Date of Report: Sept 23, 2011

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
- [ ] 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)
- [x] 2. Interim Report # 1 .
  - [x] Updating the initial funding request based on more accurate site data or design analysis
  - [x] Status of accomplishments to date
- [ ] 3. Final Report (Following completion of work)

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: **West Riverside**
B. Fire Number: MT-SWS-000056
C. State: Montana
D. County: Missoula
E. Region: Northern (1)
F. Forest: Lolo
G. District: Missoula
H. Fire Incident Job Code: PMGB1A(1502)
I. Date Fire Started: 08/22/2011
J. Date Fire Contained: 09/15/2011

K. Suppression Cost: $5,500,000

L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline rehabilitated (miles): Handline – 6.8; Machine – 9.6
2. Fireline seeded (miles): 5
3. Other (identify): rehab 15 drop points and parking areas

M. Watershed Numbers: 170102040104; 170102031308

N. Total Acres Burned: **3,703** total acres
NFS Acres (3,291 ; *2,310 in Phase II TNC/Plum Creek Land exchange*) Private (412.3)

O. VegetationTypes:

40% Dom from VMAP	Acres
HERB	513.69
SHRUB	1,202.02
MX-PIPO	601.54
MX-PSME	1,159.72
MX-LAOC	40.46
MX-PICO	92.79
MX-ABLA	49.04
MX-PIEN	48.63
Grand Total	**3,707.88**

P and Q.. Dominant Soils and Geologic Type:

Riverside Fire soils in Sections 14, 15, and 16 have not been mapped within the Lolo LSI as they are outside of the Lolo NF boundary; however landform and geology are similar within the fire perimeter. Soils across the remaining sections of the fire have been mapped. Map Units, MUs, include 13UA (Andic Ustochrepts and Typic Ustochrepts with potential of metasedimentary rock outcrops), along Johnson Creek with low and moderate relief hillslopes being 30QC (underlain by weakly weathered quartzite, siltite, and argillite of the Belt Supergroup, having hard angular rock fragments and fractured, permeable upper bedrock layers). The steep mountain topography in the rest of the burned area is mapped 60QC and 64 QA, QB, and QC depending on aspect with the aforementioned metasedimentary parent geology.

Soils in MU 13UA have formed on terraces and terrace risers in thick, very cobbly alluvial deposits. In this area they have been influenced by Glacial Lake Missoula and have a silty surface layer about 10 inches thick. They are productive with moderate high levels of OM. The soils have low bearing strength and will powder when dry. Erosion hazard is low.

Similar to MU 13UA, these soils are found on convex slopes and have been influenced by Glacial Lake Missoula. The subsoils are very rocky with a silt loam surface layer. The soils are productive but have low bearing strength and will powder when dry. The surface soils are about 8 inches thick. Erosion hazard is low.

As the slopes steepen, the soils become progressively rockier. Soil creep and freeze-thaw processes have removed much of the soil mantle in this stream breakland and steep mountain slope topography. In these landscapes, talus slopes and rock outcrops are common. The soils are primarily loam in texture; pockets of deeper silt loam soil may be found in microsites or hillslope deposition areas. Soil productivity is inherently moderate to low because of the well-drained or excessively well-drained rocky profile; moisture stress and high soil temperatures are common. 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	**8.2**
2	**0.71**
3	**1.66**
Grand Total	**10.6**

S. Transportation System

Trails: 0 miles Roads: 23 miles

PART III - WATERSHED CONDITION

A. Burn Severity (acres): 634 (17%) (unburned); 1046 (28%) (low); 1815 (49%) (moderate); 214 (6%____(high)

B. Water-Repellent Soil (acres): <1 ; only present at isolated burning of stumps/down trees

C. Soil Erosion Hazard Rating (acres): 1814 (low); 214 (moderate); 0 (high) (estimate)

D. Erosion Potential: 0.2-0.5 tons/acre (estimate, 10% exceedence)

E. Sediment Potential 3.0-7.4 cubic yards / square mile (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 and 24hr

E. Design Storm Magnitude, (inches): 1.3 to 2.4 inches

F. Design Flow, (cubic feet / second/ square mile): 72 cfs/mi^2

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

H. Adjusted Design Flow, (cfs per square mile): 183 cfs/mi^2

PART V - SUMMARY OF ANALYSIS

A. Critical Values/Resources and Threats:

The West Riverside fire area is predominately a desirable mosaic pattern of mixed burn intensities from an overall watershed health. Because of fire burn severity, parent geology, and location of private infrastructure to the fire, risks to human life, property, and safety are extremely low to negligable.

Primary critical values at risk are natural resources relating to weeds, road stability, fisheries, stream function, and water quality. From a fisheries and weed perspective, the fire creates high risk issues. Wildlife, recreation, and heritage values were also considered, but assessment findings indicate no critical values at risk.

Photo 1. Looking down to the West Riverside Community

Seventy percent of the burn area is newly acquired land from The Nature Conservancy, and formerly Plum Creek industrial forestry lands.

