USDA-FOREST SERVICE FS-2500-8

Date of Report: 9/17/12

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

[X] 1. Funding request for estimated emergency stabilization funds
[ ] 2. Accomplishment Report
[ ] 3. No Treatment Recommendation

B. Type of Action

[X] 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)

[ ] 2. Interim Report
[ ] Updating the initial funding request based on more accurate site data or design analysis
[ ] Status of accomplishments to date

[ ] 3. Final Report (Following completion of work)

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Millie

B. Fire Number: MT-GNF-000164

C. State: MT

D. County: Gallatin

E. Region: 01

F. Forest: Gallatin

G. District: 06

H. Fire Incident Job Code: P1G67R

I. Date Fire Started: 08/28/2012

J. Date Fire Contained: estimated 11/1/12

K. Suppression Cost: $7,800,000 as of 09/14/2012

L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles): 9.5 as of 9/14/12
2. Fireline seeded (miles): 0 as of 9/14/12
3. Other (identify): 7.15 miles of dozerline as of 9/14/12

M. Watershed Numbers: 100200080504, 100200080503, 100200080703, 100200080702

N. Total Acres Burned: 10,425 as of 09/17/12
NFS Acres(10,425) Other Federal (0) State (0) Private (0) some unburned private acres are within the fire perimeter

O. Vegetation Types: Engelmann spruce/subalpine fir (30%) lodgepole pine and Douglas fir (45%), Whitebark Pine (20%), grassland (5%)

P. Dominant Soils: Soils are primarily loamy-skeletal to sandy-skeletal Entisols and Inceptisols with many rock fragments. The predominant parent materials are hard volcanic and metamorphic gneiss residuum with limited amounts of alluvium, colluvium, and glacial till in depositional portions of the landscape. Surface textures associated with volcanic parent materials are primarily sandy loams. Abundant hard rock fragments in surface soil layers are common in nearly all parent materials in this area. Soil productivity is generally low on south facing mountain slopes and moderate on north facing slopes. Extensive areas of shallow soils and rock outcrop are present on south aspects in convex slope positions. Primary landscape forming processes in this area are soil erosion, dissection by steep gradient drainages, rock slides on extremely steep slopes, and potential debris flows.

Q. Geologic Types: Geologic materials in the upper portion (east end) of the Storm Castle drainage are primarily Tertiary volcanic and much older (Archian) gneiss bedrock. The volcanic rock in this area has been mapped as belonging to the Sepulcher Formation. Primary rock types in this formation include welded tuff, breccia, andesite, and volcanoclastic sandstone. Two large exposures of the underlying gneiss are present in the center of this area, on the north side of Storm Castle Creek. Smaller amounts of recent alluvium and glacial till are present adjacent to Storm Castle Creek. Landslide and talus deposits occur on steeper sloping portions of the area, often occurring in contact areas between different rock types.

R. Miles of Stream Channels by Order or Class: 1st order 41 miles, 2nd order 10 miles, 3rd order 6 miles, 4th order 4 miles

S. Transportation System
Trails: 12.7 miles Roads: 78.7 miles

PART III - WATERSHED CONDITION

A. Burn Severity (acres): 3231 (low) 3155 (moderate) 2028 (high)

B. Water-Repellent Soil (acres): 5183

C. Soil Erosion Hazard Rating (acres):
1743 (low) 3231 (moderate) 5183 (high)

D. Erosion Potential: 8-19 tons/acre (ERMiT, 10% exceedance value)

E. Sediment Potential: 20.5 tons/square mile (assuming no debris flows)

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 2 grass/shrubs 20-50 conifers

B. Design Chance of Success, (percent): 70

C. Equivalent Design Recurrence Interval, (years): 10

D. Design Storm Duration, (hours): 6 and 1 hr

E. Design Storm Magnitude, (inches): 1.7 (6hr), 1.1 (1hr)

F. Design Flow, (cubic feet / second/ square mile): 63-113 (tributary drainages), 23-30 (Storm Castle Creek)

G. Estimated Reduction in Infiltration, (percent): 83

H. Adjusted Design Flow, (cfs per square mile): 148-359 (tributary drainages, 296-718 bulked)

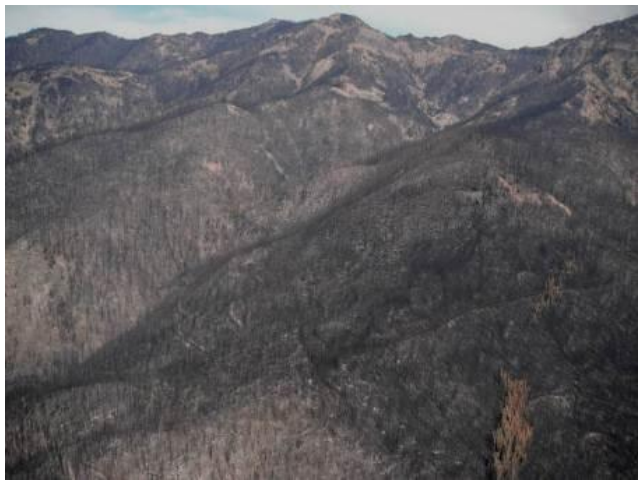
PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:

