USDA-FOREST SERVICE FS-2500-8 (6/06)

Report Date: 10-2-15

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: **Stickpin Fire**

B. Fire Number: **WA-COF-1111**

C. State: **Washington**

D. County: **Ferry**

E. Region: **06 – Pacific Northwest**

F. Forest: **21** – Colville

G. District: **Republic**

H. Fire Incident Job Code: **P6J1F6 (0621)**

I. Date Fire Started: **August 11, 2015**

J. Date Fire Contained: **October 15, 2015**

K. Suppression Cost: **$37,658,000 (est.)**

L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles): **50 miles total on fire; 40 miles estimated**
2. Fireline seeded (miles): **0 miles**
3. Other (identify): **0**

M. Watershed Number(s): (6^{th} level hydrologic units, percent of watershed acres within fire perimeter):

6th Field HUC	Subwatershed Acres	Forest Service Lands Only (ac)	% Subwatershed Burned
Lone Ranch Creek	14,706	7,192	49
Little Boulder Creek	13,829	2,661	19
East Deer Creek	23,385	4,084	17
North Fork Boulder Creek	21,082	9,085	43
South Fork Boulder Creek	44,071	11,596	26
Saint Peter Creek	17,634	6,180	35
Long Alec Creek	11,669	2,684	23
West Deer Creek	13,662	4,765	35

Total Burn Acres Analyzed in GIS: 53,954
Unburned/Very Low: 8,924
Low: 15,472
Moderate: 12,902
High: 16,657

N. Total Acres Burned: **53,729 Acres**
Colville NF (**48,485**), Other Federal (**0**), State (**2,641**), Private (**2,594**)

O. **Vegetation Types**: The vegetated habitat in the Stickpin Fire area is a combination of Eastside (interior) Mixed Conifer Forest, Lodgepole Pine Dominated Forest and Ponderosa Pine Dominated Forest. It is composed of open to closed evergreen conifer tree canopies. The tree species include lodgepole pine, western larch, Ponderosa pine, Douglas fir, western redcedar, subalpine fir, Engelmann spruce, and whitebark pine. The understory varies from graminoid, to evergreen or deciduous shrubs and forbs. On pumice soils, a sparsely developed shrub and graminoid undergrowth appears with open to closed tree canopies (Rex C. Crawford 2011 http://www.nwhi.org/index/habdescriptions). Deciduous shrubs include Rocky Mountain maple, serviceberry, oceanspray, mallowleaf ninebark, Scouler's willow, snowberry, big huckleberry, creeping Oregon grape, tobacco brush, Oregon boxwood, kinnikinnick, grouseberry, pinegrass and/or Geyer's sedge can appear with grouseberry in the subalpine zone. Idaho fescue, bluebunch wheatgrass, junegrass, (Rex C. Crawford 2011 http://www.nwhi.org/index/habdescriptions)

P. **Dominant Soils:** GaC – Gahee loam, 0 to 15 percent slopes; GoF – Growden fine sandy loam, 35 to 65 percent slopes; GsF – Growden-Pepoon-Oxerine complex, 15 to 65 percent slopes; SdC – Scar sandy loam, 0 to 15 percent slopes; MkE – Merkel sandy loam, 15 to 35 percent slopes; LeF – Leonardo fine sandy loam, 35 to 65 percent slopes; TnF – Togo loam, 35 to 65 percent slopes; TnE – Togo loam, 15 to 35 percent slopes; TrE – Togo-Rock land complex, 15 to 50 percent slopes

Q. **Geologic Types** Granitic and Gneissic bedrock formations, Metamorphic Schist bedrock formations, Rhyolitic and Andesitic bedrock formations, Eolian volcanic ash, Alluvial glacial till and outwash.

R. Miles of Stream Channels by Order or Class: **Perennial: 75 miles (65 on CNF) Intermittent: 117 (102 CNF) miles**

S. Transportation System: **Trails: 52 miles Roads: 135.4 miles**

PART III - WATERSHED CONDITION

Burn Severity on NF Lands (acres): **8,475** (Low/unburned) **13,778** (low) **11,597** (moderate) **14,635** (high)

Acres by Burn Severity on FS Lands in 6th-Field Hydrologic Units

6th-Field Subwatershed	High	Moderate	Low	Unburned	Total acres Burned	Subwatershed acres on Forest
Lone Ranch Creek	2,640	1,193	1,904	1,456	7,202	7,19
Little Boulder Creek	99	357	2,085	119	2,661	2,66
East Deer Creek	1,857	701	1,007	519	4,084	4,08
North Fork Boulder Creek	2,009	2,170	2,317	2,589	9,085	9,08
South Fork Boulder Creek	2,677	3,117	3,520	2,282	11,599	11,59
Saint Peter Creek	601	2,470	2,075	1,033	6,198	6,18
Long Alec Creek	932	833	541	378	5,492	2,68
West Deer Creek	3,820	707	234	4	7,095	4,76
Grand Total	14,635	11,548	13,683	8,380	53,416	48,24

B. Water-Repellent Soil (acres): **23,655**

C. Soil Erosion Hazard Rating (acres):
4,798 (low) **10,401** (moderate) **6,114** (high)

D. Erosion Potential: **43.0** ton/acre

E. Sediment Potential: **964** cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years):	**1 to 5**
B. Design Chance of Success, (percent):	**80%**
C. Equivalent Design Recurrence Interval, (years):	**25**
D. Design Storm Duration, (hours):	**3 hours**
E. Design Storm Magnitude, (inches):	**1.5"**
F. Design Flow, (cubic feet / second/ square mile):	**34 cfs/sq. mi.**
G. Estimated Reduction in Infiltration, (percent):	**35%**
H. Adjusted Design Flow, (cfs per square mile):	**46 cfs/sq. mi.**

PART V - SUMMARY OF ANALYSIS

Background: The Stickpin Fire was reported on August 11, 2015 burned along the Kettle Crest between Curlew and Orient. The fire is believed to be lightning caused. Hot, windy conditions combined with very dry fuels caused the fire to grow quickly. The Stickpin Fire is the largest fire of the Kettle Complex Fire which also includes the Renner and Graves Fire. The complex has been managed by the Oregon Incident Management Team #1 who took over command of this incident Sunday September 20th, at 1800. The command was transferred to a local Type 4 team on Tuesday September 29th, at 0700.

In general, soils found within the fire perimeter consist of moderately-well to well-drained soils formed in volcanic ash overlying glacial till or granitic, gneissic, andesitic, rhyolitic, or schist bedrock formations in the higher elevation forested areas. Shallow soils (< 15 inches) and rock outcropping are commonly present and often associated with steeper topography and rock escarpments. Valley bottoms typically include deeper soils (> 40 inches) that are well to excessively-drained, formed in alluvial material derived from a mixture of volcanic ash, glacial till and/or glacial outwash. Surface soil textures range from ashy loams to ashy silt loams to fine sandy loams with some surface textures exhibiting gravelly surface rock fragment modifiers (15 – 35 percent rock fragment content within the soil horizon) in the higher elevations. Valley bottom soils typically exhibit gravelly to very gravelly (35 – 65 percent rock fragment content) sandy loams to loamy sand soil surface textures with a few locations that may have silt loam surface textures.

