# MUSTANG COMPLEX FIRE

# FS-2500-8
# BURNED-AREA REPORT

SALMON-CHALLIS NATIONAL FOREST

INTERIM FUNDING REQUEST #1
OCTOBER 16, 2012

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

Date of Report: **10/16/12**

**BURNED-AREA REPORT**
(Reference FSH 2509.13)

## PART I - TYPE OF REQUEST

A. Type of Report

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

B. Type of Action

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

[**X**] 2. Interim Report **#1** (*Additions and updates since initial request are shown in blue text*)
[**X**] 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

*Conditions as of 9/7/12 (date of most recent BARC map) within the Salmon-Challis NF, unless otherwise specified*

A. Fire Name: Mustang Complex (SCNF portion) B. Fire Number: ID-SCF-012190

C. State: Idaho D. County: Lemhi

E. Region: 4 F. Forest: Salmon-Challis National Forest

G. District: North Fork H. Fire Incident Job Code: P4G4A0 (0413)

I. Date Fire Started: July 30, 2012 J. Date Fire Contained: 65% contained as of 10/12/12
Estimated containment date: 10/30/12

K. Suppression Cost: $38,323,413 (as of 10/12/12)

L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles): 26 miles of dozer line rehabilitated (waterbars where needed)
5 miles of hand line rehabilitated (waterbars where needed)
2. Fireline seeded (miles): 11 miles of dozer line seeded
3. Other (identify):

M. Watershed Number (for burned watersheds within the Salmon-Challis NF boundary only):

| 5th level HUC | 6th level HUC | 6th level Watershed Name | Watershed size (acres) | Percent of watershed within burn perimeter |
|---|---|---|---|---|
| North Fork Salmon River 1706020306 | 170602030605 | Hughes Creek | 26,111 | 47 |
| | 170602030606 | Lower North Fork Salmon River | 22,294 | 50 |
| Indian Creek-Salmon River 1706020307 | 170602030701 | Dump Creek-Salmon River | 18,274 | 35 |
| | 170602030703 | Indian Creek | 34,649 | 89 |
| | 170602030704 | Squaw Creek | 10,975 | 100 |
| | 170602030705 | East Boulder Creek-Salmon River | 19,313 | 29 |
| Pine Creek-Salmon River 1706020308 | 170602030801 | Spring Creek | 12,100 | 100 |
| | 170602030802 | Boulder Creek-Salmon River | 21,577 | 63 |
| | 170602030804 | Big Sheepeater Creek-Salmon River | 12,565 | 75 |
| Owl Creek-Salmon River 1706020313 | 170602031301 | Owl Creek | 34,433 | 100 |
| | 170602031302 | Cove Creek-Salmon River | 12,101 | 68 |
| | 170602031303 | Colson Creek-Salmon River | 18,629 | 57 |
| Horse Creek 1706020701 | 170602070101 | Upper Horse Creek | 19,389 | 25 |
| | 170602070102 | Reynolds Creek | 11,167 | 29 |
| | 170602070103 | Middle Horse Creek | 13,926 | 73 |
| | 170602070104 | Little Horse Creek | 13,052 | 100 |
| | 170602070105 | West Fork Horse Creek | 13,594 | 90 |
| | 170602070106 | Lower Horse Creek | 19,672 | 99 |
| Cottonwood Creek-Salmon River 1706020702 | 170602070202 | Bear Basin Creek-Salmon River | 14,257 | 63 |
| | 170602070203 | Corn Creek-Salmon River | 18,414 | 60 |

N. Total Acres Burned (as of 9/25/12):

| | NFS Acres | State | Private | TOTAL |
|---|---|---|---|---|
| Salmon-Challis NF | 246,740 | 0 | 1722 | 248,462 |
| Bitterroot NF | | | | 89,857 |
| TOTAL | | | | 338,319 |

**This report considers only the acres burned within the Salmon-Challis National Forest boundary. Acres shown are based on the 9/25/12 fire perimeter. The fire has burned an additional 3,000 acres since 9/25/12, primarily outside of the SCNF boundary.*

O. Vegetation Types: The fire area spans many vegetation types at elevations of 2875 to 8909 feet. Forested areas include Ponderosa Pine and Douglas Fir at lower elevations, and Lodgepole Pine and Subalpine Fir at higher elevations. Non-forested areas include Mountain Mahogany, Sagebrush, and Bunchgrass.

P. Dominant Soils: The Salmon River "Breaks" area includes steep, highly dissected landforms with highly erodible soils. Soils within this area are moderately deep, coarse-textured sandy loams with high rock fragment content. Source areas are mostly granitic, with some areas of quartzite. Granitic landtypes cover the western portion of the burned area, including the lower portion of Indian Creek and all watersheds to the west of Indian Creek. Quartzite landtypes generally cover the eastern portion of the burned area, including Hughes Creek, Hull Creek, and the upper portion of the Indian Creek watershed. The soils in the quartzite landtypes are much more stable than those within the granitic landtypes. Granitic soils are highly erodible, and decomposed granite produces large quantities of sand sized sediment.

Q. Geologic Types: Granitics, Metamorphics, Quartzites

R. Miles of Stream Channels by Order or Class: Perennial: 445 Intermittent: 351

S. Transportation System

Trails: 27 miles motorized 106 miles non-motorized

Roads: 185 miles open system 177 miles closed system 334 miles unclassified (U-Routes)

## PART III - WATERSHED CONDITION

A. Burn Severity (acres): 77,442 (low) 57,604 (moderate) 45,309 (high) 67,962 (Unburned / no data*)

** BARC imagery was obtained on 8/22/12, 9/7/12, 9/18/12, and 9/19/12. An error in the satellite sensor created strips of 'no data'. A final product was created by putting together a "mosaic" of the 4 datasets, providing nearly full coverage because the strips didn't occur in the same place on each flight. Small areas of 'no data' still exist, particularly on the eastern end of the fire where more recent fire (primarily low intensity burn) occurred.*

** Field review indicates high accuracy of burn intensity data from the BARC imagery. Burn severity was derived from the BARC burn intensity data through soil sampling of representative sites. High intensity burn areas in lodgepole, subalpine fir, and douglas fir showed high burn severity. High intensity burn areas in ponderosa pine and other cover types typically showed moderate burn severities. A burn severity map was created to reflect these observations.*

Burn severity for watersheds of concern

| Watershed | Watershed size (acres) | Burn Severity (acres / percent) | | | |
|---|---|---|---|---|---|
| | | Low | Moderate | High | Unburned and no data |
| Corn Creek | 5733 | 1494 / 26 | 1275 / 22 | 1857 / 33 | 1095 / 19 |
| Colson Creek | 6911 | 1581 / 23 | 2560 / 37 | 2588 / 37 | 177 / 3 |
| Owl Creek | 34,432 | 9760 / 28 | 12,207 / 36 | 9101 / 27 | 3223 / 9 |
| Boulder Creek | 8990 | 2311 / 26 | 2950 / 33 | 3093 / 34 | 632 / 7 |
| Spring Creek | 12,100 | 3368 / 28 | 4347 / 36 | 3612 / 30 | 769 / 6 |
| Squaw Creek | 10,941 | 3555 / 32 | 2563 / 23 | 2545 / 23 | 2278 / 21 |
| Indian Creek | 30,698 | 9259 / 30 | 8098 / 26 | 7977 / 26 | 5364 / 18 |

B. Water-Repellent Soil (acres): 45,309*

** This figure is reported as the area of high burn severity based on field sampling.*

C. Soil Erosion Hazard Rating* (acres):

| Landtype Erosion Hazard Rating | Total acres | Percent of burned area |
|---|---|---|
| Low | 17,087 | 7% |
| Moderate | 91,276 | 37% |
| High | 102,179 | 41% |
| Very High | 37,071 | 15% |
| **Total** | **247,613** | |

**Acres are based on the Landtype Erosion Hazard attribute in the Landtypes GIS database.*

D. Erosion Potential: 3.9 – 5.6 tons/acre *

** Based on ERMiT modeling for high burn severity on representative slopes, at the 20% probability that the sediment yield will be exceeded (see hydrology/soils specialist report).*

