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

Date of Report: Aug 22, 2013

**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: **West Mullen**
B. Fire Number: MT-SWS-000056
C. State: Montana
D. County: Mineral
E. Region: Northern (01)
F. Forest: Lolo (16)
G. District: Superior (07)
H. Fire Incident Job Code: P1HQU8(0116)
I. Date Fire Started: 07/14/2013
J. Date Fire Contained: 08/05/2013

K. Suppression Cost: $10,500,000

L. Fire Suppression Damages Repaired with Suppression Funds

**Completed as of 8/16**

1. Fireline rehabilitated (miles): Handline – 1.2; Machine – 3.3
2. Fireline seeded (miles): 10

3. Other (identify): rehab 2 drop points and parking areas

**Planned for 2013 Rehabilitation:**

1. Fireline rehabilitated (miles): Handline – 2.3; Machine – 6.0
2. Fireline seeded (miles): 10

3. Other (identify): rehab 5 drop points and parking areas

M. Watershed Numbers: 170102040701; 170102040703

N. Total Acres Burned: **6,282** total acres
NFS Acres ( 2,801); Plum Creek (1,534); State of Montana (1,233); Private (714)

O. VegetationTypes:

| | Acres |
|---|---|
| HERB | 1,357 |
| SHRUB | 266 |
| MX-PIPO | 852.9 |
| MX-PSME | 3,583 |
| MX-LAOC | 60.5 |
| MX-PICO | 34.9 |
| MX-ABLA | 66.3 |
| RIPARIAN | 59.4 |
| **Grand Total** | **6,282** |

P, Q. Dominant Soils and Geologic Type:

Landforms in the south, west, and east boundaries of the of the fire area include terraces (Map Unit (MU) 13) along the valley bottoms rising into stream breaklands (MU 60) and steep mountain slopes (MU64). The ridges of these slopes are comprised of broadly convex ridges (MU32). The north half of the fire area is comprised of steep mountain slopes and stream breaklands descending from the broadly convex ridges. These slopes run out into dissected footslopes (MU 24), moderate relief mountain slopes (MU 30), and terraces in the valleys on the northern border of the fire area.

Landform 13 (terraces) is specified as “UA” which includes a parent material derived from undifferentiated metasedimentary rocks or weakly weather granitic rocks (U), and a vegetation type is open-grown forest consisting of dry, south-facing ponderosa pine and Douglas fir (A). Soils in MU 13UA have formed on terraces and terrace risers in thick, very cobbly alluvial deposits. In this area they have been influence by Glacial Lake Missoula and have a silty surface alayer about 10 inches thick. The soils have low bearing strength and will powder when dry, however erosion hazard is low.

Landform 24 (dissected footslopes) in the fire area is classified as “JB” which consists of a parent material derived from Glacial Lake Missoula silt and clay deposits or Tertiary valley fill deposits (J). Vegetation type is dry, Douglas fir forest (B) characterized by moderately stocked stands of Douglas fir and ponderosa pine with, patchy, dense you stands of Douglas fir. The understory consists primarily of shrubs and grasses. Soils have high silt content and are associated with alluvial fans at the base of mountain slopes. These soils are very erodible, hazard is high.

Landform 30 (moderate relief mountain slopes) is classified as “MA, MC, QA, and QC”. Parent material in geology group “M” includes moderately weathered metasedimentary rocks derived from Belt Supergroup Formations consisting primarily of argillite, calcareous argillite and siltite. Vegetation in these areas is comprised of open-grown forest (A) or dry, mixed coniferous forest (C) supporting Douglas fir, larch, ninebark, and beargrass habitat types. Soils are silt loams with moderately low erodibility and a high water holding capacity, hazard is low. Parent material in geology group “Q” is similar that found in group “M”, with the major difference being that the metasedimentary rocks are weakly weathered and produces soils that are sandy loams with many hard rock fragments. Vegetatation types include open-grown forest (A) and mixed coniferous forest (C). These soils are resistant to erosion, hazard is low.

Landform 60 (stream breaklands) are straight to concave slopes with greater than 65% slope. In the fire area these slopes are classified as “MA, MB, and QA”. Parent material in geology group “M” includes moderately weathered metasedimentary rocks derived from Belt Supergroup Formations consisting primarily of argillite, calcareous argillite and siltite. Vegetation in these areas is comprised of open-grown forest (A) and dry Douglas fir forest (B). Parent material in geology group “Q” is similar that found in group “M”, with the major difference being that the metasedimentary rocks are weakly weathered and produces soils that are sandy loams with many hard rock fragments. Vegetation is open-grown forest (A). Erosion hazard is low.

Landform 64 (steep mountain slopes) are complex slopes with greater than 55% slope. In the fire area, these slopes are classified as “MA, MC, and QA”. Erosion hazard is low.

R. Miles of Stream Channels by Order or Class:
Stream miles by order within the Fire Perimeter

| Stream Order | Length (Miles) |
|---|---|
| 1 | **6.19** |
| 2 | **2.46** |
| 3 | **5.49** |
| 4 | **2.27** |
| Grand Total | **16.4** |

S. Transportation System

Trails: 0 miles Roads: Lolo National Forest: 6.3 miles; Plum Creek: 19.4 miles; Private: 3.4 miles,
State of Montana: 5.5 miles, **Total Miles: 34.6 miles**

## PART III - WATERSHED CONDITION

A. Burn Severity (acres): 430 (7%) (unburned); 3506 (56%) (low); 1903 (30%) (moderate); 441 (7%) (high)

B. Water-Repellent Soil (acres): <10 ; present at isolated burning of stumps/down trees

C. Soil Erosion Hazard Rating (acres): 4888 (low); 1392 (moderate); 0 (high) (estimate)

D. Erosion Potential: 0.22-0.80 tons/acre (estimate)

## PART IV - HYDROLOGIC DESIGN FACTORS

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

B. Design Chance of Success, (percent): 80

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

D. Design Storm Duration, (hours): 10-yr, 6 hr

E. Design Storm Magnitude, (inches): 1.4 inches

F. Design Flow, (cubic feet / second/ square mile): 35 cfs/$mi^2$ entire fire area
Smaller watersheds areas such as the 1.8 $mi^2$ portion of the Sleeping Child watershed on the Bitterroot NF which burned at moderate to severe intensity yielded 111 cfs/$mi^2$ following 0.66” in 30 min. convectional storm. Over 400 cfs/$mi^2$ was measured following 0.41” of rainfall in 30 minutes on the 2.3 $mi^2$ Crittenden Gulch watershed, Helena NF (USGS WRI Report 03-4319).