Soils formed in, or influenced by, volcanic ash are important to forest management as these soils represent a valuable resource from both an economic and ecological perspective. The unique properties of ash cap soils such as high water holding capacity and inherent fertility are important and are linked to the level of site productivity in the forested ecosystems of this area. Volcanic ash soils can also be considered a non-renewable natural resource in the context that if they are lost, they cannot be replaced until another volcanic ash deposition event occurs. Volcanic ash soils also exhibit high erodibility due to their fine texture and relatively amorphic structural development.

A. Describe Critical Values/Resources and Threats:

Summary of Issues:

Critical Value	Value-at-Risk	Drainage with Value	Risk	Threat Description
Human Life & Safety Property	Roads Motorized Access	Lone Ranch Creek Little Boulder Creek East Deer Creek NF Boulder Creek SF Boulder Creek Saint Peter Creek Long Alec Creek West Deer Creek	Very High Very High* Very High* Very High Very High Very High Very High* Very High	Post-fire watershed conditions threaten the life and safety of visitors using the Forest Service roads and road infrastructure within the fire perimeter. Roads are downslope of high/moderate severity burned areas increasing the risk from debris flows, increased runoff, and erosion from over-steepened slopes during storm events. These events can plug culverts, erode roadbeds, and trap the public behind damaged areas. Boulder Creek Road in the NF Boulder Creek sub watershed is rated at High risk. This county road crosses the fire and provides the only access to several Forest System roads and trails. There is also an increased risk from burned, hazard trees, and rock fall across the high and moderate burn severity areas.
Human Life & Safety Property	Highway 21 and 395	Lone Ranch Creek Little Boulder Creek East Deer Creek NF Boulder Creek SF Boulder Creek Saint Peter Creek Long Alec Creek West Deer Creek	NA NA Low Low NA Very High NA NA	Post-fire watershed conditions threaten the life and safety of traffic on Highways 21 and 395. Portions of the highway is downslope of high/moderate severity burned areas increasing the risk from debris flows, runoff, and erosion during storm events. These events can plug culverts, erode roadbeds, and trap the public behind damaged areas.
Human Life & Safety Property	Homes, Buidlings, Utility lines	Lone Ranch Creek Little Boulder Creek East Deer Creek NF Boulder Creek SF Boulder Creek Saint Peter Creek Long Alec Creek West Deer Creek	Intermediate Very Low Intermediate Low NA Very High Very High High	Damage to homes is possible due to moderate and high severity burn above. Homes near stream channels should have a site specific assessment completed. Unknown status or location of lines. It is assumed that lines follow roads.
Property	Campgrounds	Lone Ranch Creek Little Boulder Creek East Deer Creek NF Boulder Creek SF Boulder Creek Saint Peter Creek Long Alec Creek West Deer Creek	NA NA NA NA NA NA NA Very High	The Deer Creek Forest Campground was destroyed by fire. All remaining trees are considered hazards to the public and to employees. The entire infrastructure, minus one picnic table and a single CXT toilet, was burned or otherwise damaged. This campground was only occasionally used, however it does provide one of the few developed campsites with amenities for through-hikers of the Pacific Northwest National Scenic Trail. Water for this campground has been supplied by a spring on the south side of the Boulder-Deer Highway (both for stock and through-hikers). The spring is still currently running water through a damaged piping system to burned troughs.

Property	Trails	Lone Ranch Creek Little Boulder Creek East Deer Creek NF Boulder Creek SF Boulder Creek Saint Peter Creek Long Alec Creek West Deer Creek	NA NA Intermediate Very High Very High Very High Very High Very High	Post-fire watershed conditions threaten the life and safety of visitors using the Forest Service trails within the fire perimeter. Trails are downslope of high/moderate severity burned areas increasing the risk from debris flows, increased runoff, and erosion from over-steepened slopes during storm events. These events can wash out the trail tread and damage other infrastructure. Erosion risk is low for the Deer Creek Summit Trail, but hazard trees are of very likely due to the amount of moderate to high burn severity along the trail. The Kettle Crest North Boulder Trail and Taylor Ridge Trail are at minimal erosion risk because they lie along the mountain ridge. Kettle Crest North, Leona Loop, Ryan Cabin, Stickpin, Big Lick, Profanity, Leona, Taylor Trails, Long Alec, and Boulder Deer Summit Trails and Trailheads are at Very High risk of erosion. There is also an increased risk to visitors from hazard trees and the Summits-Curlew and Deer Creek Summit south and north are at a intermediate risk due to hazard trees.
Property	Boulder Creek Road	NF Boulder Creek and West Deer Creek	High to Very High	Post-fire watershed conditions threaten the life and safety of traffic on Boulder Creek Road and road infrastructure within the fire perimeter. Portions of the highway is downslope of high/moderate severity burned areas increasing the risk from debris flows, runoff, and erosion during storm events that may plug culverts and damage roadbeds. There is a need to protect culverts by installing stand pipes on the intakes of the culver pipe and trash rack to catch debris. Additionally, mulching may be used to reduce erosion and runoff to downstream roads.
Natural Resources	Native or naturalized communities non-forested	Lone Ranch Creek Little Boulder Creek East Deer Creek NF Boulder Creek SF Boulder Creek Saint Peter Creek Long Alec Creek West Deer Creek	All High to Very High	Field reviews indicate that there is a substantial risk of noxious weed invasion along roads, handlines and dozerlines used during fire suppression activities. There is a high liklihood that noxious weed seeds were brought into the area by fire equipment and weeds were spread through the fire from suppression activities through local noxious weed infestations in and around the fire. The slow natural regeneration following moderate to high burn severity also leaves some areas at risk. Known noxious and invasive weed populations are expected to aggressively compete with native species for space and nutrients in burned areas.
Cultural & Heritage Resources	Cultural Sites	Lone Ranch Creek Little Boulder Creek East Deer Creek NF Boulder Creek SF Boulder Creek Saint Peter Creek Long Alec Creek West Deer Creek	Very Low NA Low Very Low Very High NA Low High	Trail had blazed trees along the Boulder Ryan trail likely burned in fire. The burn area encompasses a range of prehistoric and historic cultural sites which range in occupation middle Archaic period (i.e., 6,000 years ago) to the middle of the 19th century. Prehistoric sites include lithic scatters, rock shelters and habitation sites. Local historic sites include a 1890s era site, early 20th century cabin sites, an old lookout, and Civilian Conservation Corps structures. The heritage sites which hold the greatest risk of fire damage tend to be historic structures made of combustible material, notably wood. There are no known Native American sites located in the area of effect; however that does not mean those sites are not present, it only indicates none have been identified prior to the fire.