E. Sediment Potential: 1851 – 2658 cubic yards / square mile

## PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period (years): 1-3 (grasses). 2-5 (woody), 10-50 (conifers)

B. Design Chance of Success (percent): 80

C. Equivalent Design Recurrence Interval (years): 5 year

D. Design Storm Duration (hours): 30 minute

E. Design Storm Magnitude (inches): 0.7 to 1.2 inches

F. Design Flow (cubic feet / second/ square mile): 15 - 30

G. Estimated Reduction in Infiltration (percent): 23% - 37% (in watersheds of concern)
*(based on water repellant soil acres)*

H. Adjusted Design Flow (cfs per square mile): 19 – 41

Pre- and post-fire flood magnitudes for streams of concern in the burn area, based on streamflow modeling using *Fire Hydrology Version 1.3* (see hydrology/soils specialist report).

| Stream/Location | Flow recurrence interval (yrs) | Watershed size (sq mi) | Pre-fire flow (cfs / cfs/sqmi) | Post-fire flow (cfs / cfs/sqmi) | Percent increase in flow |
|---|---|---|---|---|---|
| Corn Creek at Mouth | 5 | 8.9 | 130 / 15 | 650 / 73 | 400% |
| Colson Creek at Mouth | 5 | 10.7 | 105 / 10 | 579 / 54 | 451% |
| Owl Creek at Mouth | 5 | 53.8 | 661 / 12 | 2100 / 39 | 218% |
| Boulder Creek at Mouth | 5 | 14.1 | 192 / 14 | 787 / 56 | 310% |
| Spring Creek at Mouth | 5 | 18.9 | 216 / 11 | 828 / 44 | 283% |
| Squaw Creek at Mouth | 5 | 16.9 | 195 / 12 | 654 / 39 | 235% |
| Indian Creek at Mouth | 5 | 54.1 | 564 / 10 | 1865 / 35 | 231% |

## PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:

**GENERAL DESCRIPTION** _____

The Mustang Complex Fire has burned a large area between the Salmon River to the south, the Continental Divide to the north, Sabe Creek to the west, and the Highway 93 corridor to the east. The majority of the fire is within the Salmon-Challis National Forest, but the fire has also spread north of the continental divide and west into the Bitterroot National Forest. The western portion (approximately 25%) of the fire is within wilderness, and the eastern portion of the fire is in non-wilderness, including urban areas along the Salmon River Road and around the communities of North Fork and Gibbonsville.

Numerous critical values and resources are present within the fire perimeter. Forest Service infrastructure includes numerous roads, trails, bridges, campgrounds, day use areas, boat launches, guard stations, and lookouts. Resource values include fisheries, wildlife, soil productivity, hydrologic function, native plant communities, and historic and prehistoric cultural sites. Non-Forest Service values include private residences, water supplies (domestic, hydropower, and irrigation), outfitter camps, mining claims, and range improvements. The fire has affected the corridors along the Salmon River Road and Highway 93. These corridors are both vitally important as access to private residences, private and commercial recreational uses, hunting and fishing opportunities, and other economic values.

Post-fire threats within the burned area include flooding, debris flows, rockfall, hazard trees, and invasive plants. These threats have the potential to impact all of the critical values and resources listed above. Summer thunderstorms in the Salmon River Corridor generally track west to east up the canyon, building intensity along the way. Blackened ground in burned areas can intensify the magnitude of these storms. Very high intensity rainstorms can result when these storms track along the axis of a particular watershed, and these types of events have produced very large floods in the past.

**BAER CRITICAL VALUES** _____

## Human Life and Safety

### Human life and safety on or in close proximity to burned NFS lands

Probability and consequences are estimated by the types of threats to Human Life and Safety

**Hazard Trees**_____**Possible probability/Major consequences … High risk**
Structurally compromised hazard trees exist as a result of the fire along numerous roads, trails, and recreation sites within the burned area, particularly in areas that burned with moderate and high intensities. These hazard trees will remain a threat to Forest users for a period of several years as root systems decay. The sudden onset of gusty winds can occur during thunderstorms, causing trees to fall.

**Floods and Debris**_____**Likely probability/Major consequences … Very High risk**
Flash floods, debris flows, and rockfall are likely to occur as a result of the fire, with the greatest risk occurring in the bottoms and mouths of drainages and below steep slopes. Many roads and trails are located in these types of areas, downstream from moderate and high severity burned areas. Typical high intensity, short duration thunderstorms that track up the Salmon River canyon can quickly produce flash floods as a result of the hydrophobic soils and lack of vegetation. Much of the Salmon River Breaks area includes dissected landscapes with very steep slopes. Storms are likely to result in high hillslope erosion rates, which may also cause rockfall onto trails, roads, the Salmon River Road, and recreation sites. Falling trees can also initiate rockfall. Winter avalanches are also likely to occur with increased frequency as a result of the fire. This is likely to impact human safety and access along the Salmon River Road.

**Loss of Access**_____**Likely probability/Moderate consequences … High risk**
The Salmon River Road accesses private properties, commercial businesses, and developed Forest Service recreation sites. This road provides the only roaded access to areas downstream of Panther Creek, including boat launches, campgrounds, lodges, and private residences. The mouths of numerous steep drainages cross the Salmon River Road. These drainages have a high likelihood of producing large floods or debris flows that could potentially bury or cut through the road. Historically, this has happened numerous times as a result of post-fire floods as well as non-fire related floods. In addition to loss of revenue for businesses, loss of access to these areas would be detrimental to the safety of Forest users as well as residents, who could become trapped for a period of time. Likewise, trail or trail bridge washouts resulting from post-fire floods could also potentially affect access to outfitter camps.

## Property

### Buildings, water systems, utility systems, road and trail prisms, dams, wells or other significant investments on or in close proximity to burned NFS lands

**Colson Creek Road system**_____**Very Likely probability/Moderate consequences … Very High risk**
Nearly the entire Colson Creek watershed was burned during the Mustang Complex Fire. Much of the riparian area is unburned, while high severity burns occurred on the steeper slopes. Numerous critical values and resources are present within the Colson Creek watershed. Because of the relatively small size of the watershed (6900 acres) and its location within the Salmon River corridor where high intensity summer rainstorms can produce localized intense rainfall, the following BAER critical values are at risk:

- Colson Creek Road: The Colson Creek Road provides access from the mouth of Colson Creek to several private residences along Lower Colson Creek, the Colson Creek Guard Station, the Long Tom Lookout, and the 123 Road accessing Spring Creek. The Colson Creek road crosses Colson Creek 4 times. These culverts are about 40 years old, and they are all 4.5-foot diameter or 5-foot wide by 3-foot high squash pipes at about a 5% gradient. They are all at about a 30-degree angle to the road. The lower culvert has an old concrete diversion structure just upstream of the inlet. These culverts likely have insufficient capacity for post-fire flood events. A tributary from the northwest also crosses the Colson Creek Road at a

3-foot diameter culvert. This tributary drains an area of high severity burn, and a potential post-fire flood would threaten the Colson Creek Road. The riparian area along Colson Creek was only partially burned, but the risk of debris jams during floods at these culverts is high. Potential post-fire risks include debris jams, capture of flow by the road, loss of road fill, sediment delivery downstream, impacts to private properties, and loss of access. Because of the skewed alignments at the crossings and the relatively high valley gradient (approximately 8%), a debris jam could easily route flow onto road and cause extensive road damage and sediment delivery at any of these crossings. This risk is particularly high on this road because of the insloping of the road, the outer berms, the lack of drainage features on the road, and the erodible nature of the road material. The road is also located very close to Colson Creek in many places between the Forest Service boundary and the first switchback (3 miles). Flow concentration from increased runoff from hillslopes and draws could also greatly affect the road.

