

**Date of Report:11/21/2021****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:** Trail Ridge**B. Fire Number:** MT-BDF-006286**C. State:** Montana**D. County:** Beaverhead, Ravalli**E. Region:** R1**F. Forest:** Bitterroot, Beaverhead-Deerlodge**G. District:** Darby-Sula, Wisdom**H. Fire Incident Job Code:** P1P1DX (0102)**I. Date Fire Started:** 08/26/2022**J. Date Fire Contained:** 11/6/2021**K. Suppression Cost:****L. Fire Suppression Damages Repaired with Suppression Funds (estimates):**

1. Fireline repaired (miles): 10.4 miles (in progress)
2. Other (identify):

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

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
100200040501	Upper Trail Creek	24897	5912	24%
100200040503	Lower Trail Creek	17036	23	0%
100200040506	Tie Creek	20138	2265	11%
100200040507	Johnson Creek	25559	1492	6%
170102050404	Meadow Creek	20600	299	1%
170102050501	Tolan Creek	12914	8324	64%
170102050501	Camp Creek	22755	16	0%
170102050503	Jennings Camp Creek	25418	770	3%

**N. Total Acres Burned: 19101**

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
NFS	19101
OTHER FEDERAL (LIST AGENCY AND ACRES)	
STATE	
PRIVATE	
TOTAL	

O. **Vegetation Types:** Lodgepole pine (*Pinus contorta*) with some Whitebark pine (*Pinus albicaulis*) dominate through the ridges and parts of the fire in the Meadow Creek and Tolan Creek drainages. The Whitebark pine is particularly prevalent along the Continental Divide Trail and through the Schultz Saddle area. The Trail Creek drainage tends toward the drier habitat types with Ponderosa pine (*Pinus ponderosa*) with bunch grass understory on southern aspect and upper slopes and mixed conifers on the northern aspects and wetter refuge areas.

P. **Dominant Soils:** Soils in the fire area are typical of soil series on moderately steep slopes (20-50%) through this area of the Bitterroot drainage. Soils typically are gravelly sandy loam at the surface and colluvium over residual granitic bedrock in the lower horizons. Soils on ridgetops are typical of the Lolopeak-Mohaggin-Shermount families with shallow volcanic ash at the surface layers. Soils on the floodplains and terraces are much deeper with strong O horizons over alluvium parent material.

Q. **Geologic Types:** Granitic bedrock.

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

Table 3: Miles of Stream Channels by Order or Class

STREAM TYPE	MILES OF STREAM
PERENNIAL	28
INTERMITTENT	18.4
EPHEMERAL	
OTHER (DEFINE)	

S. **Transportation System:**

Trails: National Forest (miles): 20

Other (miles):

Roads: National Forest (miles): 44.7

Other (miles): Abandoned Roads 2 miles

### 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	1641				1641	9
Low	5677				5677	30
Moderate	10074				10074	53
High	1709				1709	9
Total	19,101				19,101	

B. **Water-Repellent Soil (acres):** 12,416 acres (approximately 60% of the burned soils)

Bitterroot National Forest Specialist completed several field hydrophobicity test (water drop method) throughout the burned area. In general, in moderate and high soil burn severities showed signs for moderate to very strong hydrophobicity up to 4 centimeters below the soil surface. In moderate soil burn severity, hydrophobicity was found at depth of 3 centimeters, while depth of hydrophobicity was highly variable in soils rated as severely burned. In an adjacent, unburned area soil hydrophobicity was weak with minimal water

repellency at the soil surface and moderately strong repellency up to 1 centimeter deep. Water repellent soil conditions diminish over time through natural freeze-thaw cycling and vegetation re-establishment. Much of the soils were burned in earlier fires in 2000 and these soils regardless of soil burn severity category had weaker hydrophobic responses. Hydrophobic conditions caused by the fire are anticipated to last 1 to 2 years post-fire, until grass and forb reestablishment can stabilize soil water infiltration rates.