G. Estimated Reduction in Infiltration, (percent): 0-5

H. Adjusted Design Flow, (cfs per square mile): 38 cfs/mi$^2$

## PART V - SUMMARY OF ANALYSIS

### A. Critical Values/Resources and Threats

The 6,282 acre West Mullan fire area is predominately a desirable mosaic pattern of mixed burn intensities. From an overall watershed health perspective, hazards are low in a majority of the fire area. Moderate risks exist relative to erosion, sedimentation, and flow rates. Although these resource hazards range from low to moderate, if a low-probability event should occur, consequences to life and property are high due to terrain features and location of private infrastructure.


Photo 1. Looking Northeast into Pardee Drainage

Primary critical values at risk include private structures and infrastructure within the municipality of Superior, Montana. The potential of individual watersheds to affect infrastructure is detailed in the "hydrologic response" section below. Secondary critical values at risk include natural resources values relating to weeds, road stability, stream function, fisheries and water quality. From a weeds perspective, the fire creates very high risk issues. Wildlife, recreation, and heritage values were also considered, but assessment findings indicate no critical values at risk. Detailed reports follow below for each resource with critical values at risk, including hydology, weeds, fisheries, and road infrastructure.


Photo 2. Looking east across Charette Gulch and the "face drainages" on Plum Creek Ownership.

Of the 6,282 acres burned in the West Mullan fire, 45% occurred on lands with Forest Service ownership. Plum Creek lands accounts for 24% of the burned area, and contains a majority of the high severity. The remaining ownership includes 20% State of Montana and 11% private lands. This mixed ownership presents some interagency issues, and requires coordination with these partners during planning and implementation of any proposed actions. At the time of assessment, representatives from Plum Creek Timber Company, the State of Montana, Mineral

County, and the National Weather Service have been contacted, as well as all private landowners.

**Watershed Description and Hydrologic Response**

The West Mullan Fire burned in two 6th HUC watersheds, the Thompson-Flat (170102040701) and the Slowey-Marble (170102040703). Because the 6th HUC watersheds are very large and "butterfly", or consist of several smaller distinct watersheds across the Clark Fork River, several sub-watersheds were drawn for analysis. The watersheds and the acreage burned within them are given in Table 1 below.

**Table 1. Analyzed watersheds and acreage burned.**

| Watershed | Total Watershed Acres | Acres Burned | Percentage Burned |
|---|---|---|---|
| Charette Gulch | 460 | 460 | 100 |
| Flat Creek | 10,243 | 1,450 | 14 |
| Jim Gulch | 105 | 104 | 100 |
| Kelly Gulch | 400 | 400 | 100 |
| Keystone Creek | 6,677 | 895 | 13 |
| Pardee Creek | 5,727 | 1,767 | 31 |
| Shaw Gulch | 325 | 325 | 100 |
| Water Gulch | 225 | 223 | 99 |
| Wood Gulch | 943 | 279 | 30 |

The burned area is predominately medisedimentary based soils which are moderately deep and have moderate infiltration rates with some alluvial and lacustrine deposits in lower elevations. Most of the burned area is in steep terrain, with maximum slopes of 55-100%. The main streams analyzed are 2nd (Wood Gulch), 3rd (Pardee Creek and Keystone Creek) and 4th (Flat Creek) order streams. There are also several 1st and 2nd order ephemeral "face drainages" that were analyzed.

The fire burned through several forest types along elevation gradients from dry ponderosa pine at the lower elevations to moist mixed conifer forest at the highest elevations. There was a mosaic of burned and unburned area across the fire with the most severe burning occurring at the highest elevations and on the northeastern perimeter of the fire where burnout operations occurred during suppression. Burn severity by watershed is given in Table 2. Appendix A also contains a map of the watersheds with fire burn severity. Small areas of isolated soil hydrophobicity were found in the burned areas (<1% of total area).

**Table 2. Acres and percentage of watershed by burn severity.**

| | Total Acres | | | Percentage of Watershed | | |
|---|---|---|---|---|---|---|
| Watershed | High Severity | Moderate Severity | Low Severity | High Severity | Moderate Severity | Low Severity |
| Charette Gulch | 97 | 208 | 154 | 21 | 45 | 34 |
| Flat Creek | 82 | 465 | 867 | 1 | 5 | 8 |
| Jim Gulch | 3 | 35 | 61 | 3 | 34 | 58 |
| Kelly Gulch | 21 | 116 | 256 | 5 | 29 | 64 |
| Keystone Creek | 24 | 201 | 559 | 0 | 3 | 8 |
| Pardee Creek | 104 | 650 | 908 | 2 | 11 | 16 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Shaw Gulch | 104 | 99 | 113 | 32 | 30 | 35 |
| Water Gulch | 5 | 104 | 107 | 2 | 46 | 48 |
| Wood Gulch | 9 | 91 | 170 | 1 | 10 | 18 |

*Values-at-Risk Assessment*

High peak flows and debris torrents are common causes of resource damage following wildfires. This threatens infrastructure such as roads, culverts, bridges, buildings, and other developments. For the West Mullan fire, there are multiple values at risk at the mouth of Flat Creek. This stream enters an undersized 48" culvert (Photo 3) in the town of Superior and is piped into the Clark Fork River under the town. Therefore, a large flood event would endanger several buildings within this municipality. The trash rack placed for public safety increases the risk of the culvert inlet being plugged by organic debris and sediment.