- Additional Roads: Numerous closed system roads are located in the Colson Creek watershed, originally constructed for timber activities. Roads 438 and 439 each cross Colson Creek with a 6-foot diameter culvert overtopped by about 3 feet of fill. These crossings are at high risk of failure during post-fire floods or debris jams. Overtopping of these roads would not route water down the Colson Creek Road, but would contribute to high sediment and debris loads. Road 440 also crosses a small tributary from the northeast with a 3-foot culvert. This tributary drains an area of high severity burn, and a post-fire flood would threaten this road and potentially route additional flow onto the Colson Creek Road.
- Colson Creek Guard Station: The Colson Creek Guard Station is accessed via a short spur road off the Colson Creek Road. This spur includes another 4.5-foot diameter culvert on Colson Creek. This culvert is also undersized for post-fire floods, with similar risks as discussed above. The Guard Station itself is a cultural site located on a low bench along the creek that is at risk if a debris jam were to occur at the culvert or further upstream.
- Salmon River Road bridge: The Colson Creek bridge on the Salmon River Road is an 18-foot wooden bridge with about 7 feet of freeboard over the bankfull stage. Poor alignment, channel constriction, and artificial debris under the bridge (including a fence and multiple diversion structures) could contribute to development of a debris jam during a post-fire flood event, which could impact the road as well as numerous residences downstream. The Salmon River Road provides important access to properties, boat launches, and trailheads between Colson Creek and the end of the road at Corn Creek.

**Salmon River Road_____Likely probability/Major consequences … Very High risk**

The Mustang Complex Fire burned to the Salmon River Road along most of its length. The Salmon River Road is a Forest Service road that provides an important link between the community of North Fork and the numerous residences, businesses, boat launches, trailheads, and recreational and economic opportunities between North Fork and the end of the road at Corn Creek. Ingress and egress are at risk along the Salmon River Road, as it crosses the mouths of many drainages that are susceptible to large storm events. In many cases, private year-round residences are located at the mouths of these drainages, on their alluvial fans, or within floodplains within the valley floors. Terrain along the road includes very steep, rocky hillslopes, small steep watersheds, and alluvial fans at the mouths of larger watersheds.

It is expected that although the burn severity on most of these steep hillslopes along the road was low, post-fire impacts along the Salmon River Road will likely include rockfall, mudslides, fallen trees, and general hillslope erosion onto the road. Larger watersheds that include higher severity burns could also potentially produce debris flows that could affect the road. The first 17-mile section of the road is paved and includes a well defined inside ditch that functions primarily as a rock catcher. The remaining 30 miles does not include an inside ditch. The risk to human safety along this road is high from objects falling onto the road, particularly if the inside ditch fills with material. The risk of improper drainage impacting the road is also high if drainage structures and culverts are not maintained.

Large flood events commonly impact the Salmon River Road as a result of post-fire runoff as well as "normal" flow events. The Cramer Fire of 2003 resulted in a large debris flow event on Cramer Creek that covered the road with boulders and debris, and created a large new rapid in the Salmon River. This debris flow bypassed the existing 2-foot diameter culvert. Likewise, a 2003 post-fire flood event on Long Tom Creek buried the road in 5 to 10 feet of debris and blew the existing culvert into the Salmon River. A culvert or bridge that would pass such an event would be nearly impossible to construct because of topographic

constraints in these areas. Because these types of events typically deposit material on the road rather than blowing out the road, the highest risk occurs when debris flow deposits block the existing culvert, causing subsequent streamflows to erode into the road fill.

**Other Forest Roads_____Likely probability/Moderate consequences … High risk**
Portions of Forest Service roads located within areas of moderate and high burn severity, as well as road segments located adjacent to or crossing stream channels that drain areas of moderate and high burn severity are at risk of increased erosion or damage during post-fire runoff events. Mid-slope roads are susceptible to increased soil deposition, mudslides, rockfall, and increased runoff onto the road surface. Most of the roads in the burned area do not have adequate drainage features such as rolling dips and outsloping, and these roads are susceptible to concentation of flows on the road surface, gullying, and loss of the road. Some roads have inside ditches with relief culverts, which are susceptible to failure as a result of increased erosion. The Spring Creek Road, Squaw Creek Road, Indian Creek Road, and Sage Creek Road are all important at-risk Forest Roads within the burned area that provide access to private property, outfitter camps, and mining claims. Many of these roads have bridges and culverts over streams that are at risk of post-fire flooding. The Indian Creek Road includes 7 bridge crossings over Indian Creek.

**Forest Trails_____Likely probability/Moderate consequences … High risk**
A total of 176.6 miles of trail are located within the burned area of the Mustang Complex Fire. 71.5 miles of those trails are located in areas that burned at moderate and severe intensities. These trails are at risk of severe erosion resulting from increased post-fire runoff and sediment erosion on the hillslopes above them. Without functional drainage structures, trails can alter hillslope drainage, causing rutting, increased soil loss, and loss of trails. Of the 71.5 miles of trail identified, 55.3 miles are located outside of Wilderness and 16.2 miles are located within Wilderness. More than half of these trails support outfitter-guide use, and loss of these trails would have economic consequences. Trails such as the Owl Creek Trail, East Owl Creek Trail, Horse Creek Trail, Cove Creek Trail, Squaw Creek Trail, and Henderson Ridge Trail have sections that are immediately adjacent to major streams. These trails are at risk of damage by post-fire floods or debris flow events, and they also increase the risk of sedimentation into fish bearing streams as a result of post-fire erosion.

**State Highway 93 _____Unlikely probability/Moderate consequences … Low risk**
The fire burned slopes adjacent to Highway 93 north of North Fork over a distance of about 1 mile. Fire adjacent to the highway was primarily low intensity burn on grassy slopes. These slopes will quickly regenerate, and the risk of slope failure impacting the highway is low. However, increased rockfall and minor sediment erosion are likely to occur for a period of 1 to 2 years following the fire. The highway does not cross any major drainages that experienced considerable moderate or high severity burn.

**Indianola Guard Station_____Possible probability/Moderate consequences … Intermediate risk**
The Indianola Guard Station includes 10 structures in the valley floor at the mouth of Indian Creek, just upstream of the Salmon River Road. A portion of the property is located within a floodplain, and several structures are located immediately adjacent to Indian Creek. Although the stream bank has been pushed up to prevent overbank flood events, most of the property is at risk of flooding during an extreme post-fire flood event. Two footbridges cross Indian Creek at the Guard Station. The upper bridge is a wooden bridge with insufficient freeboard over the creek. It is likely to blow out during a high flow event, and this could in turn damage the lower concrete footbridge.

**Campgrounds/Boat Launches ____ Possible probability/Moderate consequences … Intermediate risk**
Campgrounds at risk as a result of the fire include Spring Creek Campground, Ebenezer Campground, and Corn Creek Campground. The Spring Creek watershed contains extensive moderate and high severity burns. A post-fire flood on Spring Creek could possibly send water through the developed site, potentially impacting two campsites, one water source, a parking area, two outhouses, and the boat ramp. Sediment produced at the mouth of Spring Creek is sure to cause deposition of sediment on the boat ramp because of the close proximity of the channel to the boat ramp. The Ebenezer Creek watershed burned primarily at low and moderate severity, and the channel likely has sufficient capacity for post-fire flood events. Flood risk at the Ebenezer Campground is low. Corn Creek is likely to experience some degree of flooding as a result of

moderate and high burn severity in the upper watershed. The campground is on an alluvial fan terrace above the creek, but possible hazards exist for the two campsites located adjacent to the creek.

## Natural Resources

### Soil Productivity and hydrologic function on burned NFS lands

**Soil Erosion_____Very likely probability/Major consequences … Very High risk**
The Mustang Complex Fire burned through steep terrain. Most of the moderate and high severity burns occurred on moderate and steep slopes in the upper portions of the watersheds, while the riparian areas along the valley floors generally did not burn hot (with some exceptions). The forested areas that burned at low to moderate severity already have excellent ground cover as a result of needle cast, and non-forested areas that burned at low to moderate severity will quickly regenerate grasses that will stabilize the soils. The portions of the upper watersheds with moderate and high burn severity are the locations where soil erosion is most likely to occur as a result of high hillslope gradients, lack of groundcover, and the effects of intense summer rainstorms. Consequences of loss of soil cover include loss of vegetative cover, loss of nutrients, changes in vegetation species composition, impacts to wildlife habitat, decreased infiltration rates in the long term, increased peak flows in the long term, and sedimentation in stream channels.