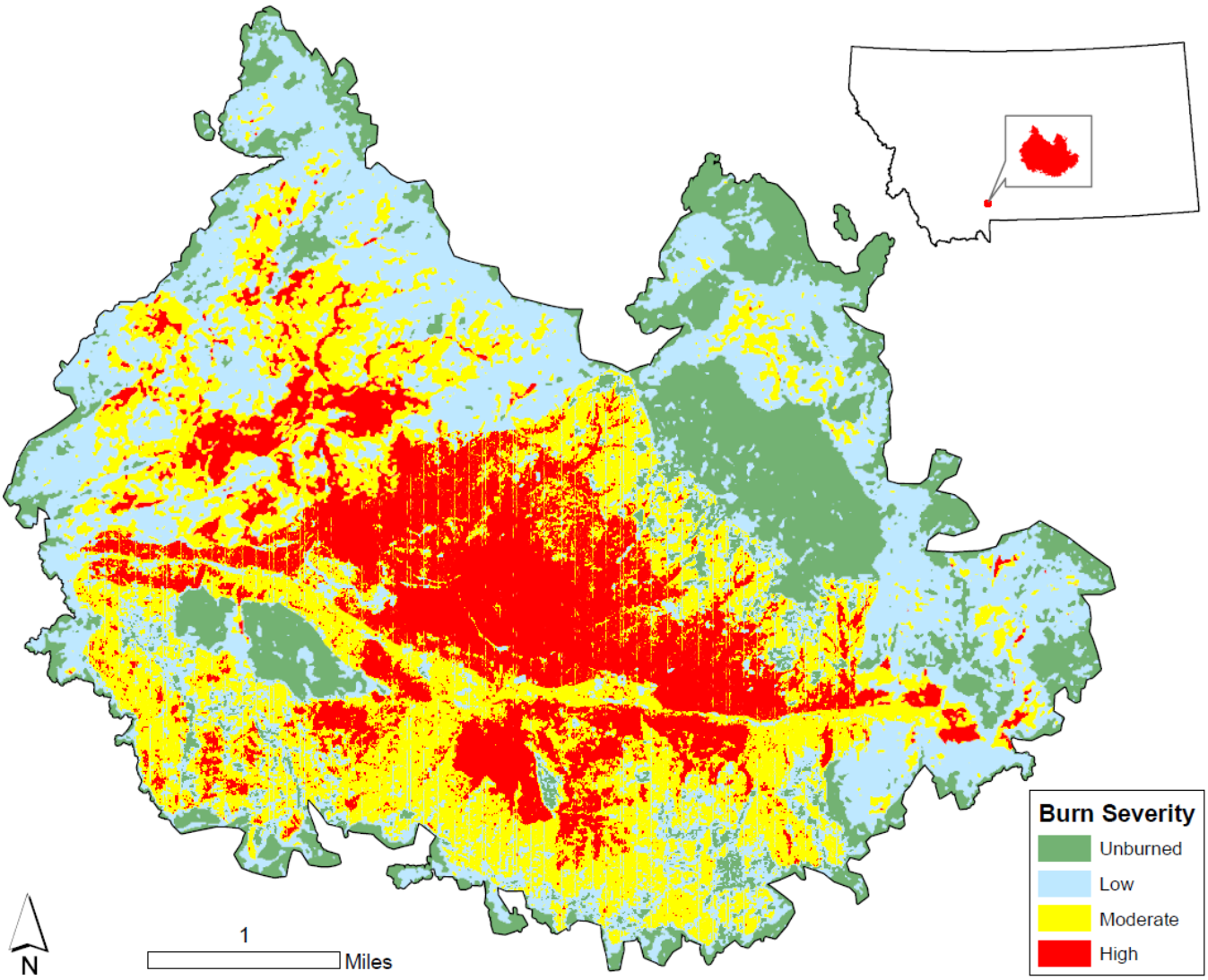
The 10,425 acre Millie fire started from natural causes (lightning) on August 28, 2012 with a major burn on August 29 to over 8,300 acres. Most of the fire was in the Storm Castle Creek drainage with some burning into Swan Creek on the south and Big Bear and South Cottonwood Creeks on the north. The Millie Fire suppression efforts required closure much of the northern part of the Gallatin Range to public access due to expansion potential. A primary goal of fire suppression effort was to keep the wildfire from extending into the Hyalite Creek drainage which is just east of both Storm Castle and South Cottonwood Creeks. Hyalite and the adjacent Bozeman Creek are the primary municipal watersheds for the City of Bozeman and provides water to the Bozeman Municipal Water Treatment Plant which serves over 40,000 residents. The watershed above the main Storm Castle Road 132 is subject to extensive erosion and debris flows which poses a substantial risk to this system road. Several other roads and trails have risk to infrastructure damage from post-fire erosion. Alluvial and glacial till deposits are present in gently sloping areas along Storm Castle Creek. Colluvial talus and landslide deposits are common in very steep to extremely steep areas. Storm Castle drains about 85% of the burned area. Several high-gradient 1st and 2nd -order tributaries to Storm Castle Creek also drain the burned area. The fire burned through high elevation lodgepole pine and-Douglas-fir uplands, generally leaving a mosaic pattern of burned and unburned landscape on the southern side of the drainage, and burning more extensively in the northern half of the drainage. The table below displays burn severity. Burn intensity was not specifically mapped but the acreage of high burn intensity is much greater than the acres of high burn severity. Most of the sites examined displayed hydrophobic soil conditions in burned areas.

Soil burn severity area estimates (acres)

6th-HUC drainage	Unburned	Low Severity	Moderate Severity	High Severity	Total
Storm Castle Creek	887	2629	3058	2021	8595
South Cottonwood Creek	725	458	74	1	1258
Swan Creek	84	113	23	6	226
Big Bear Creek	47	31	0	0	78
Total	1743	3231	3155	2028	10,157



North Central part of the Millie Creek Fire above the Storm Castle Creek Road 132, this watershed has a high runoff, erosion, and debris flow potential.



Millie Fire Burn Severity

The Storm Castle drainage has the greatest percentage of high burn severity with 24% of the total burn area rated in the high category. Approximately 60% of the burned area in this catchment had high intensity burning. Sediment increases were modeled in Storm Castle Creek (R1R4 and WEPP models) with an estimated pre-fire sediment yield of 11% above natural and increasing to 99% over the first year after the fire. Peak flows were calculated for watersheds less than 5000 acres using the NRCS (TR-20) Fire Hydrology (2002) spreadsheet (RCN method) and for watersheds greater than 5000 acres via adjustments to Parrott (2004) USGS regression equations. The main BAER concern focused on hillslope erosion and localized debris flows in 1-2nd order tributaries during locally intensive rain events.