Property	Domestic Water Sources	Lone Ranch Creek Little Boulder Creek East Deer Creek NF Boulder Creek SF Boulder Creek Saint Peter Creek Long Alec Creek West Deer Creek	Very High NA Very High Very High NA NA Very High Very High	Ash and sediment can impact water quality for miles downstream until flow from unburned drainages dilutes it. There are many domestic and agricultural intakes that may have impaired water quality during the first few storms that generate erosion from burned hillslopes. Diversions and pumps/intakes are unknown, but if present may be damaged by degraded water quality affected by elevated levels of turbidity.
Property	Community Water Sources (Orient Water Supply)	East Deer Creek	Very High	The Orient Community water system and weir is at very high risk due to relatively large area of moderate and high severity burn in the headwaters of the East Deer drainage. Storms can increases flow, sediment, and debris into the water system damaging the sand lens filtration systems, weirs, and diversion structure. For the 25-year storm event, a 150% increase in flow is estimated. The system has the capability to shut down during high flow events, but the system lacks an automated system. So operating the system falls to a small group of volunteers who manually operate valves to reduce or shut off flow. Water quality affected by elevated levels of turbidity and ash may require changes in management actions and increased maintenance intervals and costs. The holding tank may only provide up to three days of water for the community should the facilities need to be shut down. Additionally, the historic intake structures is accessed by a foot trail, making cleaning of sediments captured by the weir system can only be done by hand.
Natural Resource	Soil Productivity	Lone Ranch Creek Little Boulder Creek East Deer Creek NF Boulder Creek SF Boulder Creek Saint Peter Creek Long Alec Creek West Deer Creek	Very High Low Very High High Very High High Very High Very High	The risk of accelerated erosion and mass wasting is very high is certain subwatersheds because forest canopy and effective ground cover has been completely consumed by moderate to high intensity burn. Soils found within the fire perimeter consist of moderately-well to well-drained soils formed in volcanic ash overlying glacial till or granitic, gneissic, andesitic, rhyolitic, or schist bedrock formations in the higher elevation forested areas. The unique properties of ash cap soils such as high water holding capacity and inherent fertility are important to site productivity in the forested ecosystems. Volcanic ash soils also exhibit high erodibility due to their fine texture and relatively amorphic structural development.

*** Hazard trees only, NA – Not Applicable**

B. Emergency Treatment Objectives:

The goal of the burned area emergency rehabilitation is to:

- Reduce threats to human life and safety to users of roads and protect road infrastructure in high and moderate severity burn areas in Lone Ranch Creek, Little Boulder Creek, NF Boulder Creek, SF Boulder Creek, Saint Peter Creek, Long Alec Creek, and West Deer Creek (e.g. overflow structures, enlarging culverts that could plug, and dropping select hazard trees on roads that can't be closed).
- Reduce the loss of soils and resulting productivity for soils with high loss potential. Values protected are roads (by reducing cultert failure and road surface washout)
- Reduce threats to human health through reduction of soil loss to minimize downstream sedement affects to the Orient, Washington, community water supply.
- Reduce threats to human life and safety by reducing soil errosion impacting Boulder Creek Highway.
- Reduce threats to human life and safety by installing warning signs and conducting road storm patrols.
- Reduce threats to human life and safety to visitors using the Forest Service campgrounds and trails within the fire perimeter and protect the trail infrastructure downslope of high/moderate severity burned areas from debris flows, increased runoff, and erosion from over-steepened slopes during storm events.
- Control expected invasion of noxious weeds within the area, especially along and adjacent to Forest roads and dozer lines used by fire equipment and in existing populations.
- Reduce accessibility and visibility of archaeological site locations which makes them more susceptible to vandalism/artifact looting and unauthorized recreational activity.

Objective:

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

Land **65** % Channel **NA** % Roads/Trails **85** % Protection/Safety **100** %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land (Cultural Protection)	85	90	90
Land (Noxious Weeds)	70	80	80
Land (Wood Mulch)	85	90	90
Land (Noxious Weed Seeding)	60	70	70
Roads (Drainage and Erosion Control)	70	85	85
Trails (Drainage and Erosion Control)	90	100	100
Protection/Safety (Hazard Trees)	100	100	100
Protection/Safety (Road Warning Signs)	100	100	100

E. Cost of No-Action (Including Loss): Refer to Values at Risk (VAR) spreadsheet for specific information

The VAR analysis summary identified that the total treatment cost is estimated REDACT with an expected benefit of $15,566,346. The summary implied minimum value of protecting non-market resource critical values is justified for the treatments proposed in this BAER assessment. The expected benefit/cost ratio was 3.1.

F. Cost of Selected Alternative (Including Loss): Refer to (VAR) spreadsheet for specific information

G. Skills Represented on Burned-Area Survey Team:

[✓] Hydrology	[✓] Soils	[ ] Geology	[ ] Range	[✓] Recreation
[ ] Forestry	[ ] Wildlife	[ ] Fire Mgmt.	[✓] Engineering	
[ ] Contracting	[ ] Ecology	[✓] Botany	[✓] Archaeology	
[ ] Fisheries	[ ] Research	[✓] GIS	[ ] Landscape Arch	

Team Leader: **John Chatel, Pacific Northwest TES Program Manager**

Email: REDACT Phone: REDACT FAX: REDACT

Team Members:

Name	BAER Position
John Chatel, PNW RO	BAER Team Leader
Kate Meyer, Willamette NF	Team Leader (trainee)
William Amy, Santa Fe National Forest	Team Leader (trainee)/Wildlife
Eric Robertson, Apache-Sitgreaves NF	Soils
Crystal Danheiser, Lassen NF	Soils
Stacey Weems, Uinta-Wasatch-Cache NF	Soils (trainee)
Bill Goodman, Fremont-Winema NF	Hydro
John Rihs, Apache-Sitgreaves NF	Hydro
Mike McConnell, Gifford Pinchot NF	Hydro
Judy Kittson, BLM	Engineering
Shawn Robnett, Sawtooth NF	Engineering
Barbara Shanley, Lake Tahoe Basin	Engineering
Alicia Beat, Colville NF	Heritage
Kim Vieira-Rainville	GIS
Lisa Brehm, Ottawa NF	GIS
Eric Amstad, Malheur NF	Recreation
Dave Lent, Colville NF	Recreation
Tom Bates, Arapahoe/Roosevelt/Pawnee NF	Botany

H. Treatment Narrative:

Land Treatments:

Wood Mulch Aerial Treatments

Purpose of Treatment: This treatment is to help protect burn area slopes from noxious weeds invasion, to improve soil productivity, and to protect FS property (trails, FS roads, community water supply, and historic dam). Mulching will reduce downstream peak flows by absorbing and slowly releasing overland runoff which is likely to be increased due to reduced soil cover and hydrophobic soil conditions. Mulching also helps to protect the native seedbed and retain moisture on the burned slopes to facilitate quick vegetative recovery of the treatment areas. Mulching treatments in the headwaters of the streams would be anticipated to protect a much larger downstream area from cumulative runoff and sedimentation.