Watershed Description

Except for Johnson Creek (Johnson 'Gulch' in some descriptions), watersheds are primarily "face" drainages of the Clark Fork and Blackfoot Rivers. About half of the watershed received moderate burn intensities with a small amount of high and the remainder low to unburned. Johnson Creek is a third-order tributary to the Blackfoot River with a watershed area of 5,527 acres (8.6 mi^2) and draining several higher elevation (6000-7000 Ft) glacial cirque basins. Precipitation varies from high to low elevations at 40-50 inches and 20-30 inches, respectively. Parent geology is dominated by weakly weathered metasedimentary rock derived from the Belt Supergroup (USDA 1989).

Soil burn severity was 1-2 levels lower than BARC intensity mapping (i.e. High BARC intensity equated to low or moderate soil burn severity). Few areas of high burn severity fire were observed and were associated with isolated burned down wood, tree stumps, or roots. Hydrophobic soils are not an issue. Roots are largely present in the duff layer, even in the high intensity burned areas. Infiltration capability of the soil mantle is high. This area is dry and open grown forests with limited understory vegetation development.

The road system into Johnston Creek is substandard relative to Forest Service standards and environmental impacts, namely inadequately sized culverts, destabilized roads pre-fire, and weed infestations. Primary issues are post-fire risks from existing weeds, weed invasion, roads stability and culvert maintenance on steep hillsides, and substantively undersized culverts in Johnson Creek.

Road Infrastructure

The fire area contains an estimated 23.0 miles of road (2.5 miles/sq. mi.). There are 15 stream crossings; four cross the relatively large Johnson Creek. Seven crossings are on two 1st Order streams located within the "Zorro" road system that accesses Section 3 in the West Fork of Johnson Creek. Three road systems provide road access to the Johnson Creek watershed. Road #53039 provides access to the head of the watershed and power lines structures. Roads 53036 and 53037 provide access to the western portion of the watershed, and Road #53041 provides access to the lower portion of the watershed. None of the 23 miles of road within the fire perimeter are open to public travel.

Several undersized stream crossings were identified.

- Road #53037, where a 7' x 9' arch culvert, four 36" culverts, and one 24" culvert are all undersized.
- Road #53041, where two 5' x 7' arch culverts are undersized.
- Road #53050, where a 6' x 8' arch culvert is undersized.

The four arch pipes on Roads 53037, 53041, and 53050 have constriction ratios of approximately 0.5-0.7 (the culverts constrict half to seventy five percent of the active channel). Pre-fire, these culverts did not meet USFS stream simulation criteria for accommodating bankfull channel widths. Post-fire, under storm precipitation scenarios and modeled flow values, they are at a moderate to high risk of failure.

In addition to undersized stream crossings, all roads identified in Upper Johnson Creek are built on steep ground with average side slopes of 55-65%. Some portions of the road were built on slash and many roads had slumping issues prior to the fire (photo 2). 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.

Photo 2. Prefire conditions of roads in Section 3.

Photo 4. Burned plastic culvert on newly acquired road system

Plum Creek Timber Company used plastic culverts in some areas. Two burned completely through the road fill. Photo 3 shows the remains of a plastic culvert which was burned in the fire on Road #53039. A similar culvert was burned on Road #53040. The burned structures pose a safety risk due to the potential for sudden road fill collapse, and should be replaced with 18" Corrugated Metal Pipe culverts.

Photo 5. Example of outlet scour and 'hourglass effect' from substantively undersized culvert crossings in Johnson Creek. This culvert is 7 feet wide; the bankfull stream width is 14 feet; the culvert width is half the active channel width.

Fisheries

The critical fishery values at risk are native bull trout and pure westslope cutthroat trout populations within Johnson Creek. Johnson Creek is a substantial perennial stream that supports a fishery that has been a focus of Montana State Fish, Wildlife, and Parks for stream improvements. Swanberg's (1997) bull trout telemetry data suggests that bull trout within the mainstem of the Blackfoot River use the mouth of Johnson Creek as a cold water refuge. MFWP (1997-1998) states that Johnson Creek supports low densities of rainbow, brook, brown, westslope cutthroat, and bull trout. Field review (July 28, 2011) by the Missoula Ranger District Fisheries Biologist identified three culverts that are partial fish barriers. These culverts are undersized for the 12- to 14 foot wide stream, resulting in seasonal water velocities exceeding the capability of fish swimming speeds. The seasonality of these barriers coincides with the timing of the native fish migrations likely resulting in negative impacts to local native fish populations.

There are approximately 5.3 miles of quality fish habitat within Johnson Creek and the combination of these three barriers block approximately 4.5 miles or 85% of the streams length. The majority of the higher quality spawning is located within the lower 1.5 to 2.0 miles of stream.

Approximately 2.0 miles of road are located within the Inland Native Fish Strategy riparian habitat conservation areas in Johnson Creek, which has 15 stream crossings; four are located in fish bearing stream segments. Seven of these crossing are on two 1st Order streams located within the "Zorro" road system that accesses Section 3. The prefire condition of this road system is illustrated in Photo 2, demonstrating the instability of these steep cutslopes resulting in an undriveable road.

Fishery concerns are the increased duration of fish barriers and potential erosion issues associated with increased road surface erosion and/or culvert failure. The three partial barriers are associated with undersized culverts and increased water velocities during spring-time flows. Any increase in water yield and duration of flow will likely result in these culverts becoming more of a barrier either through increases in high flow duration or through increased channel incision resulting in higher jump heights at the culvert outlets.