Road System: The Millie Fire perimeter contains an estimated 12.3 miles of open roads. These roads provide the transportation network needed to meet Forest management objectives and access to a private land inholding. The extensive ares of high severity burn above portions of these roads make them vulnerable to accelerated erosion from increased overland flow from burn areas, excessive ditch erosion, loss of road fill, filling of drain structures, and damage or washing out of road culverts. Road segments were identified which have the most potential post-fire road surface drainage problems and/or under-sized culverts unable to handle post-fire stream flows as a result of the increased runoff. Four miles of the Storm Castle Creek Road 132 are particularly vulnerable to damage from increased peak flows, accelerated hillside erosion, and debris flows. The Storm Castle Creek Road 132 is a core part of the Bozeman RD transportation system and provides recreation, trailhead access, silvicultural, reforestation, and at private land access. Five culverts on tributaries to Storm Castle Creek on Forest Route132 were judged to be undersized and at serious risk of failure due to

the post-fire peak-flow design events. Proposed treatments focus on storm proofing techniques to handle the wildfire design storm flows. Four bridges across Storm Castle Creek were judged to be adequate to convey the post-fire 10 year post fire design event (it is anticipated that the risk of post fire peak runoff response would become less over time but relatively slow recovery is expected due to severity of the burn, lack of a typical fire mosiac, steep slopes, thin soils, and south aspects).

Existing flow capacities at four bridges and five culverts within and below the Millie Fire perimeter

Site	Drainage area (ac)	Culvert diameter (in)	Depth fill above pipe (ft)	Bridge/Culvert capacity (cfs)	Post-fire 10-year flow (cfs)
Baptist Camp bridge	25,997	bridge	--	2500	553
Spire Rock DS bridge	23,806	bridge	--	800	517
Rat Flats bridge	15,831	bridge	--	1600	419
Blanchard bridge	9738	bridge	--	1200	317
French Cr	1565	48	0.6	78	722*
Unnamed trib 1	52	24	0.7	16	58*
Spring Creek	540	36	6.8	80	502*
Butte Creek	403	36	11.1	105	428*
Unnamed trib 2	398	51x32	1.2	59	388*

*Q estimates along the heavily burned areas of Rd. 132 were double the predicted "clear water" flood volume to account for entrained sediment from anticipated massive erosion and debris flows

Road 132 culvert crossings in French Creek, Spring Creek, Butte Creek and 2 unnamed tributaries to Storm Castle Creek are very undersized and extremely vulnerable to failure and road damage. The Storm Castle Road 132 is a heavily used major recreation road on the Bozeman Ranger District and provides access to much of the upper Storm Castle Creek drainage including the Trail 185 connection to the Hyalite Creek drainage. The photo at the left shows the upper part of Butte Creek in the Storm Castle Creek drainage above road 132. This part of the fire was mapped at 85% high severity burn with virtually 100% ground cover combustion. This part of the burn is extremely vulnerable to accelerated stormflows, erosion, and debris flows based on debris flow research by Gartner and others (2008), Cannon and others (2009), and Parrott (2003).

Trails: Approximately 12.5 miles of Gallatin National Forest system trails within the Millie Fire perimeter are at risk of erosion and sediment delivery, as well as a safety concern with existing and potential hazard trees immediately adjacent to the trail. Five national forest system trails are located in the interior of the Millie Fire perimeter including Trail # 185 – Storm Castle Creek 2.3 miles, #414 – Moose Jaw 0.6 miles, #417 – Storm Castle Ridge – 6.8 miles, #419 – Mica Creek – 0.2 miles, and #419 – Telephone Ridge 2.6 miles.

The critical trail resource threat is from upland slope erosion and runoff being deposited on or entering the trail. The trails were not designed for the increased overland flow that may occur from the Millie fire. This may cause

severe soil erosion on the trail surface and fill-slopes. Failure of drainage dips and water bars may cause stream capture onto trail surface area, causing soil erosion, including loss of the trail by rilling and gullying.

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

Heritage Resources: 46 known cultural resource sites, representing a wide range of cultural uses, are located within or adjacent to the fire perimeters that could potentially be affected by wildfire. Three cultural resource sites are within the high severity burn area, 24GA0474-historic, a leveled structure used for occupation, approximately 5 acres; 24GA0475-Old Butte Meadows Station, 5 acres; and 24GA0476- historic, Butte Meadows campsite with three stone fire places, also approximately 5 acres.

Weeds: The Millie Creek fire area has approximately 118 acres of known noxious weed infestations within and directly adjacent to the fire area such as spotted and diffuse knapweeds, yellow hawkweed, oxeye daisy, thistles, common tansy, and hounds tongue. The ability of native plants to reestablish, thrive and re-seed in the Millie Fire can be compromised if noxious weeds are not adequately controlled.

Burned areas within the Millie fire will contain high nutrient levels (at least before the ash and A soil horizon erode), exposed ground surfaces, and reduced shade. Noxious weeds favor this type of habitat, prevent the reestablishment of desired native vegetation, and possibly displace already established native plants. If allowed to reach large infestation levels, the resulting weed population will be very difficult and expensive to manage.

Fisheries: Storm Castle Creek is 1 of 2 key trout spawning streams for the downstream Gallatin River. The other is Spanish Creek. Storm Castle Creek is used for trout spawning upstream and into the Millie Fire perimeter. The downstream Gallatin River is considered a Blue Ribbon fisheries. Storm Castle Creek is a Category A stream per the Gallatin NF sediment standards in the Forsest Plan and Travel plan, and is an important local trout fishery.

B. Emergency Treatment Objectives:

Roads - Mitigate effects of changed post-fire watershed responses (runoff,erosion, and deposition) by stormproofing selected road areas, and protect human life and safety at specific locations where Forest roads and stream crossings are at risk of damage or failure.