- C. Soil Erosion Hazard Rating:** Soils with high erosion ratings are typically oriented along the ridges, with moderate to lower erosion soil hazard ratings dominating the fire area.
- D. Erosion Potential: from the Beaverhead Deerlodge Analysis** The edited BARC map was uploaded to the WEPPcloud -- Disturbed online model. The model was run on the Shultz Creek drainage with a single outlet location at the crossing of Shultz Creek on FSR 1203 just before the intersection with FSR 1137, as this crossing has the highest risk of debris flow with the most acres of moderate and high severity burn on steep, erodible soils upstream. The total area contributing to the outlet is 9,700 acres. We also ran a baseline run to get an idea of baseline erosion before the fire. The ground-truthed, adjusted BARC map was loaded directly into the model. The land use options, and soil options were determined by hillslope for each run. Multi-factor ranking was used for the climate station option, and PRISM Modified was used as the climate method. Single climate was selected for 100 years of simulation. Table 6 shows the results, both per unit area of watershed and also at the outlet of the watershed. Total hillslope loss is naturally high and is predicted to increase modestly post-fire.

**Table 7. WEPP cloud modeled erosion for the Shultz Creek watershed. Unburned and burned results are included.**

	Unburned model results per unit area of watershed	Burned model results per unit area of watershed	Unburned model results from outlet	Burned model results from outlet
Precipitation	38.7 in/year	38.7 in/year	1,400,000,000 ft <sup>3</sup> /year	1,400,000,000 ft <sup>3</sup> /year
Stream discharge	19.6 in/year	20.1 in/year	690,000,000 ft <sup>3</sup> /year	700,000,000 ft <sup>3</sup> /year
Total hillslope loss	54 lb/acre/year	71 lb/acre/year	260 ton/year	340 ton/year
Total channel soil loss	210 lb/acre/year	220 lb/acre/year	1,000 ton/year	1,100 ton/year
Sediment discharge	160 lb/acre/year	180 lb/acre/year	780 ton/year	850 ton/year

- E. Sediment Potential:** 70 tons per year based on the Beaverhead Deerlodge analysis.
- F. Estimated Vegetative Recovery Period (years):** Understory grasses and forbs -1 year. Shrubs-2-3 years. Trees-15-30 years (high tree mortality observed throughout fire area)
- G. Estimated Hydrologic Response (brief description):** The fire primarily impacted two subwatersheds, both Upper Trail Creek watershed on both the Beaverhead-Deerlodge and Bitterroot National Forests and Tolan Creek on the Bitterroot National Forest. About a quarter of Trail Creek Watershed burned with most of the moderate and high severity burn occurring on the ridges and upper 1/3 of slopes. Given the limited total amount of burn and focused high severity on shallower slope positions, the watershed-scale response will be minor. However, Critical Values immediately below areas burned with higher severity like trails will have impacts during post-fire runoff generating events. The impacts to Tolan Creek will be more significant. Approximately 64% of Tolan Creek burned in 2022 and nearly half that burn was judged to be of moderate or

high soil burn severity. Nearly all burned soils in this drainage exhibited some hydrophobicity. Using the USGS Regression Method for calculating flows with the Story/Kuyumjian post-fire flow adjustments, at a watershed scale flows are likely to increase by at least 45% in a two year storm event and slightly more in a 25-year storm event. The flows will include sediment bulking and debris from hillslope erosion and downstream resources will be impacted. Using the NRCS runoff curve number model, Fire Hydrology, to model smaller subcatchments in the Tolan Creek Drainage above the Bitterroots FSR#5740, which burned with 80% high and moderate soil burn severities, flows will likely increase between 700% during two year events to 200% at 500 year events. In general, the intensity of the storms will likely determine the response, with shorter during convective storm cells which deliver precipitation amounts of just over a half inch or rain per hour creating the strongest runoff and erosion response. The amount of increased flow in Tolan Creek and smaller catchments will cause damage to Critical Values especially roads and trails. Water Quality in Tolan Creek will have impacts from sedimentation following runoff events, however, the size and grade of Tolan Creek should allow movement of sediment downstream into the East Fork Bitterroot River with limited long-term detrimental impacts to aquatic habitats or downstream water quality.