Erosion concerns are primarily related to the road system in Section 3. Because this road crosses a tributary to Johnson Creek up to seven times, its hydrology is well connected and poses a high risk to downstream spawning and rearing sites for native fish if culverts become blocked and fail. The culverts within these crossing are properly sized to handle the existing flow but not for increased flow and debris from the post fire conditions which increases the risk of culvert and fill failure. Observations also indicate that at least portions of this road have its fill placed on slash which portions of have burned out. Thus, fill failures are expected to occur and potentially delivery sediment to nearby streams.

From a fisheries perspective, two options are recommended: 1) Remove culverts, restore stream channels, and re-contour the road network; or 2) install BMPs and upgrade the crossing structures to meet Q100 standards. The implementation of the treatments described above will have a high degree of success in mitigating the effects of the hydrologic changed condition related to the West Riverside fire.

Weed Infestation

Most land where the West Riverside fire occurred was acquired earlier this year (2011) from a private timber harvesting company. The burned area was heavily impacted prior to the fire from timber harvesting activities and subsequent weeds infestation. The recent West Riverside 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. Fortunately, the soil duff layer remains relatively intact throughout the fire. Most of the burned area should quickly recover with existing vegetation – including noxious weeds, which results in a high risk level for weed introduction and spread.

Photo 6. Dalmatian toadflax stems in high severity burn area

Three main weeds species of concern occur within the perimeter of the West Riverside fire (cheatgrass, Dalmatian toadflax, and spotted knapweed). These species are present along access roads, roads within the 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 is probable for all three species; Dalmatian toadflax is expected to spread vegetatively as well. Infestation levels were determined to be low (1-5%) to high (>25%). In late July (7/28/2011), a weed inventory was completed prior to the fire ignition. Results estimated 2,792 acres were infested with spotted knapweed. Dalmatian toadflax infestations were underestimated because it is difficult to see when not in flower. Roads were treated in the fall of 20111 with Picloram (Tordon) to prevent the growth of spotted knapweed, Dalmatian toadflax and other broadleaf weeds along the roads. The prescription to use Tordon was designed to have residual effect for the spring to target weeds. In the spring of 2012, the roads were inspected and the prescription was determined to be successful in preventing weed growth along the roads. This also decreased spotted knapweed spread into the interior of the burned area as well. A reduction in spotted knapweed was observed in spring inventories; however, Dalmatian toadflax spread remains an issue.

Newly acquired lands in sections 2 and 11, outside the fire perimeter are also highly infested with mostly spotted knapweed. These areas pose a threat to burn as an immediate seed source. A dozer line was constructed in section 1 (newly acquired) that tied in to a road with a Dalmatian toadflax infestation.

The Blackfoot River corridor, including Highway 200, is at the southern end of the fire's perimeter. Leafy spurge is well established along the Blackfoot River and would be considered a threat to invading the burned area of the West Riverside fire. Leafy spurge reproduces by seed and vegetatively. Introduction by birds and other wildlife would be the main introductory vectors. Seeds of leafy spurge float but the burned area is upstream and the possibility of this type of spread is highly unlikely. Overall, the presence of known weed infestations within the fire perimeter and adjacent to the area pose a high risk for weed introduction into the area..

Common mullein, common tansy, and St. Johnswort were also observed during site inspections at low levels. These species are considered moderately invasive with the exception of St. Johnswort, which can be highly invasive given the right site conditions and disturbance levels. Given the level of previous invasion, they are considered a low risk. Additionally, weed control efforts for the other three species would be effective as control or suppression of these species as well.

A single population of whitetop was inventoried earlier in the summer of 2011. The infestation was not found upon field inspection possibly because the fire removed all evidence of the plants or the plant was misidentified during the inventory.

Heritage:

There have been no previous cultural resources investigations by the Forest Service within the subject area prior to the West Riverside burn. However, previous investigations in and near the area have been conducted by the University of Montana (UM), Bonneville Power Administration (BPA), and the Montana Department of Transportation (MDOT). As a result, three cultural resource sites have been previously identified within or near the burn area. Fire impacts have caused no adverse effects at these sites.

The West Riverside burn area is considered to have low potential for other potentially significant yet unknown cultural resources because of the steep grades that dominate the landscape. While small temporary camps or activity sites may be found at saddles, mountaintops, and some ridges within the burn area, long-term and extensive prehistoric sites are generally located on flat and gentle grades adjacent to the Blackfoot River and contributing tributaries below the burn area. Likewise, early homesteaders settled near the river. While the railroad and utility corridor attest to the historic influence of mining operations at Butte and Anaconda, any actual mining in the burn area was likely never anything more than an isolated prospecting effort.

In consideration of the above, post-fire conditions have no potential to directly or indirectly impact significant cultural resources within the West Riverside burn area.

Hydrologic Response

The table below displays normalized values cfs/mi2 values for Johnson Creek. There are a number of face drainages smaller than Johnson Creek. These drainages do not have road-stream crossings and associated risks, but are expected to respond similarly to Johnson Creek, given the same storm magnitude. Under intense storm conditions, general predictions indicate that post-fire runoff conditions could be five times greater than pre-fire conditions.