**Stream Channel Function_____Very likely probability/Moderate consequences … Very High risk**
Extreme flooding hazards exist as a result of the fire in watersheds that experienced large areas of moderate and high burn severities (eg., Corn Creek, Colson Creek, Owl Creek, Cove Creek, Boulder Creek, Spring Creek, Squaw Creek, and Indian Creek). The largest risk to stream channel function in the burned area is from debris flows and excess sedimentation. Many streams consist of primarily transport reaches, such as Colson Creek and Boulder Creek, occupying narrow, relatively steep valleys with limited floodplains. These streams are more resilient to the impacts of high flows because of the confined nature of the channel and the coarse bed material. A debris flow in such a stream would impact riparian vegetation and ecological function, but the stream channel would recover relatively quickly in terms of function. Larger streams such as Spring Creek and Indian Creek have transport reaches in the upper watershed and depositional reaches in the lower watershed, and many of the steeper drainages have depositional reaches on their alluvial fans. Stream channel function in these depositional reaches can be highly impacted by debris flows or excess sedimentation, causing bank erosion, loss of pools, loss of riparian vegetation, and in extreme cases, channel avulsion or changes in channel type. Some stream reaches may experience channel downcutting as a result of high flow events. This can cut off floodplains and alter the balance of transport versus deposition in the long term. The Clear Creek Fire in 2000, located in similar terrain as the Mustang Complex, led to a large debris flow event in Garden Creek that caused severe downcutting on the alluvial fan that will likely persist for decades. A similar event could occur on streams in areas impacted by the Mustang Complex. Extreme flow events can endanger human life, and these types of channel changes can impact property located along streams.

### Critical habitat or suitable occupied habitat for federally listed threatened or endangered terrestrial, aquatic animal or plant species on or in close proximity to burned NFS lands

**Chinook, Steelhead, Bull Trout____Possible probability/Moderate consequences … Intermediate risk**
Designated critical habitat exists for Chinook Salmon, Steelhead, and Bull Trout in a number of drainages in the Mustang Complex burned area, including Owl Creek, Spring Creek, Squaw Creek, and Indian Creek (see table below). These species are all listed as threatened under the Endangered Species Act. Post-fire floods can potentially impact habitat for these species by filling pools and altering channel configuration. The largest impacts are likely to occur where debris flows scour streams and deposit large masses of sediment, or where changes in channel type occur (eg, downcutting). However, these systems rely on some amount of scour and sediment deposition in order to maintain habitat conditions. The Salmon-Challis National Forest has constructed a number of instream log structures in lower Indian Creek to create spawning and rearing habitat for these species. These structures are at risk of damage during post-fire flood events.

Approximate miles of designated critical habitat in the Mustang Fire burned area.

| Stream | Chi-nook | Steel-head | Bull Trout |
|---|---|---|---|
| Horse Creek | 20 | 23 | 30 |
| Wheat Creek | - | - | - |
| Corn Creek | - | - | 7.2 |
| Colson Creek | - | - | 6 |
| Owl Creek | 3 | 5.5 | 14.1 |
| EF Owl Creek | - | 2.7 | 0.5 |
| Boulder Creek | - | 1.4 | - |
| Spring Creek | 0.5 | 2.6 | - |
| EF Spring Creek | - | - | - |
| Squaw Creek | 0.1 | 5.0 | 9.3 |
| Indian Creek | 3.5 | 9.6 | 11.7 |
| WF Indian Creek | - | 1.7 | 3.5 |
| Corral Creek | - | - | 4.7 |
| McConn Creek | - | 2.1 | 5.6 |
| Sage Creek | - | - | - |
| Hull Creek | - | 1.3 | 5.5 |

## Water used for municipal, domestic, hydropower, or agricultural supply or waters with special state or federal designations on or in close proximity to the burned NFS lands

**Irrigation ditches & water supplies__Possible probability/Moderate consequences…Intermediate risk**
The fire did not burn within any municipal watersheds. However, numerous water sources are present on National Forest lands within the burned area, supplying water for public and private uses (see table below). Some of these systems were damaged during the fire, and others are now more susceptible to damage from post-fire flooding and hillslope erosion. Post-fire debris flows and debris jams can damage diversion structures, and increased erosion can alter the water quality of drinking water sources.

| Water Supply | Description and impacts |
|---|---|
| Owl Creek diversion | The diversion structure is susceptible to damage by high post-fire flood events. |
| Colson Creek reservoir | This small reservoir on private land on Colson Creek provides water for irrigation and hydropower and is susceptible to sedimentation or failure. |
| Colson Creek diversions | One diversion structure on Forest Service lands and several on private lands provide irrigation water for Colson Creek residents. These are all susceptible to damage during a high post-fire flood event. |
| Bear Camp Spring | This small spring on Forest Service land provides drinking water for the Long Tom Lookout. The headbox structure was burned during the fire. |
| River of No Return Ranch water supply | This diversion is on Forest Service land on Squaw Creek. The pipeline was burned during the fire. |
| Donnelly Gulch irrigation | This diversion on Forest Service land is susceptible to damage by high post-fire flood events. |
| Indian Creek irrigation/water supply | Diversions for private water supply and the spring box/pipeline for the Indianola water supply are susceptible to damage by high post-fire flood events. |
| Shoup water supply and hydropower | The small dam, diversion, pipeline, and powerhouse that generate electricity for the Shoup property is at high risk of damage by high post-fire flood events. |
| USFS Campgrounds and Boat Ramps | Wells for drinking water exist at Corn Creek Campground, Ebenezer Campground, and Spring Creek Campground. Post-fire impacts are not likely to affect water quality at these water sources. |
| Cummings Lake | Minor impacts from sedimentation may occur in the lake as a result of runoff, but fire severity in the watershed is mostly low. |

**Salmon River Wild and Scenic River _____Possible probability/Minor consequences … Low risk**
The Salmon River is designated as a Wild and Scenic River between the mouth of the North Fork Salmon River and Long Tom Bar. The 46-mile segment from North Fork to Corn Creek is designated as a Recreation River, and the 79-mile segment from Corn Creek to Long Tom Bar is designated a Wild River. The fire burned down to the Salmon River Road or the Salmon River along 43 miles and burned numerous watersheds draining into this section. The impacts of the fire are likely to produce short term impacts to the recreational values of the river, such as increased river hazards and channel changes. No treatments would be done to mitigate any of these impacts, as fire is a natural part of this ecosystem.

## Native or naturalized communities on NFS lands where invasive species or noxious weeds are absent or present only in minor amounts

**Spread of Invasive Species _____ Very likely probability/Major consequences … Very High risk**
The Mustang Complex Fire has burned in a mosaic pattern with a full range of burn intensities from very high to unburned in discontinuous patches. Invasive plant species present a concern with respect to the goal of retaining native plant communities in order to maintain the structure and function of the local ecosystem. Most of the invasive plant species that occur within the fire perimeter are well-adapted to fire. These species respond favorably to fire events and often spread rapidly after fire. The invasive plant species identified in the fire area listed on the Idaho statewide containment list, Idaho statewide control list, and/or Lemhi County Cooperative Weed Management Area (CWMA) invasive list are shown in the table below.

Invasive plant species present in the area burned by the Mustang Complex fire.

| Species | Idaho Statewide containment list | Idaho Statewide control list | Lemhi County CWMA Invasive List |
|---|---|---|---|
| Spotted knapweed | X | | X |
| Sulphur cinquefoil | | | X |
| Rush skeletonweed | X | | X |
| Hoary alyssum | X | | X |
| Canada thistle | X | | X |
| Houndstongue | X | | X |
| Common St. Johnswort | | | X |
| Dalmatian toadflax | X | | X |
| Knotweed | | X | X |
| Oxeye daisy | X | | X |
| Punctureveine | | | X |

The potential for establishment and spread of invasive plant species in the burn area is very high. Many known, mapped infestations found within the fire perimeter occur along or near roads. Since many of the roads and trails are open year-round to motorized vehicles, these travel routes continually re-infest with invasive plants. There are a number of infestations of weed species that are top priority for eradication growing along or near some of these open roads. Although these sites are treated annually for eradication and to deplete the seed bank, the potential of vectoring invasive species into the burn area via motor vehicles is still very high.

There are, however, other vectors as well for weed seeds, including domestic cattle, wildlife species, wind and water. In the case of rush skeletonweed, wind is a primary vector. Another species, sulphur cinquefoil, is spread by rodents and small birds. Sulphur cinquefoil spreads rapidly and is highly competitive; it can even out-compete spotted knapweed and has no forage value to wild ungulates. These two species, rush skeletonweed and sulphur cinquefoil, have a very high potential for disrupting native plant community re-establishment in areas otherwise uninfested by noxious weeds.