General Description: Wood shreds will be made on site with a horizontal grinder from logs identified by the Colville National Forest and applied to the ground surface by helicopter in a continuous cover of uniform thickness to replace vegetative ground cover lost in the fire. Mulch will reduce erosion, sediment delivery, and reduction in the potential for debris flow initiation to downslope values at risk associated with: a community watershed, noxious weeds, soil productivity and FS property (campgrounds, trails, FS roads, and native plant communities), and off forest values. Wood mulch is the

best treatment because sites are prone to wind erosion and have no surface vegetation that can breakup wind velocities or capture lighter wind-blown agricultural mulch. Heavier wood straw can withstand wind speeds up to 40 mph vs. agricultural straw that can withstand wind speeds only up to 15 mph (personal communication Pete Robichaud). Wind gusts routinely exceed 15 mph and occasionally exceeded 25 mph in the fall and winter at the Boulder Creek road weather station (RAWS).

Wood mulch will provide more ground cover and greater protection to hillslopes and the water system than agriculture straw based on monitoring of similar treatments completed on the Sawtooth NF (personal communication John Chatel). North American Weed Free Forage Program Species list is limited and there are species (such as all of the annual brome grasses, including cheatgrass) that are not regulated. Also, Hoary alyssum is also not regulated by NAISMA. Washington State Department Agriculture will use the standards and procedures of the North American Invasive Species Management Association's (NAISMA) Weed-Free. Hoary alyssum is currently the highest priority noxious weed on the Colville NF (Travis Fletcher Invasive species program manager, CNF, personal communication).

To estimate effectiveness of wood mulching treatments, soil and hydrologic modelling was conducted. Results of hydrologic modelling indicate that wood mulch treatment could reduce post fire peak flows by 34-77% at 3 select pour points where values are at risk (Table 1). Sediment delivery model results indicate that with wood mulching sediment delivery could be reduced by 74%-82% within the treatment area in the first year, and 48%-54% in the second year (Table 2).

Table 1 - Hydrologic modelling of pre and post fire peak flows using Wildcat.

Subwatershed Pour Point	Pre Fire Q_{pk} (cfs)	Post Fire Q_{pk} (cfs)	Post Treatment Q_{pk} (cfs)	Post Fire % Change	Post Treatment % Change	% Reduction in Post Fire Peak Flows w/ Application of Wood Mulch
Lone Ranch Creek at FS Road 6120	158	2,135	1,455	1,251	821	**34%**
West Deer Creek at Boulder Creek Road	108	1,416	409	1,223	282	**77%**
East Deer Creek at Orient Dam	1,140	2,851	2,045	150	79	**47%**

Table 2. Sediment delivery modelling of wood mulch treatment areas using ERMiT.

Predicted Soil Erosion ERMiT (tons ac-1)

Watershed:Lone Ranch Creek

Event Sediment Delivery (ton ac-1)

TOTAL BURNED ACRES OF WATERSHED 7217	Acres of Highly Erosive Soils Burned in M,H Severity	1st year Untreated (ton ac-1)	1st year Mulch (1ton ac-1)	1st year Sediment Reduction with Treatment (%)	2nd year Untreated (ton ac-1)	2nd year Mulch (1ton ac-1)	2nd year Sediment Reduction with Treatment (%)
TOTAL	879	168	39	80	112	54	53
% RED. OF SED. DELIV. PROVIDED BY TREAT. POLY. FOR BA IN WATERSHED (YR 1)							10
% RED. OF SED. DELIV. PROVIDED BY TREAT. POLY. FOR BA IN WATERSHED (YR 2)							7
OVERALL % RED IN SED. DELIV. PROVIDED BY TREAT POLY FOR BA OF WS IN 1ST 2 YEARS							17

Watershed:East Deer Creek-Kettle River

Event Sediment Delivery (ton ac-1)

TOTAL BURNED ACRES OF WATERSHED 4092	Acres of Highly Erosive Soils Burned in M,H Severity	1st year Untreated (ton ac-1)	1st year Mulch (1ton ac-1)	1st year Sediment Reduction with Treatment (%)	2nd year Untreated (ton ac-1)	2nd year Mulch (1ton ac-1)	2nd year Sediment Reduction with Treatment (%)
TOTAL	491	149	38	81	103	57	52
% RED. OF SED. DELIV. PROVIDED BY TREAT. POLY. FOR BA IN WATERSHED (YR 1)							10
% RED. OF SED. DELIV. PROVIDED BY TREAT. POLY. FOR BA IN WATERSHED (YR 2)							6
OVERALL % RED IN SED. DELIV. PROVIDED BY TREAT POLY FOR BA OF WS IN 1ST 2 YEARS							16

Watershed: West Deer Creek- Kettle River

Event Sediment Delivery (ton ac-1)

TOTAL BURNED ACRES OF WATERSHED 7109	Acres of Highly Erosive Soils Burned in M,H Severity	1st year Untreated (ton ac-1)	1st year Mulch (1ton ac-1)	1st year Sediment Reduction with Treatment (%)	2nd year Untreated (ton ac-1)	2nd year Mulch (1ton ac-1)	2nd year Sediment Reduction with Treatment (%)
TOTAL	493	110	25	82	68	34	54
% RED. OF SED. DELIV. PROVIDED BY TREAT. POLY. FOR BA IN WATERSHED (YR 1)							6
% RED. OF SED. DELIV. PROVIDED BY TREAT. POLY. FOR BA IN WATERSHED (YR 2)							4
OVERALL % RED IN SED. DELIV. PROVIDED BY TREAT POLY FOR BA OF WS IN 1ST 2 YEARS							10

Watershed: North Fork Boulder Creek

Event Sediment Delivery (ton ac-1)

TOTAL BURNED ACRES OF WATERSHED 9103	Acres of Highly Erosive Soils Burned in M,H Severity	1st year Untreated (ton ac-1)	1st year Mulch (1ton ac-1)	1st year Sediment Reduction with Treatment (%)	2nd year Untreated (ton ac-1)	2nd year Mulch (1ton ac-1)	2nd year Sediment Reduction with Treatment (%)
TOTAL	151	54	14	74	38	20	48
% RED. OF SED. DELIV. PROVIDED BY TREAT. POLY. FOR BA IN WATERSHED (YR 1)							1
% RED. OF SED. DELIV. PROVIDED BY TREAT. POLY. FOR BA IN WATERSHED (YR 2)							1
OVERALL % RED IN SED. DELIV. PROVIDED BY TREAT POLY FOR BA OF WS IN 1ST 2 YEARS							2