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

### **Introduction/Background**

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

*Table 5: Critical Value Matrix*

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

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

<b>Critical Value</b>	<b>Probability</b>	<b>Consequence</b>	<b>Risk Rating</b>	<b>Threat</b>
People hiking along Trail #78 CDT	Possible	Major	High	Damaged roots systems and scorched trees falling in storm events.
People hiking along Trails #403, 173	Likely	Major	High	Damaged roots systems and scorched trees falling in storm events. Loss of trail drainage features resulting in complete erosion of trail in places following runoff events.
Forest Users and Forest Employees Driving FSR #725 in burned area.	Possible	Major	High	Trees which have damaged roots systems are likely to fall during and after storm events putting motorists at risk.
Forest Users and Forest Employees Driving FSR #725 in burned area.	Likely	Moderate	High	Locations where culverts have been consumed in the wildfire already have holes developing in the road system. During runoff events, the roads will further destabilize because of inadequate drainage for post-fire runoff and the roads will fail. Other

				locations where culverts and ditches are already partially filled with sediment from runoff event that have already occurred will result in erosion and sediment deposition on the road surface.
Forest Employees driving FSR#5740	Possible	Major	High	Nearly the entire length #5740 travels through the burned area. Trees which have damaged roots systems are likely to fall during and after storm events putting motorists at risk.

**2. Property (P):**

Critical Value	Probability	Consequence	Risk Rating	Threat
FSR 725	Likely	Moderate	High	3.8 miles of FSR#725 go through Mod+Hi Severity Fire, there are at least 15 ditch relief culverts in this stretch roughly between the junction of FSR#73282 and Schultz Saddle. The culverts and ditches are already filling with sediment from the initial runoff in fall storms. With additional storms of higher intensities the ditches and culverts are likely to fill with sediment and cause erosion to and deposition on the road.
FSR 725	Likely	Moderate	High	Two culverts have been completely consumed by fire. The road prism is currently developing holes and road failure is likely to follow higher intensity precipitation events.
FSR 5740	Likely	Moderate	High	Crossing on Road 725 at the following 3 streams: Four B, Stone Creek and Tolan Creek are undersized for the potential runoff. Post-fire flow will increase by becoming plugged causing road to be damaged or destroyed. Post fire flows increase by 20-40% depending on the intensity of the storm.
FSR 5740	Likely	Moderate	High	Plugging of existing ditch relief culverts and plugging of ditches. Post-fire runoff response has already filled ditches in many places along FSR#5740 and ditch

				relief culverts are filling with sediment. The reduced capacity of culverts because of erosion will likely cause deposition on the road and road damage.
Trails #403, 173	Likely	Moderate	High	Elevated erosion causing tread loss in moderate/high severity burn areas

### 3. Natural Resources (NR):

Critical Value	Probability	Consequence	Risk Rating	Threat
Soil Productivity	Possible	Minor	Low	Reduced nutrient availability, soil loss
Soil Hydrologic Function	Likely	Minor	Low	Increased surface runoff as a result of soil hydrophobicity in moderate and high soil burn areas
Water Quality (downstream of fires in Tolan Creek and Meadow Creek)	Likely	Minor	Low	Increased summer temperatures, sedimentation, nutrient enrichment and turbidity.
Hydrologic Function	Likely	Minor	Low	Sediment delivery into waterbodies, change in flow regime due to reduced infiltration and roughness
T&E Species; Bull trout In Tolan Creek	Likely	Moderate	Intermediate	Temporary loss of suitable habitat because of sedimentation from failed crossing in Tolan Creek and major tributaries.
Intact native plant communities	Likely	Moderate	Very High	Invasive plant invasion in areas with 50-100% basal area loss