Spotted knapweed is the primary weed in the Mustang fire area. It is widely distributed throughout the burn area and is heaviest in areas where timber was harvested and along roads. For this reason, spotted knapweed is treated mainly via biological control except at administrative sites, developed and dispersed recreation sites and along roads where herbicides are used. Hoary alyssum and Canada thistle are also distributed widely in some locales. These species are controlled with herbicides primarily at administrative sites, developed and dispersed recreation sites and along roads.

Other invasive plant species with a more recent origin include houndstongue and sulphur cinquefoil. Infestations of these species are treated regularly with the objective of (1) eradication of small or isolated infestations and (2) arrested spread and substantially reduced plant cover in larger infestations. These objectives have been met overall and weed cover in these infestations is low to very low. However, there are "hot spots" and seedbanks associated with most of these infestations.

There are a number of new invaders within the Mustang fire area, including Common St. Johnswort, Dalmatian toadflax, knotweed, rush skeletonweed, oxeye daisy, and puncturevine. Infestations of each of these species are treated with herbicides with an eradication objective.

The combination of known weed species' presence, high road and fireline density and the high motorized traffic use combined with the vulnerable post fire condition of the soil and vegetation resources puts the recovery of native plant communities within the burn area at a high risk of derailing. The Risk Rating table below depicts the risk rating to native or naturalized communities by each of the weed species presently known to occur within the Mustang fire area.

| **Probability of Damage or Loss** | **Magnitude of Consequences** | | |
|---|---|---|---|
| | Major | Moderate | Minor |
| | **RISK** | | |
| Very Likely | Rush Skeletonweed, Sulphur Cinquefoil = Very High | Spotted Knapweed = Very High | Canada Thistle = Low |
| Likely | Houndstongue, Knotweed, Oxeye Daisy = High | Common St. Johnswort, Hoary Alyssum = High | Low |
| Possible | Leafy Spurge, Puncturevine = Intermediate | Dalmatian Toadflax, Yellow Toadflax = Intermediate | Musk Thistle = Low |
| Unlikely | Diffuse Knapweed = Low | Low | Henbane = Very Low |

## Cultural and Heritage Resources

### Cultural resources on NFS lands which are listed on or potentially eligible for the National Register of Historic Places

**Historic Guard Stations _____ Possible probability/Moderate consequences … Intermediate risk**
The Indianola Guard Station (described under Property) includes 10 historic structures at the mouth of Indian Creek. This guard station is at risk from high post-fire flood events on Indian Creek. The Colson Creek Guard Station (described under 'Property') includes two historic structures and a corral along Colson Creek. This guard station is at risk from high post-fire flood events on Colson Creek.

**Other Historic/Prehistoric Sites ___Possible probability/Moderate consequences … Intermediate risk**
A number of historic and prehistoric cultural sites are located in the Owl Creek, Boulder Creek, Spring Creek, Squaw Creek, and Indian Creek drainages, primarily along the Salmon River Road at the mouths of these drainages. This area includes a rich mining history with easy roadside access to many historic mine sites.

The Salmon River canyon is also rich in prehistoric sites, including intact prehistoric villages. It is likely that numerous unknown sites exist within the burned area, as only a small portion of the area outside of the Salmon River Road corridor has been surveyed for cultural resources. Post-fire risks to these sites include increased susceptibility to soil erosion and flooding, as well as increased susceptibility to looting as a result of increased visibility from vegetation loss. The table below shows some of the sites that are eligible for the historic register and may be at risk as a result of the fire.

| Drainage | Site | Notes |
|---|---|---|
| Owl Creek | Owl Creek Upper Campsite | Lithic Scatter/village |
| | Owl Cr Lower Campsite | Lithic Scatter/village |
| | Golden Boulder Campsite | Lithic Scatter/village |
| Boulder Creek | Shoup | Townsite with 5 buildings |
| | | Mine |
| | | Dump |
| | Boulder Basin | Dump |
| | Boulder Creek Mine | 2 Cabins, outbuildings & mining |
| Spring Creek | Spring Creek | Homestead, grave & lithic scatter |
| Squaw Creek | | Ruins |
| | Squaw Creek Powderhouse | concrete structure |
| | CCC Campsite | ruins with standing chimney |
| Indian Creek | Indian Cr Cabin 1 | cabin with outbuildings |
| | Indian Cr Cabin 2 | cabin with outbuildings |
| | Indian Creek Lithic Scatter | |

**OTHER CRITICAL VALUES** _____

**Colson Creek Private residences____Likely probability/Major consequences…Very High risk**
The year-round private residences at the mouth of Colson Creek are at high risk because of the large amount of moderate and high severity burn in the watershed (74 percent of the watershed). Approximately 15 parcels downstream of the bridge and several upstream of the bridge are at risk of a large post-fire flood event. The properties downstream of the bridge are all constructed on an alluvial fan, and several properties are located immediately adjacent to the channel. A large flood could carry water and debris in almost any direction on the fan. Several residences upstream of the bridge are located adjecent to the stream channel. Upstream of the bridge, several structures are on private property in the lower end of the canyon, including a small reservoir on Colson Creek, an undersized culvert on Colson Creek, a footbridge accessing a cabin, and 2 wooden vehicle bridges accessing small cabins. All of these structures are at risk if a large post-fire flood event were to occur, particularly if it carries a lot of debris. The vehicle bridges and culvert likely do not have sufficient capacity for the expected flows. The reservoir could provide some flood attenuation, but also presents a large risk to downstream properties if it were to be breached. The reservoir is a source of hydropower, as well as irrigation and domestic water for downstream residents.

**Owl Creek Private residences _____ Possible probability/Major consequences … High risk**
Several properties at the mouth of Owl Creek, located at the mouth of the canyon as well as on the alluvial fan, are at high risk of damage if a large post-fire flood event were to occur. 63 percent of this watershed burned at moderate and high severity, but its large size (34,432 acres) diminishes the effect of typical localized summer rainfall events. Some structures are immediately adjacent to Owl Creek, while others are on a higher bench surface above the creek. Debris jams or debris flow deposition could route flood flows onto the surface of the alluvial fan. The riparian area is relatively intact and can help to dissipate energy during flood events.

**Boulder Creek Private residences _____ Possible probability/Major consequences … High risk**
The Shoup townsite is located at the mouth of Boulder Creek at the Salmon River Road. Shoup consists of 5 historic buildings that are privately owned, but on Forest Service land, including the Shoup Store (and gas station), some cabins, and a hydroelectric powerhouse. Additional developments are present on private land in the narrow canyon upstream of Shoup, including a road, campground, hydropower diversion, and additional historic structures. 67 percent of this watershed burned at moderate and high severity. Some of these

structures are at risk if a large post-fire flood event were to occur, particularly the hydropower infrastructure, the powerhouse, and the road.

**Spring Creek Private residences _____ Possible probability/Major consequences … High risk**
Several private residences are located along Spring Creek in a residential area about 2 miles upstream of the mouth. One of these residences, located a the mouth of East Fork Spring Creek, is at high risk of flooding from the East Fork. The other residences along Spring Creek are at low risk of flooding, although a few low bridges are located over the channel. 66 percent of the Spring Creek watershed burned at moderate and high severity.

**Indian Creek Private residences _____ Possible probability/Major consequences … High risk**
Numerous private residences are located along the lower 3 miles of Indian Creek, and other private inholdings exist further upstream. 52 percent of this watershed burned at moderate and high severity, and some of these structures are at risk if a high post-fire flood event were to occur. The county bridges on FS Road #036 provide adequate passage for most flood events, but a large flood event in Indian Creek could cut off access for private residents. One private driveway crosses Indian Creek and its floodplain with a low bridge that would likely be impacted by a large post-fire flood event.

**Other Private residences _____Unlikely probability/Moderate consequences … Low risk**
Additional private residences are located along the Salmon River Road, below steep hillsides and small, steep drainages. These smaller drainages did not burn as hot as the more heavily timbered areas in the upper elevations of the larger watersheds, and recovery will occur much faster. Nevertheless, some of these properties are continually affected by flooding, and these impacts could become worse in the short term as a result of the fire. Similar conditions exist for private residences located along the Highway Corridor north of North Fork, and in the Hull Creek and Hughes Creek drainages. Large scale post-fire flooding is not likely to occur in these areas because of the low burn severity in these watersheds. Private property at the Gattin Ranch is surrounded by fire impacts from the Mustang Complex as well as the 2011 Saddle Complex.