Location (Suitable) Sites: Four subwatersheds (East Deer Creek, West Deer Creek, North Fork Boulder Creek, and Lone Ranch Creek) were selected as priority treatment areas. Subwatersheds were prioritized according to critical BAER values (Orient community water source that occupied national forest lands; forest service roads, soils that could lose all its productivity setting them back 100's of years, and the Boulder County road that occupies the forest via a right of way) at very high risk, potential for loss to those values if no treatments are implemented. Subwatersheds ranked according to the following:

1. **East Deer Creek**

- VAR: Community watershed for town of Orient and historic dam (on FS land) at very high risk; FS Roads and soil productivity at very high risk; native plant communities at high risk of noxious weed invasion
- relatively high debris flow potential; 150% increase in post-fire flows at Orient Dam and 1105% increase in flows at FS Road 6100-215

2. **West Deer Creek**
   - VAR: FS Roads, trails, and major County road through FS land at very high risk; other county roads at very high risk; homes at high risk; soil productivity at very high risk; native plant communities at high risk of noxious weed invasion
   - relatively high debris flow potential; 425-1713% increase in flows
3. **North Fork Boulder Creek**
   - VAR: FS Roads at very high risk; major County road through FS land at high risk; soil productivity at high risk; native plant communities at high risk of noxious weed invasion
   - moderate debris flow potential; 146-1079% increase in flows
4. **Lone Ranch Creek**
   - VAR: FS Roads (including high use ML 3) and soil productivity at very high risk; native plant communities at very high risk of noxious weed invasion
   - highest debris flow potential in fire; 207-1714% increase in flows

The location and size of each treatment polygon were developed by an interdisciplinary team with several criteria in mind:

- high burn severity
- location and proximity to values at risk
- post-fire peak flow increases
- post-fire sediment delivery
- USGS debris flow probability
- soil erosion hazard rating and soil types
- headwater erosion initiation areas
- slope (15-55%; based on Bare Earth LiDAR)
- Land Management Allocation

Six treatment polygons, totaling approximately 2,209 acres were then selected for treatment. Wood mulching treatments are recommended on approximately 2,209 acres. The treatment breakdown by subwatershed is as follows:

1) East Deer Creek – 598 acres
2) West Deer Creek – 493 acres
3) North Fork Boulder Creek – 151 acres
4) Lone Ranch Creek – 967

The selected sites have been identified based on 20-60% slopes in high burn severity high in the watershed in initiation zones with severe or very severe erosion hazard ratings and relatively high (USGS) debris flow probabilities compared to the rest of the burned area. Refer to BAER Treatment Map for exact locations.

Design/Construction Specification(s):

1. Wood shreds production. Wood shreds produced with four inch screens maximize the proportion of wood shreds in the two to eight inch range with less than 20% "fine" materials. Fine materials are defined for this purpose to be any material less than two inches in length. Fines can be decreased by increasing the through-put rate of the grinder. Using 4-5 foot long tree sections aligned

perpendicular to the direction of feed on the conveyor belt so that the logs approach the screens sideways; not endwise.

2. Wood shreds application rate – Wood shreds will be applied aerially to achieve 60% ground cover evenly distributed across the treatment unit at an approximate rate of 30 cubic yards (CY) per acre.

Cultural Treatments

Purpose of Treatment: The protective vegetation (camouflaging) has contributed to protection in the past, but with all surface vegetation and a 3-inch to 8-inch duff layer being removed, features and artifacts are newly exposed for the first time. This could lead to collection and looting of these sensitive sites which would also result in irreversible loss of data.

General Description: Known Sites were given rankings based upon potential for effects and consequences of impacts (See BAER Assessment Steps: Threats and Risk Evaluation). Three sites rated Very High (Sites 06210500010 and 06210200012) or High (Site 06210400026).

Location (Suitable) Sites: Monitoring (patrolling) and site updates will occur on all historic sites to provide baseline for looting and vandlism patrols.

Design/Construction Specification(s): Site 06210400026 has a feature associated (spring box) with it is a water source for a campground site located in proximity to the site. The water source is utilized by hikers and horseback riders. The recreation program will replaced the damaged wooden lid. The lid prevents the water source form being compromised by erosional forces. The treatment recommendations will be more fully discussed in the recreation specialist report.

Noxious Weeds Early Detection Rapid Response

Purpose of Treatment: Prevent establishment of new infestations, prevent spread of existing infestations, and prevent increase in weed density in existing infestations. BAER funding authorization will be used for the first year (starting in October 2015) to meet objectives above. As appropriate, these actions may be carried out under a combination of BAER and other management authorities. Treatment and monitoring activities occurring after the first year following the fire will be carried out under non-BAER authorizations. Existing or future partnerships may be used to monitor for noxious weeds and/or provide treatments on National Forest System Lands, as supported by the forest management plan and forest Invasive species management plan.

General Description: Known infestations, and areas of increased probability of infestation (e.g. Roads, suppression repair of fire control lines, drop points, helispots, staging areas, areas of moderate to high burn severity, and BAER implementation impacts within the Stickpin Fire perimeter will be assessed for potential spread or expansion. When assessment actions are initiated, personnel will be equipped to immediately treat infestations of noxious weeds. This allows for the immediate treatment and better chance of managing known infestations to prevent an expansion from pre-fire levels.

Location (Suitable) Sites: Treat known and expected weed infestations on 431 acres within and directly adjacent to high severity burned areas on National Forest System Lands. All mechanical and hand constructed control line, drop points, heli-spots and heli-bases.

Design/Construction Specifications: Select herbicide, application rate, and application timing based on specific weed being treated, and access to the location of the infestation; Consideration for sensitive species habitat and sensitivity when selecting appropriate herbicide.

Noxious Weed Seeding

Purpose of Treatment: Prevent establishment of new infestations, prevent spread of existing infestations, and prevent increase in weed density in existing infestations. BAER funding authorization will be used for the first year (starting in October 2015) to meet objectives above. As appropriate, these actions may be carried out under a combination of BAER and other management authorities. Treatment and monitoring activities occurring after the first year following the fire will be carried out under non-BAER authorizations. Existing or future partnerships may be used to monitor for noxious weeds and/or provide treatments on National Forest System Lands, as supported by the forest management plan and

forest Invasive species management plan.

General Description: Areas with southerly aspect adjacent to roads of high soil burn severity should be monitored for new or expanding infestations of hoary alyssum.