In addition, the portion of Flat Creek in the fire perimeter is a superfund site with tailing piles contaminated with arsenic and lead in the stream channel (Photo 4). As can be seen in Photo 4, these tailing piles are currently raw cut banks in the stream channel that are undermined and contaminate the stream at bankfull flow. Other than the chronic contamination from bank erosion, these piles are in a relatively stable status. These tailing piles are currently scheduled for removal and have gone through extensive survey and analysis. However, in the case of a large flood, the piles could be re-arranged, making them more difficult to remove, requiring re-analysis and surveying, and depositing contaminated tailings in downstream locations, including the municipality of Superior and the Clark Fork River.


Photo 3. Undersized culvert inlet for Flat Creek in the municipality of Superior, MT.

*Post-Fire Peak Flows*

To determine post-fire storm flow runoff, the runoff curve number (RCN) method was used to develop stream hydrographs (SCS, 1973). This RCN was then entered into the Forest Service peak flow calculator (Elliot et. al, 2010). This method is used to estimate peak rates of discharge and runoff volumes for a range of rainfall amounts, soil types, land use, cover condition, and average watershed types at ungaged sites. The unit hydrograph method is useful to estimate storm flow for areas with cover condition changes due to wildfire or land clearing, for example.

Burn severity estimates (acreage low, moderate, and high) were determined by field assessment and satellite imagery. The burn severity by area is used to adjust RCN to reflect post-fire conditions. Initial burn severity estimates were derived from a BARC satellite map, which shows before and after-fire vegetation reflectance. This map was then refined by the BAER team soil scientist for a final burn severity map. Watersheds were then delineated above values at risk and burn severity percentage by watershed was calculated (Table 2). From this, major watersheds and those with high burn severity were modeled for changes in peak flow.

Runoff curve numbers were calculated using an MS-Excel spreadsheet (Cerrelli, 2002). Runoff curve numbers for the watersheds was based upon soil type, vegetation type, and standardized information (SCS, 1973) as well as similar wildfires in the area and field assessment of the burned area. Runoff curve numbers are giving in Table 3 below.

Photo 4. Tailing piles containing lead and arsenic in Flat Creek

**Table 3. Runoff curve numbers used for post and pre-fire discharge estimates.**

| Land Cover Description | Hydrologic Soil Group | Runoff Curve Number |
|---|---|---|
| Unburned and Low Severity Burn | B | 65 |
| Moderate Severity Burn | B | 70 |
| High Severity Burn | B | 78 |

The Forest Service Peak Flow calculator uses 20-year, 10-year, 5-year, and 2-year return interval storm runoff and storm precipitation events derived from PRISM data and Rock:Clime (Elliot et. al, 1999). This rainfall data is entered into the model with watershed acreage, watershed flow length, and watershed gradient (all estimated from GIS). The RCN from above is also entered to obtain the final results. Results for watersheds are given in Table 4 below.

**Table 4. Peak flow results for pre- and post- fire in cubic feet per second (cfs).**

| | Pre-Fire Peak Flows (cfs) | | | | Post-Fire Peak Flows (cfs) | | | |
|---|---|---|---|---|---|---|---|---|
| **Watershed** | **20-yr** | **10-yr** | **5-yr** | **2-yr** | **20-yr** | **10-yr** | **5-yr** | **2-yr** |
| **Flat Creek** | 1311 | 570 | 469 | 373 | 1311 | 603 | 482 | 407 |
| **Pardee Creek** | 786 | 319 | 262 | 236 | 812 | 356 | 291 | 245 |
| **Keystone Creek** | 1007 | 372 | 314 | 296 | 1007 | 372 | 314 | 306 |
| **Shaw Gulch** | 106 | 67 | 14 | 5 | 187 | 172 | 67 | 38 |

*Results*

Runoff response to precipitation will remain elevated through 2013 due to reduced ground and canopy cover. Runoff response will likely remain elevated throughout the next three to five years, or longer depending on regrowth of groundcover vegetation (Neary et al., 2008).
As can be seen in Table 4 above, large increases in peak flows are not anticipated in any of the major watersheds. Flat Creek and Keystone Creek are not projected to have any increases in 20 year peak flows and Keystone Creek is only anticipated to have increases in 2 year peak flows.
Acreage and percentage of high, low, and moderate severity burns by watershed is given in Table 2 above. Wood Gulch was analyzed as a separate watershed because it is the tributary of Flat Creek that is directly above the tailing piles. Wood Gulch has a low percentage of high severity burn and was therefore not modeled for runoff.
Similarly, severity acreage was calculated for all of the "face drainages" on the south face above the town of Superior. Shaw Gulch, having the highest percentage of high severity burn (32%) was modeled for runoff. This face drainage as well as Charette Gulch are the drainages that are of the most concern and likely to have the largest post-fire runoff responses.

***Hydrology Emergency Determination and Recommendations***
Severely burned areas in Flat Creek are primarily on lands with State of Montana ownership. Although large increases in runoff from the Flat Creek Watershed are not anticipated due to the lack of water repellent soils and the minor amount of high severity burn within the watershed, some increased flow volumes are anticipated and roads and any culverts found to be undersized in this drainage should be enlarged or otherwise storm proofed. Exposed legacy mine waste material lying along Flat Creek is also at increased risk of being eroded and should be moved out of the floodplain as soon as possible.

