

Date of Report: 10/29/20**BURNED-AREA REPORT****PART I - TYPE OF REQUEST****A. Type of Report**

- 1. Funding request for estimated emergency stabilization funds
- 2. No Treatment Recommendation

**B. Type of Action**

- 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)
- 2. Interim Request # \_\_\_\_\_
  - Updating the initial funding request based on more accurate site data or design analysis

**PART II - BURNED-AREA DESCRIPTION****A. Fire Name:** Bridger Foothills**B. Fire Number:** MT-CGF-000214**C. State:** MT**D. County:** Gallatin**E. Region:** 1**F. Forest:** Custer Gallatin NF**G. District:** Bozeman RD**H. Fire Incident Job Code:** 0111 P1NJ3G, P1EK34**I. Date Fire Started:** 9/4/20**J. Date Fire Contained:** 10/12/20**K. Suppression Cost:** \$7,250,000**L. Fire Suppression Damages Repaired with Suppression Funds (estimates):**

- 1. Fireline repaired (miles): 5.9
- 2. Other (identify):

**M. Watershed Numbers:***Table 1: Acres Burned by Watershed*

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
100200080801	Upper Bridger Creek	30662	2835	9
100200080802	Lower Bridger Creek	13554	5453	40

**N. Total Acres Burned:**

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
NFS	2,065
OTHER FEDERAL (LIST AGENCY AND ACRES)	
STATE	
PRIVATE	6,223
TOTAL	8,288

O. Vegetation Types: Douglas fir, Aspen, Riparian

**P. Dominant Soils & Geologic Types:**

The steep, complex topography of the Bridger Mountain Range creates variable geology, aspect, slope, elevation, and vegetative patterns. These factors lead to variable soils both within the Custer Gallatin National Forest and on adjacent private land. Within the fire perimeter, elevation ranged from 8,770 ft to 5,050ft (8,770 ft to 5,600 ft on CGNF, 7,720 ft to 5,050 ft on private). Higher elevation soils near the Bridger Ridge are shallow, rocky, sparsely vegetated, and generally poorly developed. These high elevation soils are derived from underlying limestone. Mid elevations within the fire perimeter include grassland and forest soils which are deeper, more developed, and generally less steep. These soils are underlain by interbedded sandstone and shale, with influences from upslope limestone. Lower elevation sites have similar characteristics to the mid elevation sites, but include a higher proportion of riparian soils in concave landscape positions.

Q. Geologic Types: Limestone in upper elevations, interbedded sandstone and shale in mid and low elevations.

**R. Miles of Stream Channels by Order or Class:**

Table 3: Miles of Stream Channels by Order or Class

STREAM TYPE	MILES OF STREAM
PERRENIAL	5.4
INTERMITTENT	
EPHEMERAL	
OTHER (DEFINE)	

**S. Transportation System:**

Trails: National Forest (miles): 2.2

Other (miles):

Roads: National Forest (miles): O&M: 0.9

Other (miles): Decommissioned: 2.2

### PART III - WATERSHED CONDITION

**A. Burn Severity (acres):**

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	Other Federal (List Agency)	State	Private	Total	% within the Fire Perimeter
Unburned	245			396	641	8%
Low	1320			4614	5934	72%
Moderate	428			884	1312	15%
High	72			328	400	5%
<b>Total</b>	<b>2065</b>			<b>6223</b>	<b>8288</b>	<b>100%</b>

B. Water-Repellent Soil (acres): 500 (all area burned under moderate and high severity were observed to express moderate water repellency).

- C. Soil Erosion Hazard Rating:** 1320 acres low, 428 acres moderate, 72 acres high (based directly on soil burn severity)
- C. Erosion Potential:** Based on assessment using ErMit, average erosion rates from the higher elevation forested hillslopes ranged from 0 tons/acre in low burn severity areas to 2 tons/acre in high severity areas. Non-forested hillslopes averaged between 0.6 and 1.3 tons/acre depending on soils, slope length, and slope.