Table 1. Normalized flow values for predicted post-fire storm events

	Post Q2 cfs/mi2	Post Q5 cfs/mi2	Post Q10 cfs/mi2
Johnson Creek 8.6 mi2	47.7	89.9	247.7

It is important to note that size of watershed makes a large difference in cfs/mi2 values which are used in the 2500-8 to evaluate watershed emergency. Smaller watersheds within a fire perimeter will generally have up to a magnitude or more larger cfs/mi2 than larger watersheds. Parrett and others (2003) observed much smaller cfs/mi2 values in 2001 and 2002 for larger watershed in fires on the Bitterroot and Helena NF's. Watershed sizes within the fire perimeter range from 2000 – 5000 acres.

Table 2. displays culvert capacities on the major culverts in Johnson Creek. DNRC methodology for small drainages presents extreme hydraulic inadequacy to accommodate the modeled 10-yr storm event; whereas USGS methodology indicates high concern, especially the downstream culvert on Road 53041. The reality of prediction is that true values are unknown and predicted quantities both models indicate culvert capacity issues. Most importantly, is consideration of the constriction ratios, flow conveyance zones, and wood transport. These culverts all have substantive height, but severely undersized widths, reflecting antiquated design philosophies to accommodate necessary stream hydraulics and wood transport. In other words, high flood flows will have much more width per given volume that the culverts must accommodate through width, not rise. The majority of culvert failures occur because of debris plugging, not hydraulic failure, and road-stream crossing structures that are less than the active channel width have high probabilities of inlet plugging (Furniss, 2004). Consequently, inadequate capacity of most culverts, coupled with grossly undersized accommodations of active channel width, lead all predictions to high risk of major scour or road overtopping and failure under post-fire large runoff events, especially with additional wood availability and transport.

Table 2. Culvert capacity assessment on major road-stream crossings in Johnson Creek

Road	Existing CMP	Fill ht	Discharge to Qvertop Roadway (cfs)	Culvert Capacity Qfull (cfs)	Q10 Small Drainage Storm Flow Prediction DNRC Method (cfs)	Q100 USGS Regression (50% Post-fire increase) (cfs)	**Predicted Response under wood transport and high volume runoff**
53041	5' x 7'	4 ft	**233**	**176**	**1912**	**326**	**Inlet plugging and Major scour or failure**
53040	6' x 8'	5 ft	**423**	**262**	**1525**	**288**	**Inlet plugging and Major scour or failure**
53037	7' x 9'	5 ft	**639**	**395**	**1479**	**287**	**Inlet plugging and Major scour or failure**

<u>Because of the undersized culverts and probable intense storm runoff response, risks of sediment delivery from road systems and culvert scour or road-crossing failure are substantively higher under post-fire storm scenarios and are a substantive concern to stream structure and function and water quality.</u>

In addition, during the next several major runoff events, ash will likely move off the hill-slopes into the stream channels. The flush of ash through the stream systems tends to be a short-term water quality issue and may impact the fisheries depending on the concentration during the initial flushing event. However, the ash flush tends to be a short-term, natural event following a wildfire and not anticipated to be an issue for the Johnson Creek or other small drainages. There are no municipal water use occurs.

During the next runoff season, responses will be highly variable; sediment is expected to sharply increase in some tributaries and be fairly moderate in others, depending on the soil burn severity and proximity of the exposed soils to drainages. In areas of moderate to high burn intensity, sediment increase levels will likely range within expected responses from wildfires in Montana (i.e. they will most likely exceed 200 to 300% above normal the year after the wildfire).

Infiltration is expected to be high under typical conditions of snow melt and storm precipitation. Mass wasting and debris flow is not of concern on this landscape and could only occur under the most unforeseen climatic conditions or at failed road-stream crossings if undersized culverts are not removed and under very high intensity storm or rain-on-snow-events. Provided that undersized culverts are addressed to avoid road failure risk, after the first year, there are no expected adverse effects.

Erosion response: Loss to soil erosion is estimated with ERMiT, Erosion Risk Management Tool, and ranges from 0.2 to 0.5 tons per acre during the first year after the fire. This loss will occur primarily during the first 1-3 years post fire. Forest understory species should provide critical ground cover by the third growing season.

Photo 7. High severity burn area, showing steepness of the terrain below.

Burn severity was 1-2 levels lower than BARC intensity mapping. Few areas of high severity fire were observed. When observed they were associated with burned downed wood, tree stumps, or roots. Soils were found to be stable; hydrophobic soils were not found. Post fire sealing of soil pores by ash and surface soil erosion is possible and may result in increased overland flows. Roots are largely present in the duff layer, even in the high intensity burned areas and implies that recovery of emergent vegetation will occur. However the area is dry and open grown forests with limited understory vegetation development and it may take several years for sufficient ground cover to reestablish sufficiently to protect surface soils from erosion. The primary issues are existing weeds and risk of weed invasion into exposed burned sites.

Geologic response: Debris flows during summer thunder storm activity are unlikely because of inherent stability of the metasedimentary geology. Mass wasting is also unlikely, but could occur in isolated areas under some storm or runoff conditions where roads intersect steep hillslopes and shallow soils, and where oversteepened slopes ravel and compromise culvert drainage.