**Cutthroat trout habitat_____Likely probability/Moderate consequences … High risk**
Westslope cutthroat trout is listed as a USDA Forest Service Region 4 Sensitive fish species. Horse Creek, Corn Creek, Colson Creek, Owl Creek, East Fork Owl Creek, Spring Creek, East Fork Spring Creek, Squaw Creek, Indian Creek, West Fork Indian Creek, Corral Creek, McConn Creek, Sage Creek, and Hull Creek provide habitat for resident Cutthroat Trout. Colson Creek is not accessible to Steelhead because of the small dam on the reservoir on private property near the mouth. Existing cutthroat trout habitat in most of these streams is at risk because of the high potential for substantially increased sediment loads during post-fire flood events.

B. Emergency Treatment Objectives:

- Reduce threats to personal injury and/or human life for visitors and residents within the burned area.
- Lessen potential post-fire effects on the existing transportation system by providing drainage systems on Forest System roads that are adequate to move additional post-fire runoff while protecting infrastructure.
- Prevent the loss of road infrastructure and reduce risks to critical natural resources and downstream values, including private properties, human life and safety, habitat, and ingress/egress along the Salmon River Road.
- Locate and treat new and known invasive plant species infestations during early stages of spread in ecologically sensitive burned areas in order to maintain the structure and function of the local ecosystem.
- Decrease the potential post-fire effects on the existing trail system, including damage to trails from erosion and sedimentation, and sediment input from trails into streams.
- Mitigate the effects of the fire on long term soil productivity, hydrologic function, and federally listed fish species habitat in watersheds that have moderate and high intensity burns over a majority of the watershed area.

- Protect historic and prehistoric sites from erosion, sedimentation, the threat of looting, and any impacts caused by prescribed emergency treatments.

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

Land **80** % Channel **NA** % Roads/Trails **80** % Protection/Safety **100** %

D. Probability of Treatment Success

| | Years after Treatment | | |
|---|---|---|---|
| | 1 | 3 | 5 |
| Land – weed treatments | 95%+[1] | 70%[2] | 25%[3] |
| - Aerial mulching and seeding | 70% | 80% | 80% |
| | | | |
| Channel | NA | NA | NA |
| | | | |
| Roads | 70% | 80% | 90% |
| | | | |
| Protection/Safety | 90% | 90% | 90% |
| | | | |

[1] *Local post-treatment effectiveness monitoring results typically show a greater than 95% mortality rate for treated infestations. This is true for all weed species that are known to occur or that may occur in the burn area. This is a function of proper application procedures and techniques.*

[2] *Most infestations will be treated with herbicides that possess soil residual capability, providing effective control beyond one year. So in Year Two post-treatment, control is generally almost as high as Year One. Beyond Year Two, the herbicide begins to lose effectiveness as it is broken down by soil microbes. Levels of control may persist into Year Three, depending on the herbicide used, soil and topographic conditions and the life history strategy of the weed species being treated. However, if a seed bank was present, as the herbicide decays, a fresh flush of sprouting occurs, reducing the level of control. The level of control depends on a number of factors in addition to seed banks, such as the residual capability of the herbicide, the porosity of the soil, precipitation levels, or other management actions (e.g. pulling roadside ditches where weeds are often found mixes the soil and reduces residual activity and encourages sprouting of seeds in the seed bank).*

[3] *On the steep slopes and gravelly soils in the burn area, control levels by Year Five will have been reduced far below that needed for effective management. By this time, retreatment will be needed to continue to deplete the seed bank, if one exists. New infestations or new invaders will be monitored and generally re-treated in Year Two under an Early Detection/Rapid Response strategy. Pre-existing infestations and invaders will be monitored for level of control. Once seed production resumes, the site would be re-treated for continued control using other funding sources.*

E. Cost of No-Action (Including Loss): Expected Benefit of Treatment: $12,887,950 *(see VAR Tool)*

F. Cost of Selected Alternative (Including Loss): Total Treatment Cost: $4,179,205 *(see VAR Tool)*

G. Skills Represented on Burned-Area Survey Team:

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

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Larry Vogel, Trails, Salmon-Challis National Forest
Dan Garcia, Fisheries, Salmon-Challis National Forest
Mike Helm, GIS, Salmon-Challis National Forest

## H. Treatment Narrative

### Land Treatments

#### *Early Detection Rapid Response Weed Control*

*General Description*: Due to the potential for invasive species spread as a result of the fire and adverse impact on the ecological structure and function of the local ecosystem, two to three visits are needed at many sites to perform Early Detection Rapid Response (EDRR) activities. EDRR activities would take place in areas heavily used by livestock and wildlife, and moderately to severely burned areas in plant communities that are most susceptible to weed establishment and spread (e.g. sage/grass communities, meadow complexes, open conifer stands, and open riparian areas), primary system roads, high clearance vehicle routes that are heavily traveled, areas disturbed during fire suppression, and trails. EDRR activities will begin at known weed infestations and then radiate out from these epicenters to detect, map and treat new infestations. Crews will be trained to recognize and look for new invaders as well that may have been vectored into the burn area by fire suppression crews. This approach served well for BAER efforts after the 2007 Clear Fire in lower Panther Creek, when an astute crew member found and reported infestations of salt cedar establishing in the riparian area along Clear Creek. In addition to BAER funding that will be used to prevent expansion of weeds in the burned areas, other program funds will be used to reduce pre-fire infestations.

*Design*: Perform Early Detection Rapid Response to locate and treat new and known minor populations of invasive plant species' infestations during early stages of spread in ecologically sensitive areas in order to maintain the structure and function of the local ecosystem. The selection of herbicide, application rate, and time of application will be based on specific weeds being treated, access to the locations of areas where weeds may occur and plant phenology at the time of treatment. The application rates and spraying method would depend on the abundance of the target species, condition of non-target vegetation, soil type, depth to the water table, the distance to open water sources, riparian areas, special status plants, and requirements of the herbicide label. Applications would be scheduled and designed to minimize the potential impacts to non-target plants. Monitoring of treated sites would determine treatment efficacy and the need for follow-up treatments. Monitoring would identify whether treatment methods needed to be changed or if a more effective herbicide should be used. Not all invasive plants sites have been located and it is expected that new sites will emerge in the burn area. Ongoing monitoring of treated sites would also look for new infestations. Newly discovered infestations would likely receive a high priority for treatment under the EDRR strategy.

*Purpose*: Given the large burn area and high road densities with associated noxious weeds and high human use throughout the year, there is a real potential for invasive plants to take a foothold within the disturbed area if it is not identified and treated soon after the fire.

*Fall 2012 Treatment Description*: Work will be accomplished with a combination of force account, contract and partner labor, using existing SCNF Indefinite Delivery/Indefinite Quantity (IDIQ) weed management contracts and existing partnership agreements. These instruments would allow a rapid delivery system to begin work in Fall 2012. Immediate areas of concern for treatment in the Fall of 2012 include (a) the Corn Creek and Owl Creek drainages where small infestations of rush skeletonweed and sulphur cinquefoil have been found, (b) Horse Creek where oxeye daisy has begun to spread from infestations that originated on private land, (c) Colson Creek and Owl Creek where puncturevine infestations have been found, and (d) Squaw Creek and Indian Creek where Dalmatian and yellow toadflax sites have been found. Trail clearing would be necessary to access infestations in Horse Creek and Owl Creek. Keeping primary road systems open would likewise be necessary to access these key areas with priority infestations.

### *Aerial Straw Mulching*

Purpose of Treatment: Provide immediate ground cover in severely burned areas to protect the soil from erosion and loss of nutrients, reduce peak flows, and maintain favorable moisture and temperature conditions for seed germination and growth. This treatment is to immediately stabilize the soils from the damaging effects of high intensity rainfall prior to establishment of vegetation. This treatment would address numerous values at risk in the watershed, including Forest Service infrastructure, human life and safety, private residences, soil productivity, hydrologic function, native plants, and critical fish habitat.