Average erosion rates from the low elevation forested slopes ranged from 0.6 tons/acre in low burn severity areas to 5 tons/acre in high severity areas. Non-forested hillslopes averaged between 3.3 and 6.4 tons/acre depending on soils, slope length, and slope gradient.

- D. Sediment Potential:** Nearly all of the areas burned on FS land were higher elevation forested hillslopes where average estimated erosion potential ranged from 0 tons/acre in low burn severity areas to 2 tons/acre in high severity areas. Potential sediment potential from these areas, using the high end of average erosion potential for FS lands, is 2 tons/acre during the 3-yr storm (based on 100-yr weather record generated with Prism).

- F. Estimated Vegetative Recovery Period (years):** 1-3 (grasslands and forest understory)

- G. Estimated Hydrologic Response (brief description):** The Bridger Foothills Fire burned 8,288 acres, primarily in the southeast portion of the Bridger Mountain Range, with a small incursion into the west edge of the Bangtail Range. The fire was reported on the afternoon of September 4 near the southwest end of the range near the "M." It quickly ran to the top of the Bridger Ridge and spotted over to the southeast part of the ridge near the mouth of Bridger Canyon. The majority of the burning occurred on September 5<sup>th</sup> when strong winds ahead of an incoming cold front drove the fire north and east up Bridger Canyon. The area burned was a mix of timber, open grassland areas, aspen groves, and riparian. Burn intensities were high in many of the timbered areas.

Soil burn severity was not directly correlated to burn intensity in many locations. The majority of the fire area was determined to be low severity, largely due to the presence of grassland areas and numerous aspen groves and riparian areas, and the relatively high speed with which the fire moved (Figure 1). Although the fire burned with moderate or high intensity in many forested areas, the soil burn severity was low or moderate in many of those locations. This was likely due to the very fast movement of the fire on September 5 and relatively low exposure time of the soil to intense heat.

Critical value assessment requiring post-fire peak flow calculation was only necessary in Pine Creek drainage, at the north edge of the fire perimeter, where a FS road provides access for range permittee administrative use. Post-fire peak flow estimates were calculated for three locations with catchment areas ranging from 42 to 380 acres. Those three locations, all of which were culverts at road crossings, were the only places within the perimeter where sufficient area burned under moderate to high severity to potentially warrant emergency response. Model results suggest a doubling or tripling of potential peak flow response between 5- and 10- year recurrence intervals for the three catchments in question (Table 5).

Table 5: Pre- and Post-fire peak flows in three catchments within Pine Creek drainage

Catchment ID	UTM coordinates (NAD 83)		Pre-fire flow (cfs)			Post-fire flow (cfs)		
	East	North	2-yr	5-yr	10-yr	2-yr	5-yr	10-yr
2	506385.29	5068092.64	4	15	24	7	22	42
5	507603.68	5067706.79	1	3	6	3	10	17
6	507331.65	5067627.89	1	2	4	2	6	10