### 4. Cultural and Heritage Resources: Not evaluated

#### B. Emergency Treatment Objectives:

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

Land: 90%

Channel: n/a

Roads/Trails: 80%

Protection/Safety: n/a

#### D. Probability of Treatment Success

Table 6: Probability of Treatment Success

	1 year after treatment	3 years after treatment	5 years after treatment
<b>Land</b>	80%	65%	50%
<b>Channel</b>	NA	NA	NA
<b>Roads/Trails</b>	80%	75%	50%
<b>Protection/Safety</b>	NA	NA	NA

**E. Cost of No-Action (Including Loss):** \$1,000,000, increased probability of stranding the public in remote location with no outlets. Resource damage from increased noxious weed infestations in disturbed areas. Loss of road and trail infrastructure.

**F. Cost of Selected Alternative (Including Loss):** \$102,300 + (0.2)[road and trail treatments] \$86,250 = \$119,550

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

- ☒ Soils      ☒ Hydrology      ☒ Engineering      ☒ GIS      ☐ Archaeology  
☒ Weeds      ☒ Recreation      ☒ Fisheries      ☐ Wildlife  
☐ Other:

**Team Leader:** Rebecca A. Lloyd

**Email:** rebecca.lloyd@usda.gov

**Phone(s)** 406-830-0998

**Forest BAER Coordinator:** Rebecca A. Lloyd

**Email:**

**Phone(s):**

**Team Members:** Table 7: BAER Team Members by Skill

Skill	Team Member Name
<i>Team Lead(s)</i>	Rebecca A. Lloyd, Bitterroot
<i>Soils</i>	Rebecca A. Lloyd, Bitterroot
<i>Hydrology</i>	Rebecca A. Lloyd, Bitterroot
<i>Engineering</i>	Jim Stuart and Jake Pintok, Bitterroot
<i>GIS</i>	Rebecca A. Lloyd, Bitterroot
<i>Archaeology</i>	
<i>Weeds</i>	Diane Bessler-Hackett, Bitterroot
<i>Recreation</i>	Mark Smith, Bitterroot
<i>Other</i>	

**H. Treatment Narrative:**

**Land Treatments:**

**P1a. Invasives EDRR**

Early Detection and Rapid Response of noxious weeds is a known and cost-effective treatment to minimize the spread of noxious weeds into native plant communities in burned areas. Proposed EDRR weed treatments will include 12 miles road and 16 miles trails through high and moderate soil burn severities and well as the 10.4 miles of dozer line constructed as a means of indirect fire suppression. For nearly all work the Bitterroot will use seasonal crews with backpack sprayers. The Bitterroot conversion rate of 7 acres per mile of road and 3 acres per mile of trail and dozer line and a treatment cost of \$50/acre for roads and \$150/acre for trails and dozer line. The estimated acreage and cost for roads are 12 mi \* 7 acres = 84 acres at \$50/acre = \$4,200; estimates for trails/suppression line are 26 miles \* 3 acres/mile = 79 acres at \$150/acre = \$11,850 where EDRR targets 50 feet either side of the trail and road where crossing high and moderate soil burn severities.

TREATMENT ITEM	UNITS	UNIT COST	NUMBER OF UNITS	TOTAL COST
<b>P1A. INVASIVES EDRR</b>	cost/acre	\$150	48	\$7,200
	cost/acre	\$50	84	\$4,200
<b>P1B. INVASIVES EDRR - Fire Suppression Repair</b>	cost/acre	\$50	31	\$4,650