Severely burned areas in Charette Gulch and Shaw Gulch are in lands with Plum Creek Ownership. These face drainage watersheds are at higher risk of increased flows and debris torrents. These small watersheds have values at risk in the form of life and property, as there are private residences at the base of these drainages. Undersized culverts in the fire area are at increased risk for failure. Increased runoff response to precipitation will likely remain elevated in all drainages in the fire area for at least 2 years. Cullverts will be at risk for failure. The National Weather Service has been made aware of this anticipated increased risk and will lower the level of Doppler Radar rainfall estimates needed to issue flood warnings in this area. Coordination with the County, NRCS, and individual private land holders will be required to accomplish any protective measures on private lands such as seeding or flow diversion structures. Contact has been made with representatives from both the County and the National Weather Service with regard to the elevated risks of flooding and debris torrents.

## Road Infrastructure

### General Description of Road System

The majority of the roads in the burned area are state, county, or private roads. Assuming that all roads within the burned area are rehabilitated appropriately, there is a relatively low risk for failure to the majority of the road system. However, a few locations within the road system have been identified as high risk and road treatments are recommend prior to heavy runoff.
Two undersized stream crossing have been identified in the burned area both of which are road stream crossings along Pardee Creek. The first culvert is located on Pardee Creek Road #97. The existing 30" culvert is constricting the channel and as a result the outlet is perched. The second culvert is located on non-system Road #37220 where it crosses Pardee Creek. The existing culvert is constricting the channel and the outlet is perched. Any increases in post fire runoff, especially coupled with debris or wood transport, create a high probability of increased velocities through the culverts. Increased velocities are likely to lead to additional scour at the outlet, or in the event of plugging would lead to road crossing failure. Futhermore, these culverts do not meet the USFS stream simulation criteria for accommodating bankfull channel widths.


Perched outlet (A) and improper alignment of inlet (B) in undersized culvert located on Pardee Creek Road #97.

In addition to the undersized stream crossings, The Lower Club Gulch Road #37158, Upper Club Gulch Road #7870, and Lower Wood Gulch Road #67044 have been identified as high risk for failure. In the post-fire condition, road cut slopes are prone to heavy rilling, raveling, and localized cut slope failure. Slope stability on over-steepened, substandard roads post-fire and culvert plugging are substantive concerns. The Lower Club Gulch Road #37185 is a non- system road on Forest Service land. The road is extremely steep and narrow with potential to channelize the natural flow of water. In addition there are two culverts at the head end of the drainage that could potentially fail. The Upper Club Gulch Road #7870 is a Forest Service long term system road that provides access to State and Forest Service. The upper end of Club Gulch is considered a high severity burn area with areas of complete canopy removal and high soil burn severity. The Upper Club Gulch road is located within this high burn severity area, and the Lower Club Gulch road is located down- drainage from this high severity area. In addition, Club Gulch is a tributary to Flat Creek which could have a high level of consequence if increased runoff was to occur (detailed above in Hydologic Response). The road drainage features will need to be improved to avoid failure. The Lower Wood Gulch Road #67044 is a state road that is located "up the gut" of Wood Gulch and has a high potential to channelize the natural flow of water. This road is partially located on State of Montana Ownership, but follows along a tributary to Flat Creek and increases the probability of runoff into Flat Creek. (See Map Appendix B)

***Road and Road-Stream Crossing Emergency Determination***

Engineering, hydrology, and fisheries findings all indicate high concern should post-fire precipitation and runoff occur. Although runoff risks are low to moderate, the existing condition of the infrastructure leads to high consequence with any increase in runoff, and especially with considerations of wood and debris transport (See Map Appendix B). Prudent options to avoid post-fire impact scenarios are to replace the culvert on Pardee Creek Road #97 at the road stream crossing, remove the culvert from non-system Road #37220 at the road stream crossing, perform major storm proofing on the Lower Club Gulch Road #37185, recontour the Lower Wood Gulch Road #67044, and improving road drainage on the Upper Club Gulch Road #7870.

**Fisheries**

**Pre – Fire Conditions:** Within the fire perimeter, Pardee Creek and Flat Creek are the only streams that present fisheries concern. Pardee Creek contains a small isolated population of westslope cutthroat trout. Average to high flows in Pardee Creek connect with the Clark Fork River; however, a perched culvert at the mouth prevents upstream migration resulting in isolated individuals. Flat Creek contains

populations of westslope cutthroat, rainbow and eastern brook trout and flows intermittently in the lower three miles. Connectivity is precluded by a culvert draining under the buildings and paved streets of the town Superior.

Habitat is variable within both streams. Flat Creek is subject to major effects from past mining and has ongoing Superfund Cleanup efforts. In the short-term, habitat and water quality is compromised in the lower reaches, but improves in the upper watershed, above historic mining and road influences. Pardee Creek has variable habitat conditions depending on stream reach with some reaches very compromised of high-quality habitat, while segments are of suitable quality.

Westslope cutthroat trout populations are at high risk of long-term extinction in both drainages because of population isolation and associated long-term potential of chronic decline or episodic mortality from a variety of stress factors.

**Post Fire Concerns:** Post-fire fishery concerns typically relate to episodic fish mortality from debris flow events and loss of channel habitat to chronic stresses from sedimentation from hillslope processes or infrastructure, such as roads and road-stream crossings. Risk of severe debris flow and channel modifications appear to be a very low risk. However, because populations are isolated with variable habitat conditions, and with culvert barriers at the mouths and within the stream system, sedimentation, water quality, and modifications to habitat are of high concern. Road conditions, road-stream crossing structures, and habitat issues are currently stressing long-term viability. Treatments such as roadway stabilization, culvert remediation, and other actions that prevent or reduce sedimentation are necessary.