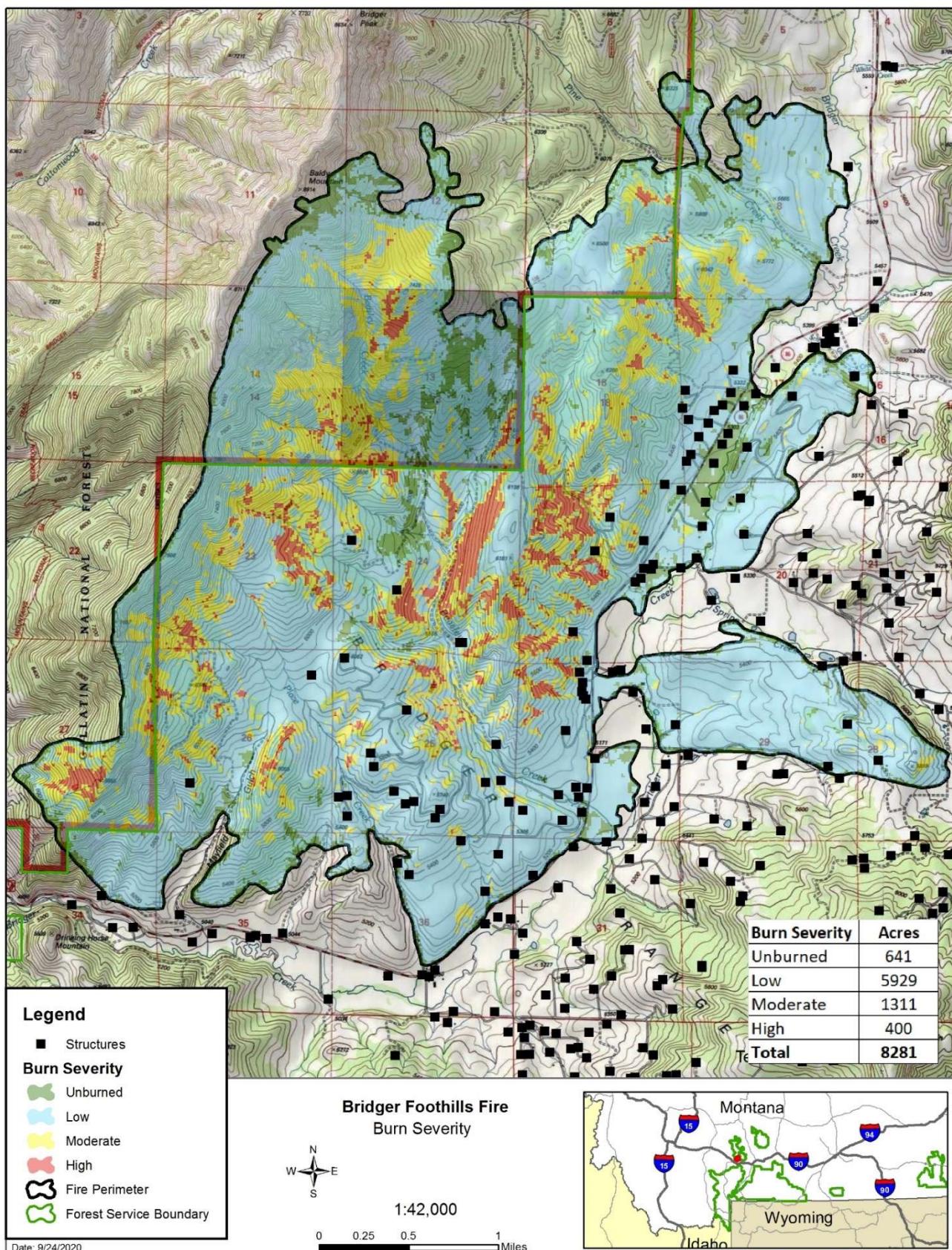


Figure 1: Soil Burn Severity Map

## PART V - SUMMARY OF ANALYSIS

### Introduction/Background

#### A. Describe Critical Values/Resources and Threats (narrative):

*Table 5: Critical Value 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

#### 1. Human Life and Safety (HLS):

*Risk Assessment: Human Life and Safety*

*Probability of Damage or Loss: Possible*

*Magnitude of Consequence: Major*

*Risk Level: High*

Risk of falling trees striking trail crew while conducting BAER-funded trail work on Trail 513

#### 2. Property (P):

#### Property: Trail Stabilization of Forest Service Trail #513

*Risk Assessment: Trail Infrastructure*

*Probability of Damage or Loss: Very Likely*

*Magnitude of Consequence: Moderate*

*Risk Level: Very High*

Trail 513 runs from the college "M" trailhead up to Bridger Ridge and then north along the spine of the ridge. Approximately 0.5 miles of the trail pass through the burned area (see photo below). The trail is used heavily by the public all year around, with the greatest use occurring during spring, summer, and fall. Much of the trail segment affected by the fire is very steep (20-30% grade) and highly subject to erosion by foot traffic and runoff. Burn severity in this area was primarily high. This trail will be at risk of further damage as soon as it is re-opened to the public. This future damage is likely to occur through the following mechanisms.