Location (Suitable) Sites: Areas of high soil burn severity near and adjacent to roads and known weed infestations on National Forest System Lands. Suppression related disturbance such as: mechanical and hand constructed control line, staging areas, drop points, helispots, and constructed safety zones.

Design/Construction Specifications: Infestations should be treated with the appropriate herbicide and then the area around the infestation should be sown with a native seed mix developed in consultation with the forest botanist:

Roads and Trails Treatments:

Road Drainage Stabilization

Purpose of Treatment: The watersheds burned in the Stickpin Fire will show the effects of the fire via increased runoff rates, erosion, sediment, and debris transport creating a future concern for roads and culverts. The effects will most likely result in plugged culverts and overtopped or washed away road surfaces and fills. There is also increased danger to structures that remain in the flood plains due to the increased risk for debris slides and flooding. The treatments identify roads and culverts that are predicted to be impacted by post-fire debris flows and flooding, and where necessary, recommends treatments to minimize the risks to public safety and protect the investment of the transportation system from the expected increased post-fire runoff.

General Description: Several road stabilization treatments have been prescribed for Forest Service Roads located on the Colville NF within the Stickpin Fire that will be directly impacted by post fire events. These treatments are necessary to mitigate the predicted effects that will occur to the transportation infrastructure system.

Location (Suitable) Sites: The total mileage of systems roads within the fire perimeter is 135 miles. These roads may run through all or some of the low, moderate, and high severity burn areas. Those sections of roads that run through the moderate and high severities total 67 miles and were found to have, or will have, road drainage issues and at a minimum will require some level of treatments. Mileage of roads in the burn area, by maintenance level: 79.5 mi. - Level 2 roads; 18.4 - Level 3 roads (refer to spec sheet for specific roads).

Design/Construction Specifications:

Level 3 to 5 Roads

1) Ditch Cleaning – All drain ditches along the length of the roads shall have all existing silt and debris removed and either hauled away or spread out such that the material cannot reenter the drainage structure during a runoff event.
2) Culvert Cleaning – Remove any blockages from inlet, outlet and inside barrel. Straighten bent or replace inlets. Catchment-basins shall have all existing silt and debris removed and either hauled away or spread out such that the material cannot reenter the drainage structure during a runoff event. Install carsonite posts when necessary.
3) Debris (Trash) Racks - Assemble wood or steel culvert inlet debris racks where indicated or found to be necessary on or above culvert locations. Debris racks design shall be such that it will capture the expected woody debris material that will come with the expected flows in each of the drainages.

Level 2 Roads

Spot drainage treatments specified below would occur on all non-high traffic Level 2 roads to ensure drainage structures do not plug and the road infrastructure is not impacted. Upon this treatment the road would be gated where hazard trees are too extensive to treat and risk to the public are very high. If any Level 2 roads are deemed needed for salvage then non-emergency funds should be used to reduce hazard tree risks and more extensive drainage treatments should be implemented. If any remaining Level 2 roads

are deemed high traffic roads then more extensive drainage treatments should be implemented and an interim 2500-8 for these costs submitted.

1) Ditch Cleaning – All drain ditches along the length of the roads shall have all existing silt and debris removed and either hauled away or spread out such that the material cannot reenter the drainage structure during a runoff event.
2) Culvert Cleaning – Remove any blockages from inlet, outlet and inside barrel. Straighten bent or replace inlets. Catchment-basins shall have all existing silt and debris removed and either hauled away or spread out such that the material cannot reenter the drainage structure during a runoff event. Install carsonite posts when necessary.
3) Culvert Replacement – where culverts will be severely impacted by post-fire runoff, remove and replace with culvert sized for post-fire flows. Where appropriate design as an AOP.
4) Gates – Install gates to close roads when necessary for public safety and to develop and implement closure orders when necessary.

Drainage Protection, Debris Rack

Purpose of Treatment: Debris racks are structures used to protect culverts from failure due to floatable debris that would plug culverts. Debris racks protect downstream habitat by trapping fine and coarse detritus from sheet, rill, gully, channel, and bank erosion behind the structure. Debris structures protect the transportation infrastructure, public safety, and downstream resource values. The purpose of the debris rack is to protect the infrastructure of the Boulder Creek Road. This road is heavily used by forest personnel who use it to access roads that enter the forest. This road has a common value between the Forest Service and Ferry County and thus both share in wanting to provide the necessary treatments in order to keeping the road from being damaged by expected high run-offs.

General Description: Boulder Road, where it crosses National Forest, traverses several drainages that are within the Stickpin Fire. Some of these drainages contain perennial streams which flow from areas where the severity of the burn is mostly high. One of these streams, Third Creek, flows through a 45 inch CMP underneath the Boulder Road. Upstream of this culvert there is an extreme amount of dead wood lying across the channel basin that has a high probability of being transported downstream to the culvert and potentially plugging the inlet. The failure of this culvert on the County Road could severely impact USFS land.

Location (Suitable) Sites: The specific location for the debris rack is upstream of the 45 inch CMP crossing under Boulder Road on USFS land at Third Creek (adjacent NFSR 501). The debris rack should be placed upstream far enough to prevent debris from being able to wrap around the structure and enter the area between the rack and the culvert inlet and also where there is enough storage area behind the structure after a single large storm event. If a large debris storage area exists at the rack location, maintenance frequency is reduced and added safety is provided against overtopping the installation during a single storm. The general dimensions of a trash rack vary from site to site. The straining area of a rack should be at least 10 times the cross-sectional area of the culvert being protected. Vertical bars are spaced from one-half to two-thirds the minimum culvert dimension to allow lighter debris to pass through the rack and the culvert. The overall rack dimensions should be a function of the amount of debris expected per storm, the frequency of storms, and the schedule of expected cleanouts.

Design/Construction Specifications: The debris rack needs to be designed to stop small to medium floating debris. The storage area must be large enough to retain the anticipated type and quantity of debris expected in one storm or between cleanouts. The length of the structure should be of such length that would prevent debris from coming around the structure and getting between the inlet of the culvert and the rack. Rack height should allow some freeboard above the expected depth of flow in the upstream channel for the design flood. Vertical racks that receive the full impact of floating debris and boulders should have their brace members set in concrete. Debris racks are typically constructed in sections using heavy rail, steel, wood, or chainlink fence material. Rail and steel construction are stronger and more resilient to

stormflows than either wood or chainlink racks. Refer to Figure 81 on page 131 of the Burned Area Emergency Response Treatments Catalog for an example of a debris rack design.

Trail Drainage

Purpose of Treatment: Ensure maximum effectiveness at preventing erosion of trail surface and consequent sediment loading in streams.