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 Riverside Fire risk levels by resource included weeds/sensitive plants, roads, road-stream crossings, and fisheries. Only 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.

Table 3. Values at Risk Matrix.

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

Unlikely	Intermediate	Low	Very Low

Weed Emergency Determination
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.

Research by Rice and Toney (1997) and a weed risk assessment project conducted in the Northern Region of the USFS (Mantas and Jones 2001) have identified potential vegetation types most at risk from invasion by a number of invasive exotics. The following table displays potential vegetation types in the burn perimeter and nearby suppressions lines and have been determined to be vulnerable to the listed weed species when there is site disturbance, such as wildfire.

Table 4. Vulnerable Vegetation Types in the West Riverside Fire

Species	Vulnerable Vegetation Types Within the Burn Perimeter
leafy spurge	Any disturbed site
spotted knapweed	Graminoid parks, Ponderosa pine, riparian forests
houndstongue	Any disturbed site
Canada thistle	Riparian, uplands, shrublands and meadows
field bindweed	Grasslands
black henbane	Roadsides, grasslands
Dalmatian toadflax	Any disturbed site

It is important not to overlook potential seed sources 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 emergency to resource recovery is of a high priority, especially in those areas, which have highly invasive species' concentrations prior to the burn and in or near sensitive plant populations. Large portions of roads, trails, and hillslopes are infested with spotted knapweed. The gross area provides a seed bank where spotted knapweed seeds can continue to germinate, 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.

Dozers were washed at Incident Wash Stations prior to entering the fire area. However, dozer lines did cut through known infested sites which heightens the probability that all dozer lines are suspect of new weed starts from transported weed seeds.

Suppression dozer lines for the West Riverside Fire are considered prime weed beds, especially with a large infestation being in the area and suppression activities possibly moving seed source around suppression lines. The West Riverside 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.

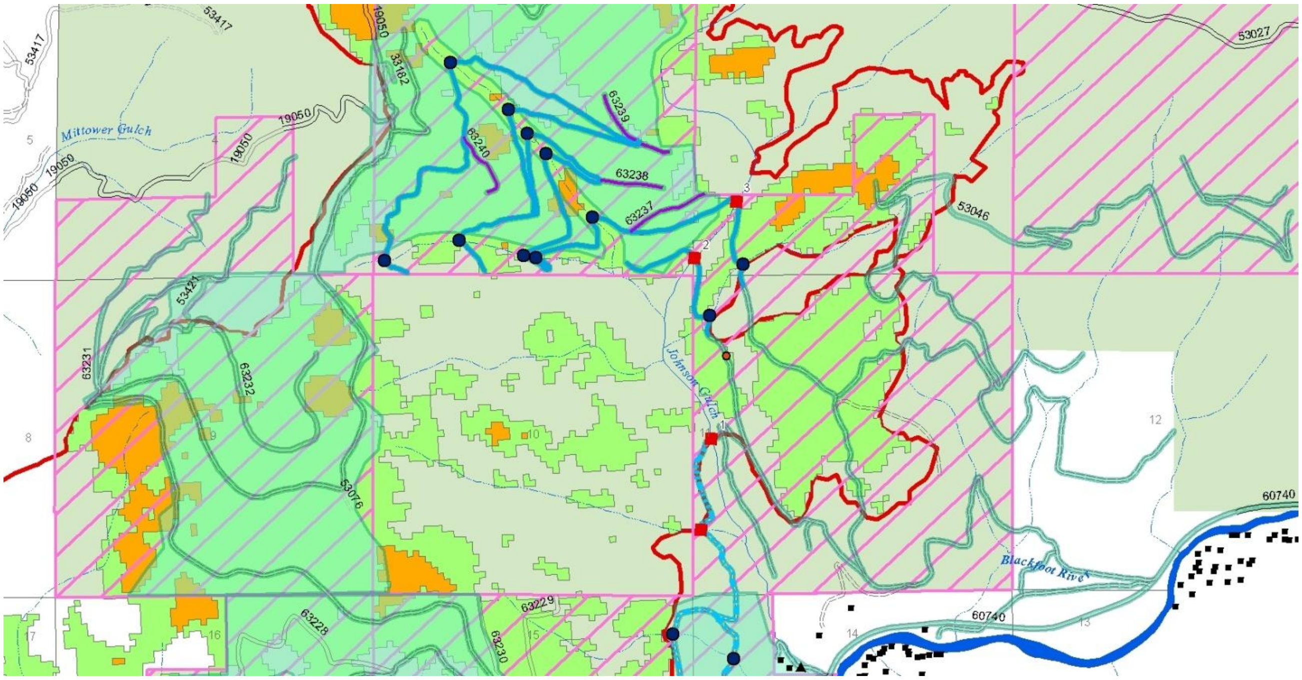
Road and Road-Stream Crossing Emergency Determination
Engineering, hydrology, and fisheries findings all indicate high concern for post-fire precipitation and runoff risk scenarios relative to the four undersized culverts in Johnson Creek (red dots on Photo 8) and the unstable road sytem in Section 3 (highlighted darker blue roads with black dots indicating culvert conditions). Prudent options to avoid post-fire impact scenarios are to either replace or remove the four culverts in Johnson Creek and perform major storm proofing of the “zorro” road system in Section 3, or recontour the roads and remove culverts.

