The costs of developing closure orders, purchasing and installing closure signs and monitoring closure treatment effectiveness are included in this funding request.

G. Monitoring Narrative:

(Describe the monitoring needs, what treatments will be monitored, how they will be monitored, and when monitoring will occur. A detailed monitoring plan must be submitted as a separate document to the Regional BAER coordinator.)

Road Treatment Effectiveness Monitoring

A variety of road and trail stabilization treatments were recommended. While storm inspection and response will provide information on the condition of the road and trail networks following storms, funding for the Forest Roads Engineer, BAER Team Hydrologists and Implementation Team Leader to conduct treatment effectiveness monitoring is also recommended. Estimated time required for monitoring and information sharing with RWEACT is 10 person days.

Closure Effectiveness Monitoring

Several roads, trails and recreational facilities are recommended for temporary closure. Estimated time required for closure effectiveness monitoring is 20 person days over the course of the year. Most of this monitoring would be conducted by Forest Recreation Specialists and Road Engineers. Hydrologists would also participate to field review watershed response of known precipitation events. This information would be used to inform Forest decisions on appropriate timing for lifting closures.

Part VI – Emergency Stabilization Treatments and Source of Funds Initial

Line Items	Units	Unit Cost	NFS Lands		Other \$	# of units
			# of Units	BAER \$		
A. Land Treatments						
Nox. Weeds Detection and Treatment	acres	42.69	650	\$27,749	\$0	
Heritage Site Stabilization	each	2906	1	\$2,906		
<i>Insert new items above this line!</i>					\$0	
<i>Subtotal Land Treatments</i>					\$30,655	\$0
B. Channel Treatments						
Channel Debris Clearing: Heritage Structure Removal	each	4048	2	\$8,096		
Channel Debris Clearing: Woody Debris	days	250	4	\$1,000		
Channel Debris Clearing : Little Squaw Bridge	each	1360	1	\$1,360		
Channel Debris Clearing: Lake Fork Bridge	each	1550	1	\$1,550	\$0	
Riprap for road and campground protection	two	27080	1	\$27,080		
<i>Subtotal Channel Treat.</i>					\$39,086	\$0
C. Road and Trails						
Road Storm Proofing (culvert removal, outsloping, dips)	many	343180	1	\$235,760		
Road: Culvert Removal and Armored Crossings	two	71920	1	\$71,920		
Trail Storm Proofing	mile	2626	19	\$49,894	\$0	
<i>Insert new items above this line!</i>					\$0	\$0
<i>Subtotal Road & Trails</i>					\$357,574	\$0
D. Protection/Safety						
Trail Closures	many	19750	1	\$19,750		
Rec. Area Closures	each	3887	9	\$34,983		
Heritage Site Protection Signs	all	4081	1	\$4,081	\$0	
<i>Insert new items above this line!</i>					\$0	\$0
<i>Subtotal Structures</i>					\$58,814	\$0
E. BAER Evaluation						
Assesment Team Costs					\$70,500	
<i>Insert new items above this line!</i>						
<i>Subtotal Evaluation</i>					---	\$70,500
F. Monitoring						
Road and Trail Treatment Effectiveness						
Closure Effectiveness (Roads, Trails and Rec. Sites)					\$0	\$0
<i>Insert new items above this line!</i>					\$0	\$0
<i>Subtotal Monitoring</i>						
G. Totals						
				\$486,129	\$70,500	
				\$486,129		

PART VII - APPROVALS

1.  Forest Supervisor (signature)

07/30/2013
Date

2. _____
Regional Forester (signature)

Date