General Description: Install 300 drainage structures to prevent erosion, mass wasting and debris flows that are predicted to occur following the burn. These measures would also address the risk to human safety, risk of loss of trail infrastructure. Fell hazard trees along trail where crews will be working to provide a safe work area. Clean existing trail drainage structures on 30 miles of trail in the burn area to ensure increased runoff will not destroy trail tread or contribute sediment to streams. Address slough and berm on trail to allow for adequate sheet flow. Fell hazard trees along trail where crews will be working to provide a safe work area. Monitor drainage performance following precipitation events, by performing tread work as described above. Cost for follow-up monitoring and maintenance is less because of the decrease in amount of work to fell hazard trees, and the predicted amount of material clean-up should be significantly less than initial stabilization.

Location (Suitable) Sites: Trail within the burn perimeter that is likely to contribute significant volumes of sediment to stream system if drainage facilities are not adequate for increased runoff. 52 miles of trail are within the fire perimeter. Of those 52 miles, over 25 miles are within areas of high burn severity and over 16 miles are within areas of moderate burn severity. Amount of trail proposed to be treated is all miles within high severity burn areas and 25% of trail miles within moderate severity areas, focusing on segments with steeper grade where erosion is more likely.

Design/Construction Specifications:

1. Construct Check Dams according to EM-7720-104 (drawing 915-2).
2. Construct Grade Dip according to EM-7720-104 (drawing 912-4).
3. Construct Waterbars according to EM-7720-104 (drawing 922-1 and 922-2).
4. Clean waterbars as per FSH 2309.18

Protect Boulder Deer Summit South Toilet

Purpose of Treatment: Remove existing human waste from vault, and divert water and debris from entering. This will greatly decrease possibility of vault overflowing and exposing humans and environment to hazardous human waste.

General Description: Pump CXT toilet and close it to public use until risk of water infiltration is removed. Construct ditch around toilet to prevent water and debris from entering vault toilet.

Location (Suitable) Sites: Boulder Deer Summit South Trailhead CXT Toilet.

Design/Construction Specifications: Completely pump vault to remove all materials.

Protection/Safety Treatments:

Recreation Hazard Signs

Purpose of Treatment: Ensure maximum visibility and readability of signs to warn public of hazards on trails and recreation sites in the burned area, or to inform public of closed areas.

General Description: Install signs at campgrounds, trailheads, and trails that enter or are within the burned area or provide access to trails within the burn. The signs will warn of increased hazards from falling burned trees, debris flows and flooding, or to notify visitors of trail and site closures.

Location (Suitable) Sites:

Any campground or trailhead within the burned area, or with a trail that leads to the burned area.

Design/Construction Specifications:

Sign and poster guidelines for the Forest Service EM7100-15

REDACT Spring Box Protection

Purpose of Treatment: Protect spring source from surface water and materials infiltration.

General Description: Replace lid on concrete spring box that serves users at both REDACT Camp and surrounding trails.

Location (Suitable) Sites: On top of existing concrete spring box on south side of REDACT Highway at the summit.

Design/Construction Specification(s): Construct and install to Heritage Program Manager's direction, as this site is potentially eligible to be listed on the National Register of Historic Sites.

Close Deer Creek Forest Camp and Cross Country Ski Trails in Boulder Deer Summit

Purpose of Treatment: Temporarily close campground and roads to the public and employees for their protection from falling hazard trees.

General Description: Install gates at suitable location near Boulder Deer Creek Highway (County Road 602) on Forest Roads to be closed. Gates are intended to keep vehicle traffic out of the area, and serve as a non-removable visual barrier to deter foot traffic. Gate location should be selected to prevent access around the sides of gates. Install barrier rock if needed to accomplish this.

Location (Suitable) Sites: Boulder Deer Summit North Sno-Park (FR 6100450), Boulder Deer Summit South Sno-Park (FR 6100455), and Third Creek Road (FR 6100500).

Design/Construction Specification(s): Install to USFS Standards.

Hazard Warning and Closure Signs for Roads

Purpose of Treatment: The purpose of "Burned Area Warning Signs" is to reduce the risks to human life and safety by warning motorists of existing threats while traveling the authorized routes within the areas susceptible to flooding, debris flows, hazards trees, and all other risks attributable to post fire events on the landscape. The purpose of roadway warning signs is to replace the existing signs that were burned during the fire. These signs are necessary to warn travelers of hazardous road conditions and features such as curve signs and falling rocks. Road closure signs are needed to alert the travelers of closed roads which will be necessary to protect all users from driving into areas that have been determined to be more susceptible to hazards caused by the fire.

General Description: This treatment is for installation of "Burned Area" warning signs, roadway warning signs, and road closure signs.

Location (Suitable) Sites: Locations for "Burned Area" warning signs will be located at points of entries by use of forest system roads into the burned areas. These locations are as follows:

- Beginning of the fire perimeter along 6120 (Lone Ranch)– 1 each
- Beginning of the fire perimeter along Boulder-Deer Creek Road east and west – 2 each
- Beginning of the fire perimeter along Road 2040 (Long Alec) – 1 each
- Beginning of the fire perimeter along Road 2160 (Aeneas Creek) – 1 each
- Beginning of the fire perimeter along Road 2030 (Albian Hill) – 1 each
- Beginning of the fire perimeter along Road 9576-304 – 1 each
- Beginning of the fire perimeter along Road 9576-240 – 1 each
- Beginning of the fire perimeter along Road 6110 – 1 each
- Beginning of the fire perimeter along Road 6113 north and south – 2 each

Design/Construction Specification(s): "Burned Area" warning signs along the roads shall measure, at a minimum, 30 inch by 36 inch and consist of 0.08" aluminum, sheeted in high intensity yellow with black letters (see specification sheet). The "BURNED AREA" lettering shall be a minimum of 5 inches in height and all remaining lettering shall not be less than 3.5 inches in height. Traffic Warning, Road Closure, and Barricade Markers Signs shall conform to the Federal Highways Manual of Uniform Traffic Control Devices (MUTCD) standards and shall be installed per Federal Highway Safety Standards.

Gate Closure

Purpose of Treatment: The primary reason of installing the gates is for public safety especially during periods of expected moderate to high rainfall events. In the event severe stormy weather passes over the Stickpin Fire area, storm water and debris flows will be higher than pre-fire levels. A gate would be necessary in preventing the public from accessing the area of the forest by vehicle during these severe weather events. Where travel has been determined to be unsafe, install closures (special order) on roads until other treatment is performed or until natural rehabilitation has taken place. Based on our field review September 25 - 29, 2015, closure for safety is recommended on the following roads until other treatment takes place:

General Description: This treatment is for the installation of steel post gates to close roads when necessary for public safety and to develop and implement closure orders when necessary.