Culvert replacement would require fish passage design and culvert upsizing to meet current engineering design standards. Storm proofing the road system in Section 3 would require considerable reconstruction. The culvert replacement option would cost approximately $68,000 for the three culverts on the main stem of Johnson Creek and about $32,000 for the western tributary, totaling approximately $236,000. Storm-proofing by adding additional drainage, buttressing, and road reshaping would cost an estimated $10,000 per mile or about $80,000 (as portions of the roadway that are slumped closed and not affecting drainage would not be treated. Total cost to address the road system would be at least $348,000, not including engineering and contracting efforts. For comparison, the cost to recontour and/or storm proof roads placed in storage, including contract support, is estimated at $96,000.

Transportation planning and coordination of these BAER efforts was conducted by both Missoula District and staffs at The Nature Conservancy (The Nature Conservancy remains under contract with Plum Creek Timber Company in a fiber supply agreement). After interdisciplinary assessment, these roads have been identified as unneeded for future access by Nature Conservancy staff and Missoula Ranger District staff. Roads 53041 and 53042 have been identified for storage and unneeded for access in the next 30 years. Road #53039 will continue to provide emergency road access to the head of the watershed and to power line structures.

Consequently, the prudent scenario for post-fire emergency response is to recontour high risk unnecessary roads and storm proof those in need of storage for future use.

Photo 8. Undersized culverts in Johnson Creek (red dots), steep, destablized “zorro” road system in Section 3 (blue with black dots indicating culvert locations)


Mittower Gulch
Johnson Gulch
Blackfoot River
19050
53417
33162
63239
63240
63238
63237
53046
53027
53421
63231
63232
53076
60740
63229
63228
63230

B. Emergency Treatment Objectives:

As noted above, threats to natural resources from culvert failure, increased sediment delivery, establishment of noxious weeds, and habitat degradation for Federally Endangered and Threatened species exist as a result of the West Riverside 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:

Road **80** % Channel **80** % Roads/Trails **80** % Protection/Safety **90** %

D. Probability of Treatment Success

Table 5. Treatment succession prediction

	Years after Treatment		
	1	3	5
Road	85	90	90
Channel	90	90	90
Land/Weeds	80	75	75
Protection/Safety	85	90	95

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 $225,063 ($187,552 * 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	[x] Research	[ ] Landscape Arch	[x] GIS

Team Leaders: Traci Sylte and Shane Hendrickson

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Team Members:

- Traci Sylte – Hydrologist
- Kelsey David – GIS
- Karen Stockmann - Weeds
- Brian Story – Engineering
- Shane Hendrickson – Fisheries/multiple resources
- Ed Declava – Archeology
- Scott Woods – U of M Researcher

H. Treatment Narrative:

Proposed Road Treatments

The West Riverside BAER assessment 2500-8 includes request for $93,560 to perform the following work list items/treatments needed to protect existing infrastructure, aquatic habitat, and **protect public safety** (Table 6):

Table 6. Proposed Emergency Treatments for road-related risks

Treatment/Work Item	**Treatment Narrative – Work Requirements - Rational**
Road Recontour In Section 3 Roads – Destabilized "Zorro" road system	Roads 53036, 53037, 53040, 63238, and 63239 would be recontoured or heavily outsloped as slope steepness permits (Lolo Closure Level 5). 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 also includes removing two undersized arch culverts and eleven undersized 18 to 36 inch culverts in draws. Culvert removal would include removing the existing structure and road fill from the stream bottom area, restoring the stream to its natural grade and cross section, installing gradient control structures where necessary, and stabilizing stream banks with seed and mulch. Closure level 5 treatment would also include seeding disturbed areas. Roads would be treated for weeds prior to disturbance.
Major Culvert Removal in Johnson Creek	Four road- stream crossings (culverts) on Johnson Creek with deep fills 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 culverts, and re-creating a 14' wide 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 Johnson 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	Roads 53041 and 53052 would be "storm-proofed" and stored (Lolo closure level 3). 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 the same as for recontouring/outslope treatments (Closure level 5)..
Culvert Installation	Two 18" plastic culverts on Roads 53039 and 53041 were burned in the fire, and are vulnerable to collapse. They would be replaced with 18 inch corrugated metal pipe culverts. One 24" culvert on Road #53037, necessary for the long-term transportation system, is undersized to accommodate pre- and post-fire runoff scenarios, and would be replaced with a 36" CMP culvert.

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 $96,000.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		$8,000.00	1	$8,000
Road Decommissioning, Level 5	miles	$8,000	6.2	$49,600
Hourly Excavator	Hours	$125	40	$5,000
Road Storage, Level 3	miles	$6,000	1.54	$9,240
Culvert Replacement	feet	$70	106	$7,420
Contract Total				**$79,260**
Contract Administration	hour	$50.00	200	$10,000
Contracting Officer	day	$430	10	$4,300
Contract Preparation	day	$430	5	$2,150
Total Funding Request				**$95,710**

Proposed Land Treatment - Weed Treatment Strategy

The land where the West Riverside fire primarily occurred was acquired earlier this year (2011) from a private timber harvesting company. The area was heavily impacted prior to the fire from timber harvesting activities and subsequent weeds infestation. The recent West Riverside 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. In addition, just outside of the fire perimeter, the newly acquired lands in sections 2 and 11 are also highly infested. These areas pose a threat to burn as an immediate seed source as well. A dozer line was constructed in section 1 (newly acquired) that tied in to a road with a Dalmatian toadflax infestation.