Trail treatments - Permit reasonably safe passage for BAER rehab crews and reduce or prevent accelerated trail erosion by diverting, discharging, and dissipating runoff down the trail tread.

Weed treatments - Reduce the spread of existing noxious weed infestations into burned areas.

Herritage resources – Several sites will be seeded and mulched in immediate area around each structure.

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

Land **80** % Channel **na** % Roads/Trails **70** % Protection/Safety **na** %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land (heritage)	na	na	na
Weed treatment)	50	70	90
Channel	na	na	na
Roads/Trails	70	80	90
Protection/Safety*	90	90	95

E. Cost of No-Action (Including Loss): $4,590,000

F. Cost of Selected Alternative (Including Loss): $887,000

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

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

For the Millie Fire fire the risk levels by resource included roads, trails, heritage resources, water quality, soil productivity, and fisheries. Only roads, trails, heritage sites, and weeds had risk levels of intermediate or greater and therefore are the only resources recommended for BAER funded treatments.

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	RISK		
Very Likely	Very High roads	Very High	Low
Likely	Very High trails	High weeds, water quality, heritage resources, soil productivity, fisheries	Low
Possible	High	Intermediate	Low
Unlikely	Intermediate	Low	Very Low

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Mark T. Story
Email: mark@story2.name Phone: 406-586-3176 FAX: 406-587-6758

Assistant Team Leader: Dale White
Email: dalewhite@fs.fed.us Phone: 406-587-6752 FAX: 406-587-6758

H. Treatment Narrative:

Road Treatments: Several road sites were identified as being at high risk, with potential emergency situations. The BAER treatments are focused on storm proofing the most important routes associated with the transportation system and in the priority watershed areas. A **High Emergency Priority Determination** was identified, creating the need for treatment. BAER funds are appropriate for treatment of anticipated fire erosion events on roads but not to improve roads to standards over pre-fire conditions. Road treatments will include Road #132 Storm Castle, #2506 French Creek, #2507 South Fork French Creek, #3125 Telephone Ridge, and #6985 Orchid Gulch. The objectives of the road treatments are to stormproof the road investment from accelerated erosion, sediment transport, and sediment deposition on travel routes and reduce the sediment transfer from the routes while maintaining access to the Forest for administrative, private lands access, and public use. Detailed road treatment units and costs are listed in Appendix A with treatment details in Appendix B.

Wildfire accelerated surface flows down roads are probable and if not treated will cause significant surface erosion and failure in localized areas. The NF roads in the Millie fire are typically out sloped, but the main Storm Castle road is ditched with culverts. Without the treatments, overland flow and soil erosion will damage the roads as well as transfer additional sediment load into the aquatic system. It is likely that many of the routes will become impassible within the next year without treatment. Treatment of hazard trees will provide for a safe working environment for the rehab crews and contractors during contract administration and planning. Only specific trees along the main road are targeted for felling to protect worker safety.

The majority of the culverts are ditch relief culverts and small drainage culverts, these will require cleaning several times over the next year to prevent blockage and damage to the road.

The most critical road treatment is to upgrade 4 culverts on the Storm Castle Road 132 (Spring and Butte Creeks, 2 unnamed drainages) and upgrade the undersized French Creek culvert to a bridge where private land access is in jeopardy and to provide AOP capability. The 4 culverts are considerably undersized and a high potential of being blown out and/or overtopped with stormflow runoff and debris. The 4 stream crossings (culverts) on Rd 132 with deep fills will be removed to eliminate the substantial risk of culvert plugging, over topping, breaching, and channel scour. The work will consist of fill removal, removing existing culverts, and re-creating an approximately 15' wide stream bottom area. The 4 culverts are anticipated to be removed in October 2012 and larger culverts installed in June 2013 after the highest risk for snowmelt. This will require closing the 132 road from auto and truck access until the new culverts are installed. Storm Castle Road 132 is a major corridor for public and Forest Service administration. Closing this system road for extended periods is not a realistic option considering the multiple management activitries and recreational access.

In addition to the 4 large culverts, 8 locations on Rd 132 that will need installation of 18" culverts to pass storm runoff. These locations have existing 12 inch culverts to be upgraded. Four additional locations needing cross drains currently have no existing culverts will also identified to have 18" cross drains installed.

The treatments for the roads consist of a variety of storm proofing techniques including blading the roads and restoring drainage, constructing armored drainage dips, hazard tree removal to provide for safety during BAER contract administration, cleaning culverts to prevent damage, and upsizing culverts. Armoring drainage dips is essential due to the erosive nature of the soil in the Millie fire. Armoring will be completed on selected road segments with screened material from a local source. It will provide protection against rutting and reduce sediment movement.

Trail Treatments

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

Selected hazard trees will be removed on the 12.5 miles of trails within the Millie Creek fire burn perimeter in accordance with EM-7720-102 standard specification for construction of trails. This will allow reasonably safe access for BAER trail rehab crews. Approximately 360 trail drainage structures will be installed. Trail work will consist of:

1. Removal selected hazard trees and clearing of down trees where pack string acces is blocked.
2. Install adequate drainage structures and subsequent cleaning out of these structures to prevent erosion of trail prism from upslope runoff likely to occur over the coming months of rain and snowfall.
3. Stabilize trail prism to provide safe travel routes for BAER rehab crews.
4. Install warning signs at all trail portals to inform BAER rehab crews of associated hazards within a burned landscape.