TOTAL

\$16,0500

**Channel Treatments:** *No channel treatments are recommended.*

### **Roads and Trail Treatments:**

#### **R2. New Drainage Features**

##### **R2a. Rolling Dips (FSR 5740)**

Add rolling dips or water bars along 5 miles of FSR 5740. The 5740 road is a midslope road that goes through the area immediately downslope of the highest burn severities in the Tolan Creek drainage. The combination of dips and water bars will help the road shed the increased runoff from the burned slopes above. Tolan Creek is one of the most important streams for providing critical habitat for ESA-listed bull trout and is tributary to the East Fork Bitterroot. A failure of 5740 at the midslope position will not represent a loss in the infrastructure investment on the Forest will also introduce many hundreds of cubic meters of sediment into Tolan Creek which would negatively impact critical habitat, adding to the 'natural' sedimentation predicted from the burned hillslopes in areas not influenced by the road. Fluvial bull trout are expected to have some resilience to the sediment inputs following wildfire, but road failures adding to the variable hillslope erosion could degrade habitat enough to have an impact on suitable habitat for over-wintering as well as spawning habitat in Tolan Creek.

##### **R2b. Ditch Relief Pipes on FSR#725**

Replace two 18" ditch relief pipes on Forest Service Road #725 just below Schultz Saddle. The existing pipes were burned during the fire and ceased to function. The road is already failing as a result of the loss of the pipes under the road bed. These pipes could be moved into a BAR request if needed.

#### **R3. Storm Inspection and Response**

Following storm events, storm inspection and response is recommended for 8 miles of FSR #5740 and for 6.5 miles of FSR #725 between the junctions with #73511 and end at Trail #173. Inspection and response of these two roads will require treatments outside the ability of the Bitterroot National Forest's road crew to complete the work and the work will be contracted. Roads will be patrolled to identify risks to human life and safety and to evaluate forest road conditions such as damage to road surfaces and drainage features. As needed, response actions could include excavation of clogged drainage features and removal of roadside hazards such as rocks and trees will ensure existing drainage features are fully functional.

#### **R4. Culvert Removal at Tributary of Tolan Creek**

The existing stream crossing culvert along a tributary of Tolan Creek at M.P. 8.06 on FSR #5740. The existing culvert is undersized for predicted post-fire flows and additional expected bulking debris. The Upper Tolan watershed is over 80% burned with much of that classified as high and moderate soil burn severity. Engineers believe the culvert will not survive the post-fire flows and a failure will result in total road failure which will cause hundreds of cubic meters of sediment failing into Tolan Creek where there are ESA listed Bull trout. In order to avoid this kind of road failure, sedimentation into the field, and the need to then complete an expensive repair to the road pulling the existing culvert, laying back the fill and stream crossing slopes and then closing the road at the crossing.

#### **R5. Critical Dip- Tributaries of Tolan Creek on 5740**

Add critical dips to improve overflow capacity on 4 culverts along FSR #5740 at crossings with tributaries of Tolan Creek. Flow modeling shows the that culverts may be slightly undersized to accommodate flow with the debris bulking from the post-fire runoff in the steep tributaries of Tolan Creek that cross Forest Road #5740. Critical dips will help accommodate overflow to prevent water diverting around the inlets of the culverts and causing road failures on either side of the stream



channel. The overflow will allow water and some debris to continue directly over the road without diversion and return to the channel reducing the chances of road failure.

#### T1 and T2. Trail Drainage and Structure Stabilization

The trails cross several sections where the fires burned with high and moderate fire severity across slopes where post fire erosion would threaten the trail prism. The proposal is to address the drainage along the trail by adding waterbars and stabilize any crossings for the short term. A BAR request will be submitted to re-build stretches of trail that were so badly burned the trail tread is completely gone as well as re-enforce stream crossings for longer term restoration given the likelihood of failure in the short term and ability to rebuild sufficiently in a backcountry setting. Approximately 16 miles of trail cross areas mapped as high or moderate soil burn severity; however, 6 miles of trail were burned to the point where a BAR request will need to include rebuilding the trail tread completely; consequently, 10 miles of trail will need BAER treatments. Proposed BAER treatments will prevent erosion and further failure of the trail tread. Hazard trees will be felled to secure safety of forest service personnel in work areas.