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 2012 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 ($1,722). The post fire inventory of the interior of the fire revealed small, scattered infestations of Dalmatian toadflax intermixed with a strong native and desired vegetation component. The most effective treatments for Dalmatian toadflax include the release of the biological control agent *Mencinus janthinus* or a heavy application of herbicide. *Mencinus* is present in the burn area and additional releases would be recommended on sites with dense infestations. The herbicide prescription to control Dalmatian toadflax would render the surrounding area inhabitable by any other plant species and would require follow-up revegetation efforts **if a broadcast herbicide treatment were prescribed**.

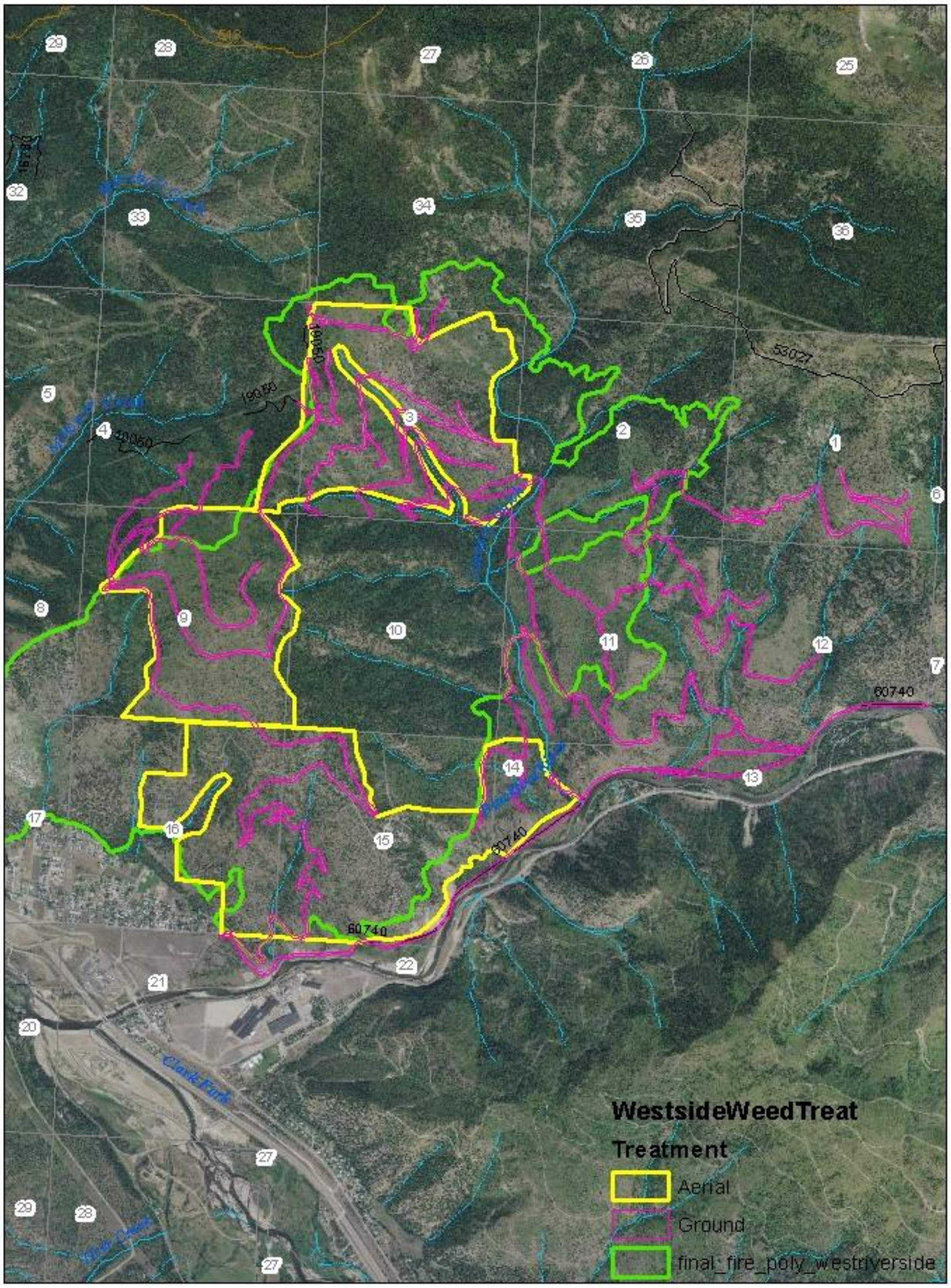
It is recommended **to immediately** target Dalmatian toadflax plants strategically as individuals in order to preserve the new growth of native plants and other preferred vegetation. This would require having a team of backpack sprayers canvassing the burned area and spraying the herbicide directly on individual plants. In order to accomplish this effectively, it is estimated a team of 5 employees would be needed to hike through the burn, identify Dalmatian toadflax, take a GPS reading, and treat the plant for 30 days. The GPS location would be used for future monitoring. The treatment would consist of an application of Tordon at 1.5 quarts per acre. The use of Tordon would provide a residual effect to prevent any new seedlings of Dalmatian toadflax to establish. The team would also survey the area for other weed species and spot treat these weed infestations with the same precision approach as the Dalmatian toadflax to ensure further protection to native and preferred vegetation communities. It would be expected the crew could treat up to 0.5 acres per day per person which would ultimately equate to 75 acres wetted; however, considering only individual plants are being treated (1 ft^2) this would cover most of the burned area (3,703 acres). This treatment would cost $31,150 and would be accomplished with through a partnership agreement (already in place**). It is recognized that treatment must be completed within the next several weeks (within one year of fire containment).**