## Weed Infestation

Inventories prior to the West Mullan Fire indicated weed infestation of spotted knapweed, St. John's wort, common tansy, oxeye daisy, and meadow hawkweed complex on Forest Service system roads and BPA access roads and tower sites within and adjacent to the burn area. Inventories are current as of 2009. Bald Hill, west of Keystone Creek from the West Mullan Fire, contains inventoried infestations of spotted knapweed, St. John's wort, sulfur cinquefoil, and cheatgrass. Infestations of leafy spurge have been observed along the Clark Fork River south of the West Mullan Fire.

Within the burn perimeter, Forest Service Road #7868, #97, and #194 had been treated in prior years to control spotted knapweed, oxeye daisy, meadow hawkweed complex, and other broadleaf weed species.

### Post-burn Condition and Weed Infestation

The West Mullan Fire reduced or eliminated crown canopy, shrub, and forb cover in high and moderate severity (vegetative based on BARC) burned areas on 2,344 acres of National Forest, state, and private lands. These disturbed areas are highly vulnerable to weed invasion or weed spread from existing infestation or adjacent sources. Within the West Mullan Fire, 3,505 acres incurred only low burn severity but are still at risk to invasion or spread due to an increase in bare mineral soil exposure. Suppression efforts resulted in approximately 9 miles of dozer line throughout the burn area, creating additional soil disturbance. The West Mullan Fire contains approximately 35 miles of Forest Service, state, and private roads, many of which have inventoried weed infestations and have not been treated previously. This results in a high risk level for weed introduction and spread.

The main weed species of concern within the fire perimeter are spotted knapweed and St. John's wort. These species are present along access roads, roads within the fire perimeter, and within the interior of the fire, and at least 50 feet either side of the road, mostly on the fill and cut slopes. Seed dispersal from residual populations and regrowth is probable for these species. The occurrence of spotted knapweed and St. John's wort is expected to continuously increase on burned acres following the fire.

The Clark Fork River corridor, including Interstate 90, is at the southern end of the fire's perimeter. Leafy spurge is well established along the Clark Fork River and would be considered a threat to invading the burned area of the West Mullan fire. Leafy spurge reproduces by seed and vegetatively. Introduction by birds and other wildlife would be the main introductory vectors.

Small occurrences of cheatgrass exist within the fire perimeter but have not been inventoried. Cheatgrass is a species of concern and is present on adjacent lands. These infestations pose a threat to the burn area as an immediate seed source. As a fire-adapted species, the likelihood of invasion by cheatgrass is high.

**Overall, the presence of known weed infestations within the fire perimeter and adjacent to the area pose a very high risk for weed introduction into the area.**

For most noxious weed species identified, disturbed sites and dry potential vegetation types are the most at risk from invasion and spread. Disturbed areas include roads, dispersed recreation sites, game trails and where ground disturbing fire suppression actions occurred (i.e. dozer lines, hand lines, and drop points). Burned sites can have altered soil structure and reduced organic matter content creating a more favorable germination substrate for weed seeds. Undisturbed areas in drier vegetation types of the fire area are also at risk.

Fig. 1 – Sum of National Forest acres at high or moderate ecological risk of weed infestation or spread, by habitat type.

| Habitat Types at High or Moderate Ecological Risk | Sum of TSMRS_ACRE | Species |
|---|---|---|
| 210 | 360 | LS, DK, SK, CT, G, H, DT |
| 230 | 341 | LS, DK, SK, CT, G, H, DT |
| 262 | 803 | LS, SK, G, H |
| 312 | 60 | LS, DK, SK |
| 320 | 193 | LS, SK, G |
| 321 | 109 | LS, SK, CT, G, H, DT |
| 322 | 77 | LS, DK, SK, G, H, DT |
| 330 | 69 | LS, SK |
| **Grand Total** | **2012** | |

Legend: SK = spotted knapweed; DK = diffuse knapweed; CT = Canadian thistle; G = goatweed or St. John's wort; H = houndstongue; LS = leafy spurge; DT = dalmatian toadflax

On National Forest Lands, 2,012 acres of FS land within the West Mullan Fire are at moderate to high risk of weed infestation based on the Lolo NF Plan Amendment No. 11 (Noxious Weed Management). These areas are at greatest risk from spotted knapweed, diffuse knapweed, Canadian thistle, St. John's wort, houndstongue, leafy spurge, and Dalmatian toadflax. Typically less vulnerable habitat types are at an increased risk of weed infestation and spread due to mineral soil exposure from fire as well.

It is important not to overlook potential seed spread vectors within the burn area as well. Although these sites (such as game trails, roads and recreation trails, and fence-lines) are converted areas where ecosystem integrity has already been altered, they are the main sources of weed seeds that can facilitate and greatly exacerbate the spread of weeds into more pristine areas. It is critical that these areas are treated as well to protect currently unaffected but vulnerable areas within the fire.

The fire-caused weed spread is of a high priority, especially in those areas adjacent to invasive species' concentrations prior to the burn and in or near sensitive plant populations. Portions of roads, trails, and hillslopes were infested with spotted knapweed prior to the fire. These areas provide a seed bank where spotted knapweed seeds can grow and spread. Spotted knapweed seeds can remain viable in the soil for up to 12 years. Areas of leafy spurge can spread, regenerate, and reproduce prolifically from the root crown, root buds, and root pieces. Very young and repeatedly damaged leafy spurge plants can regenerate. Small, deeply buried leafy spurge root pieces can develop into new plants. Through root growth and sprouting, leafy spurge can occupy a large area in a short time. Radial vegetative spread of a leafy spurge patch can be up to 11 feet annually and seeds can disperse up to 15 feet from the seed head.