General Description: A helicopter would be used to apply a layer of straw mulch to treatment areas identified in the upper portions of 4 watersheds of concern. Helicopter application is the most effective way to quickly and efficiently treat large areas. Straw mulch provides temporary and immediate cover to areas that are vulnerable to soil erosion and increased runoff. The mulch provides pre-wetting of hydrophobic soils to increase infiltration capacities and reduce runoff. The mulch also secures seeds that are within the soil as well as seeds applied to the treatment areas.

Location (Suitable) Sites: A total of 3495 acres of treatment areas for aerial straw mulching were identified in the Colson Creek, Spring Creek, Boulder Creek, and Owl Creek watersheds (see treatment area map). These watersheds were selected because of the high percentages of each watershed burned at moderate and high severity (greater than 60% in each of these watersheds), the critical values at risk that would be protected, and the probability that the proposed treatments would be beneficial.

Treatment sites within each of these watersheds were identified using the following criteria:

- Within high severity burned areas only
- On large contiguous burned areas where needlecast from nearby unburned trees is not expected
- On slopes between 30 and 60 percent
- On slopes in the upper portions of watersheds
- Within granitic landtypes with erodible soils
- In areas that are the least susceptible to high winds

These proposed treatment areas cover 1001 acres in the Colson Creek watershed, 847 acres in the Spring Creek watershed, 454 acres in the Boulder Creek watershed, and 1193 acres in the Owl Creek watershed. These treatment areas are prioritized by watershed as shown below:

| Watershed | Treat-ment priority | Proposed treatment acres | Percent of wateshed treated | Percent of high burn severity treated |
|---|---|---|---|---|
| Colson Creek | 1 | 1001 | 14% | 39% |
| Spring Creek | 2 | 847 | 7% | 23% |
| Boulder Creek | 3 | 454 | 5% | 15% |
| Owl Creek | 4 | 1193 | 3% | 13% |

These treatments would treat 13 to 39% of the high severity burn areas in each watershed. The remaining areas of high burn severity include primarily slopes that are too steep and rocky for effective treatment and patchy areas of high severity burn mixed in with moderate and low severity burn areas. These treatments would directly or indirectly address critical values at risk including Forest Service infrastructure downstream in the watersheds, human life and safety, critical fish habitat for Steelhead, Chinook, and Bull Trout,

hydrologic function, soil productivity, and native plant communities, as well as private residences at the mouths of these watersheds. The probability of damage to these critical values at risk is high as a result of floods generated from short duration, high intensity rainstorms. These treatments would provide a substantial reduction in runoff and soil erosion at a watershed scale, mitigating the risk to these values.

Design Specifications: Mulch would be applied at a rate of 0.5 tons per acre, using certified weed free straw mulch. Straw obtained for this treatment should have the following specifications:

- Straw must conform to Idaho Department of Agriculture Certified Noxious Weed Free standards.
- Suitable straw includes barley, rice, and wheat grasses.
- All straw must have been planted and harvested during the 2012 growing season.
- Bales should be 3ft X 4ft or 3ft X 3ft, weighing no more than 800 pounds each.
- Straw shaft length should not exceed 10 inches.
- Straw must be applied dry (less than 12% internal moisture content) to ensure proper dispersal.
- The Forest Service will inspect the straw bales for weed seeds and moisture content.

Aerial coverage within the treatment areas would be at least 70%. Sites would be flagged on the ground where needed, and GPS would be used to target treatment areas. Helicopter staging areas could be located along the Salmon River Road at Cove Creek Boat Launch and/or Cadigan Ranch, requiring relatively long flight distances of 3.7 to 7.7 miles to the treatment areas. These sites have archeological clearance.

All aspects of the mulching treatment, including purchase of straw, transportion, and application, would be contracted. Treatment cost is estimated at $1000 per acre, accounting for the relatively long transport distances between the staging areas and the treatment sites. Mulch would be applied in the late fall. The work window will be dependent on snow conditions. Additional specifications can be found in the *Burned Area Emergency Response Treatments Catalog*.

### *Aerial Seeding*

Purpose of Treatment: Provide groundcover to protect the soil from erosion and loss of nutrients, and reduce peak flows in areas of high burn severity. This treatment is only effective beginning the second year after treatment once vegetation becomes established, but when done in conjunction with aerial straw mulching, these two treatments can provide effective stabilization of vulnerable soils for up to 3 years, allowing native plant species to become established during this time.

General Description: Seed would be broadcast aerially over 3495 acres in the same treatment areas as those identified for aerial straw mulching. A sterile cereal grain such as Triticale (*Triticum aestivum x Secale cereale*) would be used, providing soil stabilization for 1 to 3 years while allowing native species to become established. Seeding is a relatively inexpensive way to increase the effectiveness of aerial straw mulching. While wind can decrease the aerial coverage of mulch and its effectiveness, seeding can help keep the mulch in place and also provides a secondary source of straw mulch after the first season of growth. Aerial seeding as a treatment by itself is not likely to be effective in this area because of the high potential for seeds to wash down the hillslopes during a high intensity rainstorm.

Location (Suitable) Sites: Aerial seeding would occur in the same locations as the aerial straw mulching, covering 3495 acres in 4 at-risk watersheds. This treatment would also address the same values at risk as the aerial straw mulching treatment (see “Aerial Straw Mulching” section).

Design Specifications: Seeding would be done using fixed-wing aircraft. Non-invasive, non-competitive Triticale (*Triticum aestivum x Secale cereale*) is the preferred species because it can become established rapidly after fall application, it has low persistence in the environment to reduce competition with native species, and it would not be likely to cross-pollinate with native species. Seed would be applied at a rate of about 30 lbs PLS per acre (approximately 9 seeds per square foot at 13,000 seeds per pound). This application rate would provide the desired amount of soil stabilization, while still allowing for natural growth of native species. This treatment would be contracted. Treatment cost, including administration, is estimated at $100 per acre.

## Channel Treatments

No channel treatments are proposed at this time.

## Roads and Trail Treatments

### *Colson Creek Road System Armored Rolling Dips and Culvert Removal*

The proposed treatments are designed to increase the flow and debris passage capacity at road crossings (see table below). The culverts would remain in place, and floodways, or "high water fords" would be constructed just downstream of each of the 4 crossings on the Colson Creek Road. These floodways would be large dips, reinforced with angular rock, designed to route high flows across the road surface and back into the floodplain. Rock would be taken from the quarry located along the Colson Creek Road. Humps downstream of each floodway would be constructed to keep the flow from routing down the road. These floodways would allow the crossings to accommodate high flows in case of a large flood event or debris jam at the culvert inlet, without causing extensive damage to the road or producing excessive sediment from failure of the road fill. The 2 Colson Creek culverts on the other roads, which cross more perpendicular to the stream, would have a similar design, with the culverts remaining in place and a pronounced floodway constructed to protect the fill from erosion. We would also install one secondary relief culvert at the "Long Tom" tributary crossing on the Colson Creek Road to increase flow capacity, and we would outslope the road where needed to ensure proper drainage. The "Beaver" tributary culvert on the 438 Road would be removed, and the banks would be sloped back to natural channel dimensions. One large ponderosa pine that was felled into the channel after the fire would be removed from the channel to decrease the risk of debris jams at that location that would potentially route water up onto the road.