- Direct erosion of trail prisms due to loss of drainage structures and deposition from upslope.
- Direct erosion of tread due to loss of adjacent and upslope vegetation
- Fillslope failure and/or trail tread destabilization due to direct loss of forested vegetation, organic soil components, and root systems. This potential failure mechanism is likely to occur on steep hillslopes with moderate and high burn severity.



Figure 2: Trail 513

**Property: Forest Service Administrative Roads**

*Risk Assessment: Road Infrastructure*

*Probability of Damage or Loss: Possible*

*Magnitude of Consequence: Moderate*

*Risk Level: Intermediate*

Protect road infrastructure from erosion related to post-fire hydrology in order to retain access for range permittee and protect aquatic resources from elevated sediment inputs.

**3. Natural Resources (NR):**

**Natural Resources: Native Plant communities**

*Noxious weeds are within and adjacent to the burned area. These populations are substantial in size and have the potential with the available seed bed to spread into burned areas.*

*Risk Assessment – Threats to native plant communities*

*Probability of Damage or Loss: Very Likely - Based on burn severity and proximity to existing weed*

infestations.

*Magnitude of Consequence: Moderate – Loss of native plant communities and spread of noxious weeds.*

*Risk Level: Very High – Invasive species treatment is needed for areas adjacent to documented infestations. Additional invasive species monitoring next year will determine if weeds spread is occurring further into the burned area.*

There are approximately 4.5 net acres of known noxious weed infestations within a 1,425 acre gross area in the fire on NFS lands and include Bull thistle, Canada thistle, houndstongue, spotted knapweed, leafy spurge, annual pepperweed, curley doc, mullen. Some of these acres were found during BAER assessment field work. There are approximately 121 gross acres of known infestations OUTSIDE FIRE PERIMETER including spotted knapweed, Canada thistle, annual pepperweed, common tansy, houndstongue, spotted knapweed, musk thistle, bull thistle, St. Johnswort, leafy spurge, curley doc, mullen, Burdock, Cheatgrass.

**4. Cultural and Heritage Resources:** There are no known sites within burned area

**B. Emergency Treatment Objectives:** As noted above, threats to life, property, and natural resources could result from post-fire conditions in the burned area. For these reasons the primary treatment objectives are:

- Prevent injury or loss of human life that is possible in the next 12 months
- Prevent additional loss of trail infrastructure that is very likely to occur in the next 12 months
- Prevent additional loss of road infrastructure that is possible in the next 12 months
- Minimize the establishment and spread of noxious weed infestations that is very likely to occur in the next 12 months.

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

**Land:** 50

**Channel:** NA

**Roads/Trails:** 10 (Roads) 75(Trail)

**Protection/Safety:** 100

**D. Probability of Treatment Success**

Table 6: Probability of Treatment Success

		Years after Treatment		
		1	3	5
<b>Land</b>				
Noxious weed treatment		80	85	85
<b>Channel NA</b>				
<b>Roads/Trails</b>				
Trail Stabilization		85	90	95
Replace Culvert		90	90	95
Storm Proofing		90	80	80
<b>Protection/Safety</b>				

Hazard Tree Felling	95	85	80
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#### E. Cost of No-Action (Including Loss):

The loss of trail drainage controls (waterbars) and trail tread is highly likely to increase repair costs over time, if BAER trail stabilization treatments are not implemented as soon as possible. The current estimate is \$2,000 to treat 0.5 miles of trail. If the treatments are not implemented, and assuming the at-risk trail segment requires full tread rebuilding with waterbars, the cost would be 0.5 miles x \$15,000 cost/mile for a total or about \$7,500.