Suppression dozer lines for the West Mullan Fire are considered prime weed beds, especially with a large infestation being in the area and suppression activities possibly moving seed source along suppression lines. The West Mullan Fire burned grassland and forest land, and eliminated natural competition for invaders. The fire-caused disturbance creates perfect habitat for noxious weed invasion and expansion. If emergency mitigation activities are not implemented this problem will expand exponentially and will require future extensive resources to manage. If left unmanaged the results could permanently alter plant communities and habitat, and adjacent private land values. Results of uncontrolled weed spread are well documented. Without treatment, weeds increase about 14% a year under natural conditions (USDA, Forest Service 2006). These studies show that spotted knapweed and its distribution will continue to increase if not aggressively treated.

**Values at Risk:**

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. Only treatments that had a risk of Intermediate or above are recommended for BAER authorized treatments. For the West Mullan Fire risk levels by resource included weeds/sensitive plants, roads, and road-stream crossings. Only roads, road-stream crossings, and weeds/sensitive plants had risk levels of intermediate or greater and therefore are the only resources recommended for BAER funded treatments. Treatments reccomended on non-federal lands are included in the above hydrology report, and will be presented to relevant land owners.

Table 5. Values at Risk Matrix.

| Probability of Damage or Loss | Magnitude of Consequences | | |
|---|---|---|---|
| | Major | Moderate | Minor |
| | RISK | | |
| Very Likely | Very High<br>Weeds/Sensitive Plants | Very High | Low |
| Likely | Very High | High | Low |
| Possible | High<br>Soil erosion, Roads, Road-Stream Crossing | Intermediate<br>Soil erosion, Roads, Road-Stream Crossings | Low |
| Unlikely | Intermediate | Low | Very Low |

## B. Emergency Treatment Objectives:

As noted above, threats to natural resources from culvert failure, increased sediment delivery, and establishment of noxious weeds exist as a result of the West Mullan Fire. For these reasons the primary treatment objectives are:

- Mitigate effects under changed post-fire watershed response, particularly where Forest roads cross drainages with undersized culverts and where roads on steep ground are unstable.

- Minimize the increased potential for the spread of invasive and noxious weeds.

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

Land **80** % Channel **80** % Roads/Trails **80** % Protection/Safety **N/A**

**D. Probability of Treatment Success**

Table 6. Treatment succession prediction

| | Years after Treatment | | |
|---|---|---|---|
| | 1 | 3 | 5 |
| Road | 85 | 90 | 90 |
| | | | |
| Channel | | | |
| | | | |
| Land/Weeds | 80* | | |
| | | | |
| Protection/Safety | 85 | 90 | 95 |
| | | | |

*Only one year of detection and treatment is allowed using BAER authorization.

**E. Cost of No-Action (Including Loss):** at least $400,000

**F. Cost of Selected Alternative (Including Loss):** There remains a 20% chance that the proposed treatments for this initial work may not succeed. Total cost of the action alternative plus this 20% chance of failure is $103,142 ($85,952 * 1.2).

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

| | | | |
|---|---|---|---|
| [x] Hydrology | [x] Soils | [X] Geology | [ ] Range |
| [ ] Forestry | [ ] Wildlife | [ ] Fire Mgmt. | [x] Engineering |
| [ ] Contracting | [ ] Ecology | [X] Botany/Weeds | [x] Archaeology |
| [X] Fisheries | [ ] Research | [ ] Landscape Arch | [x] GIS |

Team Leader: Ann Hadlow

Email: ahadlow@fs.fed.us

**Team Members:**

- Ann Hadlow- Soils
- Deb Job- GIS
- Carly Aniballi- Weeds/Silviculture
- Nate Kegel – Engineering
- Traci Sylte – Fisheries/multiple resources
- Erika Karuzas – Archeology

**H. Treatment Narrative:**

**Proposed Road Treatments**

The West Mullan BAER assessment 2500-8 includes request for $70,300 to perform the following work list treatments needed to protect existing infrastructure, aquatic habitat, and protect public safety (Table 7):

Table 7. Proposed Emergency Treatments for road-related risks

| Treatment/Work Item | Treatment Narrative – Work Requirements - Rational |
|---|---|
| Road Recontour | Road# 67044 would be recontoured to restore natural flow of Wood Gulch due to the moderate to high burn severity above and below the road and the steepness of adjoining slopes. Work would include removing culverts from drainage ways and rehabilitating the drainage way. Recontouring/heavy outsloping will occur for the entire road lengths, in addition to scattering of slash and woody debris on the re-sloped surface. Treatment would also include seeding disturbed areas. Road would be treated for weeds prior to disturbance. |
| Major Culvert Replacement in Pardee Creek | One road- stream crossings (culvert) on Pardee Creek will be replaced to eliminate the substantial risk of culvert plugging, overtopping, breaching, and channel scour. The work will consist of removing and replacing the existing 30" culvert with a large arch culvert that will accommodate Q100 flows and also provided aquatic organism passage. 650 acres of moderate and 104 acres of high severity burn are located upslope of this site. The natural stream channel will be simulated through the structure to accommodate all aquatic organisms. The proper soil erosion control measures will be taken during construction including diverting the stream around the construction site. The resulting BAER treatment will allow for Q100 flow conditions on Pardee Creek to handle post fire |