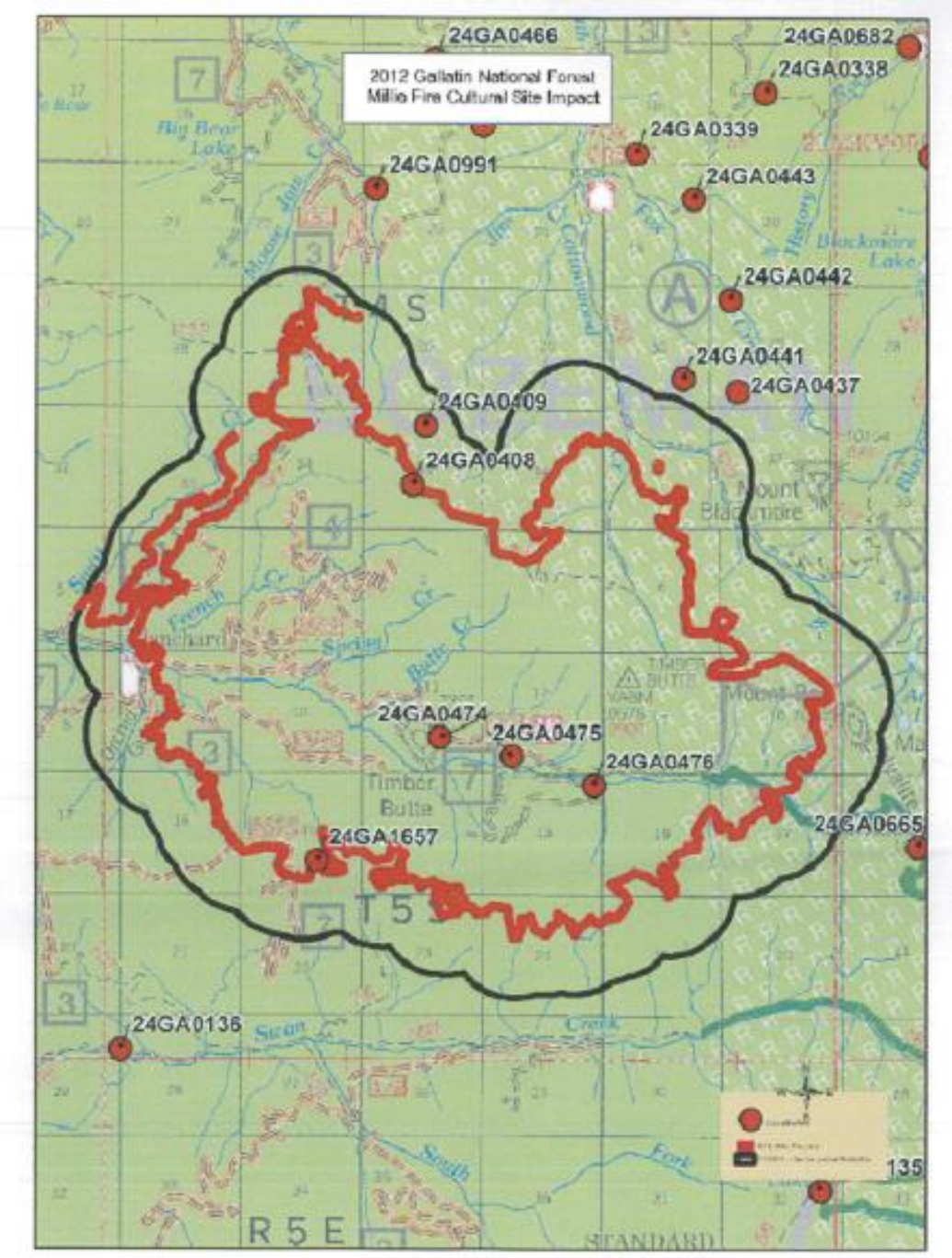
The Trail BAER work will be done at 12.5 miles of trails within the Millie Fire perimeter. Specific trails include:

#185 – Storm Castle Creek 2.3 miles
#414 – Moose Jaw 0.6 miles
#417 – Storm Castle Ridge 6.8 miles
#419 – Mica Creek 0.2 miles
#421 – Telephone Ridge 2.6 miles

Trail work is planned to start in October 2012 with 3 additional cleanings during the summer of 2013.