Note: The Beaverhead Deerlodge is proposing the work along the Continental Divide Trail and those miles on the Bitterroot are excluded from this request.

Road Treatments	Units	Unit Cost	Quantity	Total
R2A. NEW DRAINAGE FEATURE - DRAINAGE DIP	cost/mile	\$1,000	5	\$5,000
R2B. NEW DRAINAGE FEATURE – CROSS DRAINPIPE 18” diameter	cost/site	\$3000	2	\$6,000
R3. STORM INSPECTION AND RESPONSE (8 miles 725, 6.5 miles 5740)	cost/mile	\$2,500	14.5	\$36,250
R4. MAJOR CULVERT REMOVAL	Lump sum	\$5,000	1	\$5,000
R5. CRITICAL DIP FSR#5740 TOLAN XING (4)	Per dip	\$1,000	4	\$4,000
T1. AND T2. TRAIL DRAINAGE AND STRUCTURE STABILIZATION	cost/mile	\$3,000	10	\$30,000
<b>TOTAL</b>				<b>\$86,250</b>

**Protection/Safety Treatments:** The BNF plans to post signs to warn of post fire hazards on trails and roads within the fire area. The BNF has signs available and thus no need for request.

#### **I. Monitoring Narrative:**

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

			NFS Lands				Other Lands			All
		Unit	# of		Other	# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	BAER \$	\$	units	\$	Units	\$	\$
A. Land Treatments										
P1a. Invasives EDRR (road)	acres	50	84	\$4,200	\$0		\$0		\$0	\$4,200
P1a. Invasives EDRR (trail-ba	acres	150	48	\$7,200			\$0		\$0	\$7,200
P1b. Fire Suppression Repa	acres	150	31	\$4,650	\$0		\$0		\$0	\$4,650
Insert new items above this line!				\$0	\$0		\$0		\$0	\$0
Subtotal Land Treatments				\$16,050	\$0		\$0		\$0	\$16,050
B. Channel Treatments										
				\$0	\$0		\$0		\$0	\$0
Insert new items above this line!				\$0	\$0		\$0		\$0	\$0
Subtotal Channel Treatments				\$0	\$0		\$0		\$0	\$0
C. Road and Trails										
R2A. NEW DRAINAGE FEA	mile	1,000	5	\$5,000	\$0		\$0		\$0	\$5,000
R2B. NEW DRAINAGE FEA	site	3,000	2	\$6,000						\$6,000
R3. STORM INSPECTION A	mile	2,500	14.5	\$36,250						\$36,250
R4. MAJOR CULVERT REN	lump	5,000	1	\$5,000						\$5,000
R5. CRITICAL DIP FSR#574	per dip	1,000	4	\$4,000						\$4,000
T1. and T2. Trail Stabilizatio	mile	3,000	10	\$30,000						\$30,000
				\$0	\$0		\$0		\$0	\$0
Insert new items above this line!				\$0	\$0		\$0		\$0	\$0
Subtotal Road and Trails				\$86,250	\$0		\$0		\$0	\$86,250
D. Protection/Safety										
				\$0	\$0		\$0		\$0	\$0
Insert new items above this line!				\$0	\$0		\$0		\$0	\$0
Subtotal Protection/Safety				\$0	\$0		\$0		\$0	\$0
E. BAER Evaluation										
Initial Assessment	Report			---	\$0		\$0		\$0	\$0
Insert new items above this line!				---	\$0		\$0		\$0	\$0
Subtotal Evaluation				\$0	\$0		\$0		\$0	\$0
F. Monitoring										
				\$0	\$0		\$0		\$0	\$0
Insert new items above this line!				\$0	\$0		\$0		\$0	\$0
Subtotal Monitoring				\$0	\$0		\$0		\$0	\$0
G. Totals				\$102,300	\$0		\$0		\$0	\$102,300

**PART VII - APPROVALS**

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

## Appendix 1. Maps of treatments for Road 725 on Panel A and Road 5740 on Panel B.