Ground treatments would occur for spotted knapweed along the road sides (up to 40 feet either side) with 1 pint/acre of picloram for 290 acres (58 miles). This treatment would provide immediate suppression of fall growth and a residual treatment for spring growth for spotted knapweed and new growth of other potential invaders. This treatment would cost $9,280.00 and would be accomplished with an IDIQ contract (already in place).This treatment has been accomplished as of 11/09/2012.

Roads slated for decommissioning would have at least one treatment prior to decommissioning efforts; amounting to approximately 40 acres ($2,176). These roads would be the highest priority to treat this fall. 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. This treatment has been accomplished as of 11/09/2012.

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 (2012). This treatment has been accomplished as of 06/17/2012.

Proposed Weed Treatment Map Units



Effective treatment for cheatgrass is still being explored. Cheatgrass infestations would be monitored until a solution for control becomes available. Initial monitoring efforts would include establishing monitoring points and collecting data. An existing agreement with the University of Montana/Peter Rice to monitor the efficacy of the herbicide treatments would be utilized for the monitoring. Each plot is $600 to establish and collect frequency data. We would like to install at least 3 sites possibly 5 within the burned area perimeter. This would cost approximately $3000. Funding sources for subsequent years would be sought through grants and NFS funds. Re-monitoring cost would be lower than the initial establishment ($500/plot).

Table 8. Proposed emergency treatments for weed related risks (contract admin included with engineering costs)

Description	Estimated Acres	Target Weed Species	Prescription	Cost
Ground Application	290	Spotted knapweed, other	1 pt/acre	$9,280.00

(broadcast)		broadleaf road side weeds	Picloram	
Ground Application (spot)	100	Dalmatian toadflax	¾ pints/acre of Chlorsulfuron	$4,300.00
Total Herbicide				$13,580.00
Total Survey/Inventory	7 days		Spring regrowth monitoring	$1,722
Total Herbicide Efficacy Monitoring	3 – 5 sites		Initial set up	$3,000
Salary/Labor – crew	150 days (5 people 30 days)		Spot spray backpack treatment	$26,250
Salaries – FS	10 days		Administrative and ground assistance	$2,300
Herbicide supplies	30 gallons	Dalmatian toadflax	1.5 quarts/acre of picloram	$2,600
Total Backpack Treatment				$31,150
Total				~~$18,302~~$49,452

I. Monitoring Narrative: The Region will initiate Level II monitoring to further improve post fire runoff estimates. This activity has been discussed with the Regional Coordinator and will help to improve post fire flow estimates throughout western Montana. One stream reference site will be established on Johnson Creek. Pre- and post-snowmelt runoff and summer rain event channel cross-sections and gradients will be surveyed to validate runoff modeling projections made.

Weed monitoring (assessment) will be conducted in the spring of 2012 to determine areas where weeds have spread into previously uninfected areas. An interim request for BAER funding support will be made (if needed) following this assessment. This is still in process.

Part VI – Emergency Stabilization Treatments and Source of Funds

Line Items	Units	Unit Cost	# of Units	BAER $	Other $
A. Land Treatments					
Weed herbicide treatment – ground	AC	$32	290	$22,580	
Weed Survey/Inventory (fall)	Days	$246	7	$1,722	
Weed herbicide backpack treatment	Lump			$31,150	
Subtotal Land Treatments				~~$24,302~~$55,452	
B. Roads					
Road Recontour and Culvert Removal	mile	$9559.43	7.74	$73,990	
Install drainage structures	ft	70	106	$7,420	
Road Contract Admin - Engineering	hour	50	200	$10,000	
Road Contract – Contracting Officer	day	$430	10	$4,300	
Subtotal Roads and Trails				$95,710	
C. BAER Evaluation					
Assessment (person days)	day	400	15	$6,000	
Travel costs	LS	120	2	$240	
Subtotal Evaluation				**$6,240**	
D. Monitoring					
Weed monitoring (spring 2012 assessment)	DAYS	375	6	$3,000	
Stream reference and discharge monitoring	DAYS	400	8	$3,200	
Subtotal Monitoring				$6,200	
Total for this request				**$126,212**	
Total for interim request				**$31,150**	

PART VII - APPROVALS

1. ________________________ ________________

Forest Supervisor Date

2. ________________________ ________________

Regional Forester Date