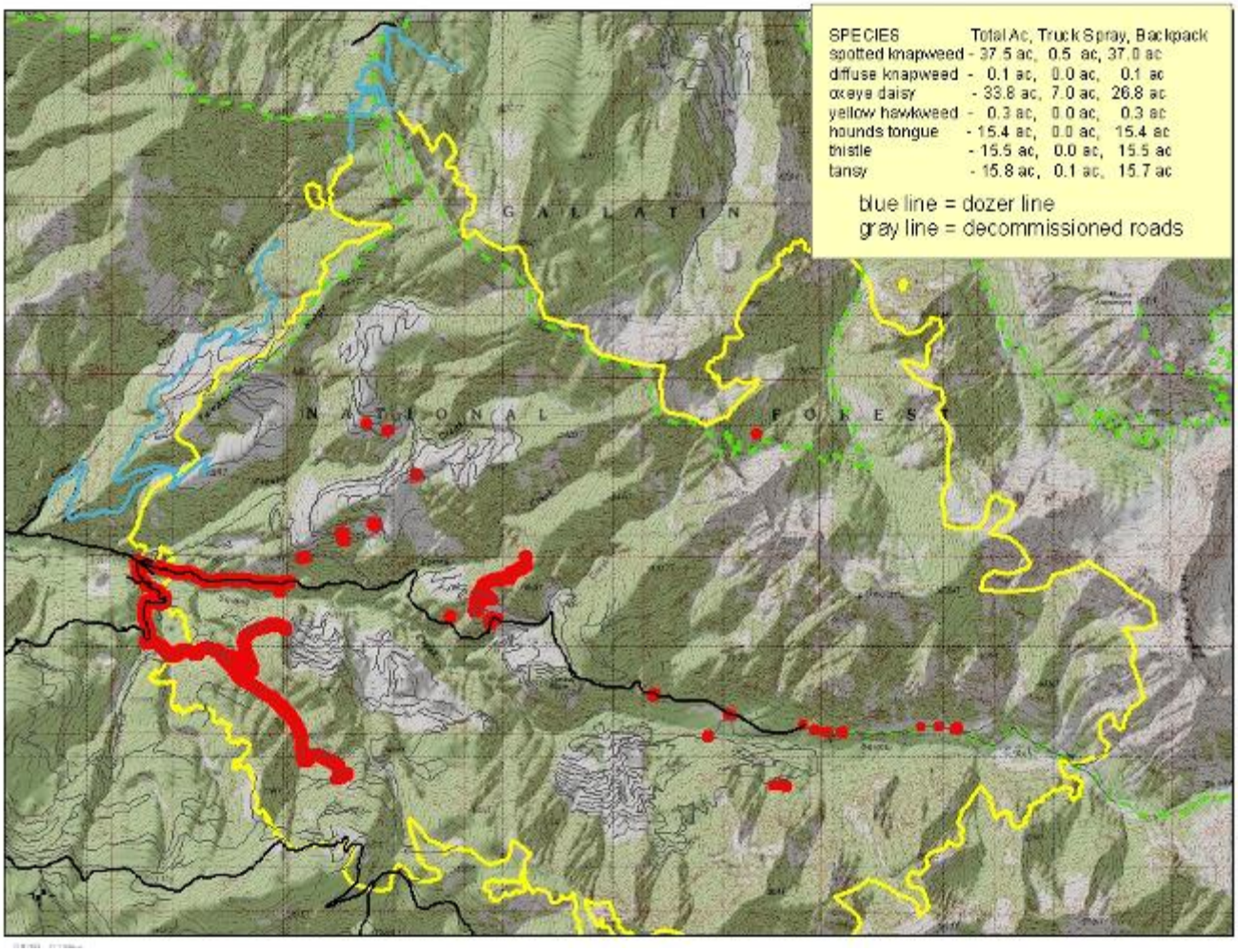
Heritage Resources

The 3 Heritage sites at risk 24GA0474-historic occupation structure, 24GA0475-Old Butte Meadows Station, and 24GA0476- historic, Butte Meadows campsite will be seeded and mulched in immediate area around each structure. This would be a total of about 1 acres of re-seeding with natural seed mix and mulching with weed free straw. Treatment sites are shown in the map at the left..



Weeds: Existing known sites of likely weed spread (~118 acres estimated) will be hand pulled or treated with herbicides for up to 3 years. BAER funding is only available for the first year of the treatments (2013). Many of the weeds are difficult to find the first year after a fires, so the acres will be covered twice during the 2013 growing season to ensure that all weeds are located and treated effectively. Other funding sources will be requested to treat any expansions of noxious weeds in subsequent years (2014, 2015). Weed treatment areas are shown in the map below.

Millie Fire and 2011 Weed Inventory (red polygons) - 118 acres of existing weeds (42 polygons)



I. Monitoring Narrative:

Hertage Treatment Monitoring: The Forest Archeologist will monitor the 3 heritage protection sites on 1 day during the summer of 2013 to evaluate the effectiveness of the seeding and mulch treatments to protect the sites from Millie fire accelerated erosion.

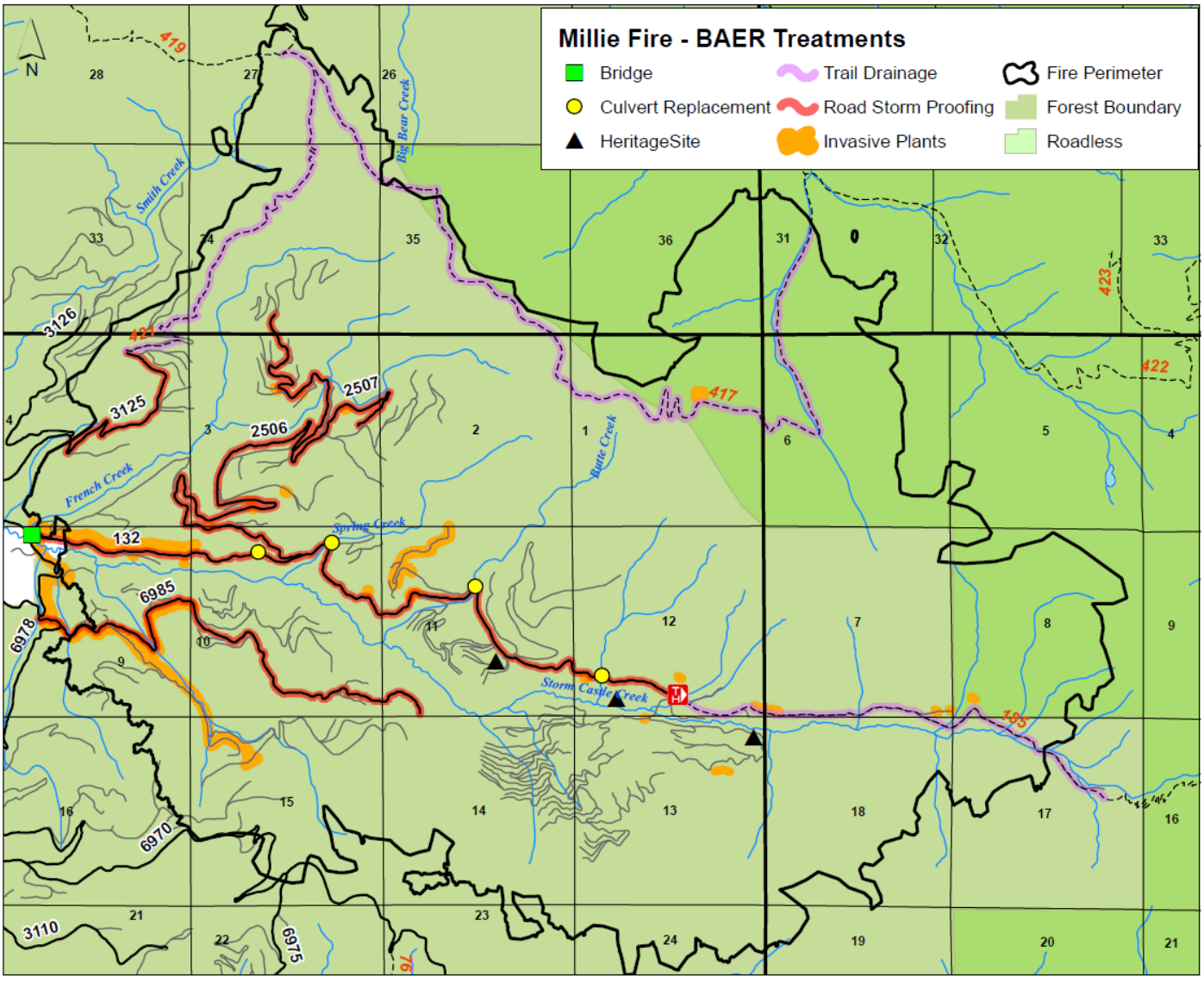
Storm Patrol/Road Closure Effectiveness: Storm patrols will identify road problems such as plugged culverts and washed out roads. The patrols will take appropriate measures to clear obstructions from blocked culverts and close roads that have received damage. Storm patrol personnel will also determine whether any damage requires heavy equipment. Road closures will be monitored to determine if vehicle tresspass is occuring and what additional measures can be implemented to further restrict access.