| | |
|---|---|
| | runoff events. |
| Major Culvert Removal in Pardee Creek | One road- stream crossing (culvert) on Pardee Creek will be removed to eliminate the substantial risk of culvert plugging, overtopping, breaching, and channel scour. The work will consist of fill removal, removing existing culvert, and re-creating a stream bottom area. Excavated fill material will be placed in compacted lifts against existing road cut faces and existing roadside ditches rerouted around the base of compacted spoil slopes. A maximum 1.5:1 (horizontal:vertical) slope will be stabilized with large wood debris scattered horizontally in continuous about 10' space rows. The slopes will then be seeded. The channel bottom will be stabilized by arranging bed material to create a step pool type channel. Weed-free straw bales will be countersunk and staked to provide sediment filtration between the channel and overlying earthen slopes. The resulting BAER treatments will leave the Pardee Creek channel unincumbered to handle post fire runoff events and are less expensive and with considerably higher probability of success than culvert replacement. |
| Road Storm-proofing | Lower Club Gulch Road #37158 would be "storm-proofed." Work would include ripping the road surface to reduce soil compaction and increase water infiltration, constructing waterbars, and piling slash and woody debris on the ripped road surface. Culvert removal, stream rehabilitation, seeding, and weed treatment would be required. |
| Road Drainage Maintenance | Road drainage on Upper Club Gulch Road #7870 would be addressed by cleaning and shaping all road drainage features such as drain dips, culvert inlets and outlets, and ditch cleaning. Cross drainage or additional ditch relief may be necessary to handle the additional movement of water. |

Road recontouring/heavy outsloping and storm-proofing/storage treatments would leave the road conditions and stream crossings in a stable condition to accommodate post fire runoff. Threat of soil raveling, erosion, and mass failure would be substantively reduced or eliminated. Proposed treatments are estimated to cost about $70,300. Forest road management objectives will not be changed as a result of the proposed treatments

Table 7. Engineering cost estimate

| Item | Unit | Unit Cost | # of Units | Cost |
|---|---|---|---|---|
| Mobilization | | $3,000.00 | 1 | $3,000 |
| Road Recontouring | miles | $6,000 | 0.5 | $3,000 |
| Road Drainage Maintenance | miles | $3,000 | 2 | $6,000 |
| Storm Proofing | miles | $4,000 | 1 | $4,000 |
| Culvert Replacement | | $40,000 | 1 | $40,000 |
| Culvert Removal | | $3,000 | 1 | $3,000 |
| **Contract Total** | | | | **$59,000** |

| | | | | |
|---|---|---|---|---|
| Contract Administration | day | $350.00 | 20 | $7,000 |
| Contracting Officer | day | $430 | 5 | $2,150 |
| Contract Preparation | day | $430 | 5 | $2,150 |
| **Total Funding Request** | | | | **$70,300** |

**Proposed Weed Treatments;**

The lands where the West Mullan Fire primarily occurred are owned by the state and a private timber company. As such, the area has been heavily impacted by harvest activities and subsequent weed infestations. The recent West Mullan Fire reduced or eliminated crown canopy, shrub and forb cover in high and moderate severity (vegetative) burned areas. These disturbed areas are highly vulnerable to weed invasion or weed spread from existing infestation or adjacent sources. These areas pose a threat to the burned area as an immediate seed source as well.

As part of the BAER treatment efforts for invasive weeds control, both ground and aerial treatments are necessary within and immediately outside of the fire perimeter to be successful. The need for aerial treatment will be accessed during the spring of 2014 and an interim BAER request for treating the interior of the fire will be submitted should conditions warrant. The needs assessment for aerial treatment would require 7 days of survey to inventory the interior of the fire accurately ($1,659).

Ground treatments would occur for spotted knapweed and St. John's wort along the road sides (up to 40 feet either side) with 1 pint/acre of picloram for 175 acres (35 miles). This treatment would provide immediate suppression of spring growth and residual treatment for the next spring growth for spotted knapweed and new growth of other potential invaders. This treatment would cost $4,120.00 and would be accomplished with force account crews or an IDIQ contract.

Roads slated for decommissioning would have at least one treatment prior to decommissioning efforts. These roads would be the highest priority to treat. After herbicide application, the site should be left undisturbed for a minimum of 14 days prior to decommissioning efforts. Decommissioned roads would be a priority for ground application and would be treated first to ensure the 14 day period.

Dalmatian toadflax would be spot treated with ¾ pints/acre of Chlorsulfuron for approximately 100 acres (20 miles) by ground application up to 40 feet either side of the road and visible infestations in the spring of next year (2014). This treatment would cost $4,300.00 and would be accomplished with force account crews or an IDIQ contract.

Populations of common tansy, oxeye daisy, meadow hawkweed complex, and sulfur cinquefoil were inventoried within the West Mullan Fire perimeter prior to ignition. These are considered moderately invasive. Continued low levels of these species are expected to occur within the burned area and are considered a low risk. Weed control efforts for the other three species would be effective as control or suppression of these species as well.

Ground-based application of herbicides to treat known weed infestations and potential seedbeds such as dozer lines is highly recommended. The use of herbicides with longer efficacy is recommended to ensure control of seed banks. Additional weed surveys are necessary to verify invasive weed occurrence throughout the interior of the West Mullan Fire and determine the appropriate level of herbicide application.

Aerial application of herbicides would be best suited to open, non-forested hillsides and big game winter range. This would limit herbicide damage to fire-weakened trees and allow recovery of native vegetation. Additionally, reforestation efforts in areas of the burn would be negatively affected by aerial application of herbicides; such areas should be excluded from any aerial application.

Table 8. Proposed emergency treatments for weed related risks (contract admin and people days included in cost estimate).

| Description | Estimated Acres | Target Weed Species | Prescription | Cost |
|---|---|---|---|---|
| Ground Application (broadcast) | 175 | Spotted knapweed, other broadleaf road side weeds | 1 pt/acre Picloram | $4,120.00 |
| Ground Application (spot) | 100 | Dalmatian toadflax | ¾ pints/acre of Chlorsulfuron | $4,300.00 |
| Aerial Application | TBD | Spotted knapweed, other broadleaf weeds Potentially cheatgrass | 1 pt/acre Picloram 2 oz/acre Plateau | ~$13.00/acre |
| **Total Herbicide** | | | | $8,420.00 |
| **Total Survey/Inventory** | 7 days | | Spring regrowth monitoring | $1,659.00 |
| **Monitoring** | 9 days | | Annual Monitoring | $2,133.00 |
| **Total** | | | | $12,212.00 |

Continued monitoring of the West Mullan Fire burn areas is recommended to determine new infestations, treatment efficacy, and retreatment need.