Location (Suitable) Sites:

Road	Location
NFSR 2030900	At upper portion of segment 900 = 1 gate
NFSR 2160000	At 2160 above 2160620 spur = 1 gate
NFSR 6110430	At upper portion of 430, moderate to severe burn area = 1 gate
NFSR 6120450	From intersection with 6120 = 1 gate
NFSR 6120470	From intersection with 6120 = 1 gate
NFSR 6120500	From intersection with 6120 = 1 gate
NFSR 6120070	From intersection with 6120 = 1 gate
NFSR 6100500	Recreation recommendation = 1 gate (cost on Recreation report)
NFSR 6100450	Recreation recommendation = 1 gate (cost on Recreation report)
NFSR6100455	Recreation recommendation = 1 gate (cost on Recreation report)
NFSR 6100400	At county road 602, Boulder Creek Road = 1 gate
NFSR 6100420	At county road 602, Boulder Creek Road = 1 gate
NFSR 6100490	At county road 602, Boulder Creek Road = 1 gate
NFSR 6100600	At county road 602, Boulder Creek Road = 1 gate
NFSR 9576300	Before NFSR 6100450 = 1 gate

Design/Construction Specification(s):

1. The gate shall be constructed according to the *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects FP-03* (Similar to the photo below). All signing associated with the gate installation shall follow Forest Service Engineering Manual 7100-15 and the Federal Highways MUTCD. This includes typical gate barricade markers and object markers and any signs that may be installed with the gate such as a road closed sign.
2. The gate shall be able to be secured in the open position so as not to be a hazard to traffic. Cables, chains, or single-wire barriers shall never be used across any roadway because they are not readily visible to road users. Travel management signs may be used on gates to display access and travel management restrictions and closures. Refer to the Sign Installation Guide for additional information about the required gate signs.
3. Ensure the area around the gate is large enough for a vehicle with trailer to turn around.
4. Road closure information will be posted on the gates and through public notices.

Hazard Tree Falling for Roads

Purpose of Treatment: The threat of hazard trees falling over those roads that are remaining opened to the public will be mitigated through the falling of trees identified to be hazardous.

General Description: Forest service roads within the Stickpin Fire that pass through areas where the severity of the burn is moderate and high are at risk of having burnt and dying trees fall over the roadway. These hazard trees pose a risk to motorists especially during high wind events.
Location (Suitable) Sites: The initial area to first concentrate the removal of hazard trees is on those high use roads (Maintenance Level 3 and above) that will remain open and traverse through the sections of high and moderate burn severities. While accessing the roads within the higher burn severities, also identify those hazard trees that lie along the roads in the lower burn severities. Expand treatment to high use ML2 roads in high severity areas if the roads shall remain open. Maintenance Level 1 roads are closed roads and will not be treated, Maintenance Level 2 Roads may be closed due to safety concerns (at the Rangers discretion), it is generally accepted that Maintenance 3 roads provide important access and need to remain open and should be treated for safety reasons.
Design/Construction Specification(s):

1. FS personnel will prepare and administer the contract.
2. Estimated length of ML 3 roads in high to moderate severity burn areas total 9 miles. An additional 5 miles of treatment is proposed in the Boulder Road corridor through severe burn areas. There are several ML2 roads that require only spot treatment to protect work for drainage, estimated at a total of 3 miles. Total mileage proposed is 17 miles.
3. Assume the removal of hazard trees within approximately 75 feet of the road centerline to calculate total acreage of area to cut and drop hazard trees = 310 acres.
4. Assuming only trees on slopes above the road need to treated, estimate 50% of the acres will need to be treated = 155 acres.

Road Storm Patrols

Purpose of Treatment: Regular road monitoring will be implemented to evaluate the condition of roads for motorized access and to identify and implement additional work needed to maintain and/or repair damage to road surfaces and flow conveyance structures across roads in order to provide safe access across FS lands. The patrols are used to identify those road problems such as filled ditches, plugged culverts and washed out roads and to clear, clean, and/or block those roads that are or have received damage. The storm patrollers shall have access to at least a backhoe and dump truck that can be used when a drainage culvert is plugged or soon to be plugged and to repair any road receiving severe surface erosion. District personnel will survey the roads within the fire perimeter after high-intensity summer thunderstorms in 2016. Survey will inspect road surface condition, ditch erosion, rolling drain dip failure and culverts/inlet basins for capacity to accommodate runoff flows.
General Description: Roads within the Stickpin Fire contain drainage structures that cross streams and side channels located in watersheds that have areas of a large percentage of high burn severity. These watersheds now have the potential for increased runoff and debris flows. The predicted increased flows are a direct result from the lack of vegetation to slow down the water flow and/or from hydrophobic soil conditions that can prevent surface water infiltration. These flow increases pose a threat to the existing crossings which may result in plugging culverts or exceeding their maximum flow capacity. If these flows plug drainage structures, the result could be massive erosion and debris torrents further down the drainage due to the failure of the fill slope. Also, there is an immediate and future threat to travelers along these roads within the burned area due to the increased potential for rolling and falling rock from burned slopes and increased potential for flash floods and mudflows. With the loss of vegetation, normal storm frequencies and magnitudes can more easily initiate rill and gully erosion on the slopes and it is likely that this runoff will cover the roads or cause washouts. These events make for hazardous access along steep slopes and put the safety of users at risk.
Location (Suitable) Sites: The patrols should first focus on the Forest Service roads that receive the most traffic and are of more value to the transportation system. Due to the vast distance between each of the roads to be patrolled the team could also check where the highest rain intensities occurred when a storm passes through the fire area and concentrate their efforts on the areas receiving the most precipitation.

Design/Construction Specifications:

1. FS personnel will direct the work.
2. Immediately upon receiving heavy rain and spring snowmelt the FS will send out patrols to identify road hazard conditions – obstructions such as rocks, sediment, washouts – and plugged culverts so the problems can be corrected before they worsen or jeopardize motor vehicle users.
3. The road patrols shall bring in heavy equipment necessary to mechanically remove any obstructions from the roads and culvert inlets and catch basins where necessary.
4. All excess material and debris removed from the drainage system shall be placed outside of bank-full channel where it cannot re-enter stream channels.

Monitoring Narrative:

**** No monitoring funding is not being requested. All of the monitoring below is already included in the previous treatments. Monitoring is only displayed here to better portray what is taking place.***

Cultural Patrols

Patrolling and monitoring of archaeological and historic resources will be required to lessen the chance of vandalism and looting to resources. Monitoring by an archaeologist for the first year is recommended to keep baseline data on the condition of resources.

Road Treatments

Storm Patrols – Monitor the storm-patrol response time to ensure objectives are being met. Identify the type of storm event that mobilizes material.

Road Drainage – Monitor road drainage (i.e. culverts, drain dips, etc.) and roadbed conditions after significant storm events to ensure the maximum drainage capacity is maintained until the natural re-vegetation of the burned area has occurred. Maintain and/or repair any damage to road surfaces. Remove sediment and debris from ditches and entrances to culverts.