The loss of the road infrastructure is possible. If lost this would lead to 0.9 miles x \$25,000 cost/mile for a total of \$22,500.

Adding both trail and road infrastructure costs equates to potential loss of \$30,000.

The value of protecting the ecological integrity of native plant communities and soil productivity of the burned area from noxious weed infestation easily exceeds the cost of treatment and monitoring. The continued spread would impact treatment costs in the future. As a course estimate, the weeds may spread largely into high and moderate burn areas at 14% per year. Using the base estimate treatment area and assuming backpack spraying, this could be upwards of \$28,000 to treat 230 acres after fire years.. Thus, the total estimate of not addressing the risks equates to at least \$58,000.

**F. Cost of Selected Alternative (Including Loss):** There remains a 20 percent chance that the proposed treatments for this work either may not be complete prior to damaging storms or fail. As a gross estimate, the cost is the treatment estimate (\$27,000) plus the loss (0.2 X \$27,000) which equals \$34,000.

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

- |   |  |   |   |   |
|---|--|---|---|---|
| <input checked="" type="checkbox"/> Soils | <input checked="" type="checkbox"/> Hydrology  | <input checked="" type="checkbox"/> Engineering | <input checked="" type="checkbox"/> GIS | <input checked="" type="checkbox"/> Archaeology |
| <input checked="" type="checkbox"/> Weeds | <input checked="" type="checkbox"/> Recreation | <input checked="" type="checkbox"/> Fisheries   | <input type="checkbox"/> Wildlife       |   |
| <input type="checkbox"/> Other:           |  |   |   |   |

##### Team Leader:

Email: dale.white@usda.gov

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##### Forest BAER Coordinator:

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Phone(s) 406-551-0874

##### Team Members:

*Table 7: BAER Team Members by Skill*

Skill	Team Member Name
<i>Team Lead(s)</i>	Dale White
<i>Soils</i>	Andy Efta, Erik Anderson
<i>Hydrology</i>	Andy Efta
<i>Engineering</i>	Grant Morrison
<i>GIS</i>	Bryce Hancock
<i>Archaeology</i>	Connie Constan
<i>Weeds</i>	Beth Bischoff
<i>Recreation</i>	Cody Yeates
<i>Other</i>	

#### H. Treatment Narrative:

##### Land Treatments:

**Objective:**

The objective is to detect and suppress new weed infestations in the burned area. Left unchecked, it is likely that existing weed infestations will increase post-fire, 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 rehabilitation has the potential to establish persistent weed populations. It is expected that most native vegetation will recover if weed invasions are minimized.

**Methods:**

As monitoring indicates, treat:

- 1) areas during suppression including dozer lines, hand lines, routes travelled for suppression, etc.
- 2) native plant communities near known weed populations, vector corridors, and fencelines adjacent to private lands.

**Channel Treatments: NA****Roads and Trail Treatments:*****Trail Stabilization*****Objective**

Approximately 0.5 miles of trail located on steep slopes with high/moderate burn severity are expected to be at risk of deterioration from a very high level public use, additional runoff, and sediment from post-fire conditions. The threats are from runoff severely eroding the trail and depositing sediment from upslope areas onto the trail.

High-severity burn along Trail #513 has created many standing dead and fire-weakened trees in this wind-prone area which threaten the safety of trail crew members implementing trail stabilization measures.

**Methods**

The method for reducing this risk is primarily installing water bars, which would be used to direct and divert flow off the trail. These treatments would reduce the risk of the trail washing out, becoming hazardous to trail users, and transporting sediment to streams. Short sections of tread will be stabilized and outsloped to accommodate fire induced runoff. Implementation will be accomplished by CGNF Trails Crew.