Watershed Response/Treatment Response: The Millie Creek Fire provides an excellent opportunity to measure watshed response to the fire and evaluate the accuracy of flow estimates. The amout of BAER

expendatures often rely on these estimate. Continual improvement of our ability to estimate post fire flows will result in appropriate expenditures to protect values at risk, including life and property.

Following rain events in 2013 discharge will be estimated using either a stage recorder, crest gage informatio, or high water marks. Two recording rain gages and stage recorder will be set up in the central part of the Millie Creek fire allow for assessment of watershed response. In addition, observational monitoring of treatment effectivenes will be achieved during water quality monitoring, rain gauge and stage recorder maintenance, and storm patrols. BAER funding is requested only for the Gallatin Watershed staff associated with the monitoring. Monitoring preparation will be prepared during the fall of 2013 after the FY13 Millie Fire authorizaton date closes so will not be charged to BAER funds. Estimated costs include:

Water Quality/Watershed Response/Treatment Response costs					
category	item	units	per unit	number	Total
Monitoring	recording rain gauge	each	500	2	1000
Monitoring	stage recorder	each	600	1	600
Monitoring	GS-11 hydro	day	340	5	1,700
Monitoring	GS-8 hydro tech	day	300	5	1,500



VI – Emergency Stabilization Treatments and Source of Funds

A. Land Treatments	Units	Unit Cost	# of Units	BAER $	Other$
Weed detection & herbicide treatment	AC	$147	118	$22,400	
Heritage site stabilization Site Hazard Tree Removal and seeding – 3 sites	Site	$500	3	$1,500	
Forest Archeologist coordination of Millie fire BAER treatment projects with MTSHIP and NHPA Section 106 compliance review	Days	$400	2	$800	
Subtotal Land Treatments				**$24,700**	
B. Channel Treatments	0	0	0	0	
C. Roads and Trails					
Road armoring & drainage etc.		See Appendix A		$101,705	
Road hazard trees@40/mile est.	trees	$43	492	$21,156	
Road culverts and bridge		See Appendix A	21.5	$358,740	
Trail drainage structures @ 35/mile	each	$150	438	$65,700	
Trail clean out/repair drainage structures	each	$62	1080	$66,960	
Trail hazard Trees @40/mile est,	each	$50	500	$25,000	
Warning signs	each	$630	12	$7,560	
Subtotal Roads and Trails	Road treatment specific funding detail are included in Appendix A. Road treatment detailed descriptions are in Appendix B.			**$646,821**	
D. Protection and Safety	0	0	0	0	
E. BAER Evaluation					
Assessment (person days)	DAYS	$325	140		$45,500
Travel costs	LS	$120	24		$3,000
Subtotal Evaluation					$48,500
F. Monitoring					
Archaeologist monitoring of treatment effectiveness of seed/mulch at 3 BAER treatments sites	Cultural Sites	$400	1	$400	
Storm Patrols	Trips	$270	16	$4,320	
Water quality / Watershed Treatment response	Each	$640	5	$3,200	
Subtotal Monitoring				**$12,720**	
G. Totals				**$679,441**	
Previously approved				$0	
Total for this request				**$679,441**	

PART VII - APPROVALS

1. /Mary Erickson/ 8/17/2012
Gallaitn NF Forest Supervisor Date

2. 8/ /2012
Region 1 Regional Forester

Appendix A. Millie Fire BAER Road Treatment Costs

C. Road and Trails	Units	# of Units	Unit Cost	BAER $
Hazard trees				
Hazard tree removal	EA	250	$43	$10,750
Road armoring and drainage				
Culvert removal	EA	4	$3,084	$12,340
Outslope blading and ditch cleaning	Mile	11.1	$1,178	$13,075
Construct rolling dip	EA	64	$610	$39,040
Construct armored rolling dip	EA	21	$1,000	$21,000
Construct armored rolling dip with imported material	EA	13	$1,250	$16,250
Total				$101,705
Culverts and bridge				
Culvert removal	EA	4	$3,084	$12,340
French Creek replacement 36 foot Bridge and site work	EA	1	$90,000	$90,000
Bridge design	EA	1	$12,000	$12,000
Spring Creek new 137" x 87" x60’ arch Culvert and site work	EA	1	$69,000	$69,000
Butte Creek new 128" x 83" x 60’ arch culvert, site work	EA	1	$67,300	$67,300
New 57" x 38" x 40’ arch culvert and site work	EA	1	$20,000	$20,000
New 77" x 52" x 40’ arch culvert	EA	1	$25,000	$25,000
New 18" drain culvert - 8 locations @ 34 ft each	LF	272	$100	$27,200
Culvert cleaning	EA	120	$285	$34,200
Rental Equipment, excavator	HR	8	$214	$1,700
Total				**$358,740**
Subtotal Roads				**$471,195**