**Proposed Monitoring**

*Weed Monitoring:* Assess all areas in the fire area that were treated for weeds in spring of 2015.

*Stream Discharge and Culvert Monitoring:* Patrol Flat Creek, Keystone Creek, and Pardee Creeks following major rain events (>1.0 in /24hours) through fall 2013 and spring 2014. Assess visible erosion issues and potential drainage issues. Check upper Flat creek culvert and main Flat Creek culvert for debris.

## Part VI – Emergency Stabilization Treatments and Source of Funds

| | Units | Cost $ | Number | $ | Other $ |
|---|---|---|---|---|---|
| **A. Land Treatments** | | | | | |
| Weed Assessment and Treatment * | Acres | ~44.41 | 275 | 12,212 | |
| **C. Roads and Trails** | | | | | |
| Culvert Removal | Each | 3,500 | 2 | 7,000 | |
| Road Drainage and Storm Proofing | Miles | 3,143 | 3.5 | 11,000 | |
| Culvert Replacement | Each | 41,000 | 1 | 41,000 | |
| Contracting and Administration, | | | | 11,300 | |
| **C. Assessment** | | | | | |
| | | | | | 4,800 |
| **D. Monitoring** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Storm Patrol | Days | 320 | 4 | 1,280 | |
| **Total Approved** | | | | **$83,792** | **$4,800** |

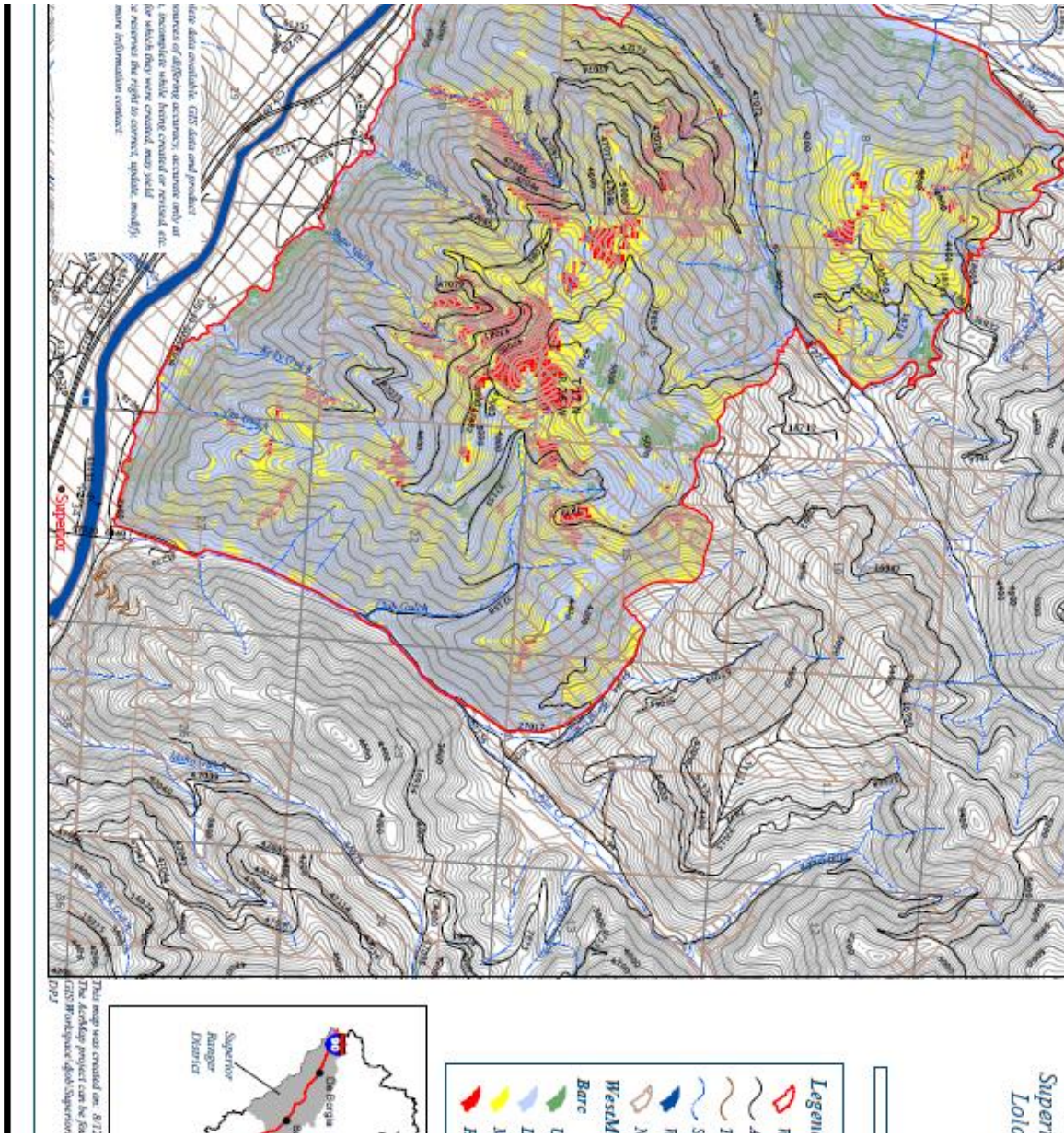
* If more needs are discovered, an interim request can be made.

## PART VII - APPROVALS

1. _____ _____
Forest Supervisor Date

2. _____ _____
Regional Forester Date

## Appendix A: BARC Map (Field Verified)



## Appendix B: Road Treatment Map