Burned trees would be assessed by a fire fighting crew and those with high hazard ratings and the potential to fall into the trail work area would be marked. Treatment targets harzard trees within 1 1/2 tree lengths of the planned working areas. Trees posing high risk and impeding drainage work would be addressed.

***Road Stormproofing*****Objective:**

Cleanout and reshaping of drain dips and ditches will restore and improve efficient road drainage. Removing debris and brush from the culvert inlets and outlets would let culverts function as designed and restore flow capacity. The purpose of this work is to decrease the risk that drain dips, ditch relief culverts, and stream culverts plug and fail, resulting in culvert washouts as well as water flows being diverted down roadways which would degrade road conditions and add sediment to downstream water bodies. The treatment aims to maintain road access for allotment permittee and administrative use by restoring road drainage and reducing potential for road prism erosion and high cost repairs.

**Methods:**

Drain dips and ditches will be cleaned out and reshaped. Culverts that are currently plugged or have inlet basins that are full or brushed in should be cleaned out to insure unobstructed flows. As soon as possible, culvert inlets and outlets would be brushed and cleaned by hand crew using chain saws, hand tools, and in some more difficult situations, with a rubber-tired backhoe.

***Drain Dip Installation***

**Objective:**

Install new drain dips at three locations identified during BAER assessment. The purpose of this work is to decrease the risk of moderate to severe damage to the road prism and adding sediment to downstream water bodies.

**Methods:**

Drain dips would be constructed by wheeled backhoe.

***Stream Culvert Replacement***

**Objective:**

Replace one under-sized existing stream culvert that has the potential to fail in the post fire period. The purpose of this work is to decrease the risk of this stream crossing failing, which would result in moderate to severe road damage to the road prism and add a large volume of sediment to downstream water bodies. The aquatic biologist has determined that an AOP culvert is not necessary at this site.

**Methods:**

The existing 18" culvert would be replaced with a 32" diameter culvert. Based on hydraulic analysis the new culvert would convey the estimated post-fire 25-yr return period flow of 21.2 cfs, and the prefire 100-yr flood flow of 19 cfs, with a headwater/depth ratio of 1.0 or less. Assuming that the pre-fire 100-yr flow is an accurate estimate of the long-term 100-yr flow at this crossing, this size culvert would meet the CGNF requirement that all new road culverts convey the 100-yr flow with a headwater/depth ratio of 1.0 or less.

**Protection/Safety Treatments:** NA

**I. Monitoring Narrative:** NA

**PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS**

Line Items	Units	NFS Lands			Other	Other Lands			All
		Unit	# of Units	BAER \$		# of units	Fed \$	# of Units	
<b>A. Land Treatments</b>									
EDRR suppression-disturbed areas	Acres	50	26	\$1,300					
EDRR Native grassland range	Acres	100	120	\$12,000					
<i>Subtotal Land Treatments</i>				<b>\$13,300</b>					
<b>B. Channel Treatments</b>									
None									
<b>C. Road and Trails</b>									
Trail Stabilization	Miles	4,800	0.5	\$2,400					
Road Stormproofing	Miles	5,000	0.9	\$4,500					
Drain Dip Installation	Each	800	3.0	\$2,400					
Stream Culvert Replacement	Each	4,400	1	\$4,400					
<i>Subtotal Road and Trails</i>				<b>\$13,700</b>					
<b>D. Protection/Safety</b>									
<i>Subtotal Protection/Safety</i>				<b>\$0</b>					
<b>E. BAER Evaluation</b>									
Initial Assessment	Lump	\$29,380	1	\$29,380					
<i>Subtotal Evaluation</i>				<b>\$29,380</b>					
<b>F. Monitoring</b>									
<i>Subtotal Monitoring</i>				<b>\$0</b>					
<b>G. Totals</b>									
Previously approved									
Total for this request				<b>\$27,000</b>					

**PART VII - APPROVALS**

1. \_\_\_\_\_  
 Forest Supervisor \_\_\_\_\_ Date \_\_\_\_\_