Appendix B. Millie Fire BAER Road Treatment Type Descriptions

Treatment Type	Explanation
French Creek New 30-36 foot Bridge and Site Work	The existing culvert on the French Creek crossing on Storm Castle Road 132 is considerable smaller than needed to pass the anticipated Millie fire increases in stormflows and debris. A small bridge is proposed instead of a culvert since it is cost effective and will provide more conveyance capability. The design arch pipe culvert sized for this crossing was 171"x110 arch AOP. A similar culvert on the Gallatin NF was installed for $89,000 in 2009 in Smith Creek. In 2010 on the same stream (Smith Creek) a 36 foot concrete bridge was installed for $88,000. A bridge at the French Creek site, compared to an arch pipe, would have less stream capacity constriction, better conveyance of stormwater, better ability to pass predicted debris flow and woody debris, and would not require as much road surface elevation at the approaches. This crossing provides also access to the Blanchford Ranch private inholding and the Line Creek road system into Swan Creek.
Spring Creek New 137" x 87" x60' arch Culvert and site work	Based on the stormflow and hydraulic analysis, it is recommended to upgrade this culvert in order to pass predicted storm flow and associated debris on Spring Creek. The Spring Creek site has too much curvature to provide a suitable bridge site.
Butte Creek New 137" x 87" x 60' arch culvert and site work	Based on the stormflow and hydraulic analysis it is recommended to upgrade this culvert in order to pass predicted storm flow and associated debris on Butte Creek. Butte Creek is particularly heavily burned with considerable channel bedload accumulation poised to be mobilized.
New 57" x 38" x 40'arch culvert and site work (Wig Creek)	Based on the stormflow and hydraulic analysis it is recommended to upgrade this culvert in order to pass predicted storm flow and associated debris in this unnamed drainage, identified as Wig Creek.
New 77" x 52" x 40' arch culvert	Based on the stormflow and hydraulic analysis it is recommended to upgrade this culvert (unnamed stream near the #182 trail head on Road 132) in order to pass predicted storm flow and associated debris. This culvert is located in an alluvial plane area. Placement may vary slightly depending on potential early summer 2013 alluvial fan stormflow response dynamics at the culvert site.
Construct rolling dip	Rolling dips will be placed at specific points to direct wildfire accelerated channelized and overland flow across the road and to prevent water from channeling down the road. This treatment is a cost effective way to remove water from the road template without the use of costly culverts and ditches. This treatment will protect the roads from erosion, limit sediment transfer, reduce rutting, and

	increase driver safety. The rolling dips will be armored on the outlet (fill slope) with local rock material, in order to prevent erosion of the roadbed. Without the armoring, the road locations at concentrated flow areas are very vulnerable to post fire accelerated erosion.
Armored rolling dip	Armored rolling dips will be used for the same purpose as the rolling dips to direct channelized and overland flow across the road. These will be used on higher traffic roads to prevent traffic from damaging the structure and also for traffic safety while crossing the dips when the road surfaces are slippery. Armored dips will be fortified at outlets with local rock material like the rolling dips. In addition, armored rolling dips will be armored along the width of the road with local screened material.
Construct armored rolling dip with imported material	These dips will only be constructed along the Telephone Ridge Road # 2507. Because the road is on very rocky native material, it will be necessary to import pit run material from a local source in order to build the dips. They will be armored the same as the other armored rolling dips.
Culvert cleaning	Culverts along the open Millie Creek fire roads are already showing signs of increased sediment deposition causing partial blockage. Culvert cleaning needs with the fire perimeter are substantial. Sediment traps will be cleaned at each inlet to limit the sediment transfer through the culverts. Each culvert will be cleaned 4 times: Fall 2012, spring 2013, summer 2013, and Fall 2013 before the BAER authorization expires.
Culvert removal	Culvert removal will be done as soon as possible during October 2012 on the five large crossings on Storm Castle Road. The channels will be left open in 2013 through the winter with the replacement culverts installed in late spring or early summer when the sites become passable. This will allow pulling the culverts and fill material in October 2012 when streamflow is low and fill material is not saturated from spring 2013 snowmelt. The largest wildfire response flows to pass without causing catastrophic road prism failures. The crossings will be excavated to mimic surrounding streambed and locally available rock will be placed to slow water velocity through the channel.
18 inch Culvert installation	Eight locations need 18 inch drain culverts to convey the increased runoff and sediment. Four of the sites are in small drainages on the main Storm Castle Road 132 where the runoff has historically been contained in a ditch and directed off the road via a drain culvert. The other 4 locations are existing 12 inch culverts that are undersized for the anticipated increased runoff and debris
Hazard tree removal	Hazard tree removal will only occur specific locations on concentrated areas of BAER

	implementation workers pro on the main Storm Castle Road 132 where the burn severity is high and snag hazard trees occur. The purpose is to provide a safer working environment for surveyors, engineers and contractors who will be performing the treatments on the roadway. Most of the hazard tree removal sites will be at stream crossings.
Out slope blading and ditch cleaning	Out slope blading and ditch cleaning is an efficient method to reestablish road drainage. The purpose is to remove wildfire increased discharge from the roadway template. Outsloping the road along with dips and drainage armoring are providing the protection to the road as well as reducing erosion and providing for safety.
Rental equipment, excavator	This rental equipment item is proposed on specific roads for specific cleaning and safety work. For example, burned out stumps in the road fill make roads impassable for vehicles and equipment, these holes need to be filled and the fill slope reshaped in order to provide BAER implementation access culverts for cleaning and installing rolling dips.