Proposed road treatments in the Colson Creek watershed.

| Site # | Road Number | Stream | Dimensions | Drain-age Area (sq mi) | Design Flow * (cfs) | Proposed Treatment |
|---|---|---|---|---|---|---|
| 1 | 123 (Colson Cr Rd) | Colson Creek | 24ft long, 4.5ft diameter pipe | 10.5 | 230 – 303 | Leave culvert in place; construct 90ft X 20ft floodway and berm across road |
| 2 | 123 (Colson Cr Rd) | Colson Creek | 26ft long, 4.5ft diameter pipe | 10.5 | 230 – 303 | Leave culvert in place; construct 60ft X 20ft floodway and berm across road; remove outer berm of road downstream of crossing; remove large ponderosa from channel |
| 3 | Colson Cr Guard Station spur | Colson Creek | 20ft long, 4.5ft diameter pipe | 10.5 | 230 – 303 | Leave culvert in place; construct 24ft X 10ft floodway and berm across road; relocate gate |
| 4 | 123 (Colson Cr Rd) | Colson Creek | 27ft long, 3X5ft squash pipe | 9.5 | 228 – 299 | Leave culvert in place; construct 60ft X 20ft floodway and berm across road; reinforce eroding bank at culvert inlet |
| 5 | 123 (Colson Cr Rd) | "Long Tom" (NW) tributary to Colson Creek | 27ft long, 3ft diameter pipe | 1.9 | 51 – 71 | Leave culvert in place; install 36ftX36in culvert as relief culvert 60ft downstream of existing culvert; clean out inside ditch feeding relief culvert, create exaggerated outslope on road and remove outer berm |
| 6 | 123 (Colson Cr Rd) | Colson Creek | 25ft long, 3X5ft squash pipe | 7.5 | 203 – 266 | Leave culvert in place; construct 30ft X 20ft floodway and berm in natural low spot on road |
| 7 | 439 (closed system rd) | Colson Creek | 42ft long, 5ft diameter pipe | 6.7 | 195 – 254 | Leave culvert in place; construct 40ft X 20ft floodway 3-4 feet below road surface; reinforce ends with rock; relocate gate |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | 440 (closed system rd) | "Beaver" (NE) tributary to Colson Creek | 30ft long, 3ft diameter pipe | 0.8 | 28 – 40 | Remove culvert; slope banks back to natural channel dimensions; close road with Kelly hump at junction with 123 Road |
| 9 | 438 (closed system rd) | Colson Creek | 45ft long, 5ft diameter pipe | 4.6 | 165 – 213 | Leave culvert in place; construct 40ft X 20ft floodway approximately 3-4 feet below road surface |

** Design flows are between the 100-year and 500-year flow events, as calculated using Streamstats, in order to allow for debris passage. Post-flood flow events in this area typically carry a large amount of debris.*

### *Ditch and Catchment Basin Cleanout*

Purpose of Treatment: Maintain effectiveness of roadside ditches and culverts to properly route runoff off the road in order to protect the transportation infrastructure.

General Description: Many existing culvert catch basins and ditches are filled with organic debris, sediment, or rock, in many cases partially blocking the culvert inlet. A high probability exists that at many of these crossings, additional material will be mobilized. It is important to maintain as much capacity as possible in culverts and ditches prior to the first high flow event in order to prevent obstruction that would route water onto the road and cause erosion or loss of the road. This is the most cost-effective method of protecting roads that cross at-risk streams and hillslope drainages. Multiple treatments may be needed.

Location (Suitable) Sites:

**Salmon River Road Fall 2012 Ditch and Catchment Basin Cleanout:** The proposed treatments along the Salmon River Road would include the following treatments in late fall, prior to snowfall.

1) Preventative maintenance and ditch cleaning would occur along the 17-mile paved section of road between North Fork and Spring Creek to accommodate the expected increase in rockfall and other erosion. The fire reached the road or burned the slopes above the road along this entire section. This section of road includes an inside ditch that catches debris and helps with road drainage. Cleaning this ditch in the fall, prior to winter storm events, would help prevent conditions that would close the road during the winter or early spring. Increasing the ditch capacity would help keep debris off the road, which will improve safety, drainage, and access along the road. This work would be done using a loader and 5 dump trucks.
2) Cleaning of culvert head basins would occur along the 30-mile unpaved section of road between Spring Creek and the end of the road at Corn Creek in order to ensure proper function of the culverts draining the numerous small drainages that cross the road. The fire reached the road or burned the slopes above the road along much of this section of road. This portion of the road does not include an inside ditch, and the focus of the proposed work is to ensure proper drainage to protect the road. Cleaning the culvert head basins prior to winter would ensure proper function during spring snowmelt runoff. Work would be done using a backhoe or excavator. Specific stream crossings where treatment would occur include Ebenezer Creek, Long Tom Creek, Cramer Creek, Fountain Creek, and Bear Basin Creek.

**Fall 2012 Ditch and Catchment Basin Cleanout on Other Roads**: With 185 miles of open system road and 177 miles of closed system road within the burned area, the risks of washout at stream and drainage crossings is high. Road segments that cross within or below areas of high severity burn are at the greatest risk from the impacts of increased hillslope drainage and soil erosion. Many of the main roads within the burned area follow ridgetops and are of less concern for drainage issues. This treatment would inspect and treat mid-slope roads on steep slopes that cross within or below high severity burned areas. The BAER team identified several road segments that will require this work prior to winter in order to ensure that these crossings have sufficient capacity for the increase in organic debris mobilized by snowmelt and the first large rain event. Ditch and culvert catchbasin cleanout at these roads would require a backhoe, and at some locations hand work. Mobilizing equipment to each of the sites is the most time consuming part of the work, but efficiency would be gained by combining this work with other previously approved work. The Fall 2012 ditch and catchment basin cleanout work identified here would require approximately 2

weeks to complete with a crew of 2, or could be contracted. The following suitable sites have been identified at this time:

- **FS Road #066 / #043** (Approximately 16 miles of road impacted by high severity burn, from FS Road #038 to EF Owl Creek): This road crosses numerous hillslope drainages with 15 to 20 culverts that are currently partially to almost fully blocked on steep severely burned hillslopes. This is a well constructed road and is currently in good condition.
- **FS Road #040** (2 miles of road impacted by high severity burn - the upper portion of the Squaw Creek Road): This is a midslope road crossing a high severity burned area and numerous drainages. The road accesses an outfitter camp and is currently in good condition.
- **FS Road #042** (EF Spring Creek): Several drainage issues are expected on this road system as a result of increased post-fire runoff.

Design Specifications: This work would be conducted using the Salmon-Challis National Forest road maintenance crew or an existing IDIQ contract. Work would follow Forest Service road maintenance specifications. Additional specifications can be found in the *Burned Area Emergency Response Treatments Catalog*.

### *Bridge Removal at Indianola*

Purpose of Treatment: The wooden footbridge at the Indianola Guard Station would be removed to prevent a potential debris jam or bridge washout that could further impact infrastructure or cause additional flooding at the Indianola Guard Station.

General Description: The wooden footbridge would be removed using a backhoe and placed off-site, outside of the floodplain. Work would occur in Fall 2012.

Location (Suitable) Sites: Wooden footbridge at Indianola Guard Station.

Design Specifications: This proposed activity would require the use of backhoe for ½ day.

## Protection/Safety Treatments

### *Road and Trail Hazard Warning Signs*

Purpose of Treatment: Hazard signs would be installed in order to warn the public of hazards that exist within burned areas, such as falling trees, rockfall, and flash floods.

General Description: Install warning signs at road intersections and trailheads that provide access to the burned area. Where necessary, hazard trees would be removed to protect the life and safety of workers implementing this treatment. The proposed work would include purchase of signs and any incidental hardware, as well as salary for installation of the signs.

Location (Suitable) Sites: Signs would be placed at all road and trail portals into the burned area, including the following sites:

FS Road #005: Sage Creek Road at the Salmon River Road
FS Road #036: Indian Creek Road at the Salmon River Road
FS Road #039: Squaw Creek Road at the Salmon River Road
FS Road #038: Spring Creek Road at the Salmon River Road
FS Road #123: Colson Creek Road at the Salmon River Road
FS Road #005: Hull Creek Road near Hwy 93
FS Road #091: Hughes Creek Road near Hwy 93
FS Road #038 at FS Road #091 (Horse Creek Pass)
FS Road #038 and #065 at FS Road #5669 (Woods Creek Pass)
Trail #158: at Forest Boundary/Trail #614
Trail #149: Boulder Basin Trailhead at Salmon River Road
Trail #151: Cove Creek Trailhead at Salmon River Road
Trail #152: Owl Creek Trailhead at Salmon River Road

Trail #156: Long Tom Trail at Salmon River Road
Trail #106: at Trail #184 Junction (Continental Divide)
Trail #162: Salmon River Trail Trailhead
Trail #096: Salmon River Trail at Forest Boundary

Design Specifications: Road signs would consist of 2-post, large, reflective signs. Trail signs would not need to be reflective and could be posted on trees or at trailhead kiosks. Signs would follow Forest Service Region 4 Sign specifications.

I. **Monitoring Narrative:**

The following implementation and effeciveness monitoring will be conducted for the proposed BAER treatments on the Mustang Complex Fire: *

**Early Detection Rapid Response (EDRR) Weed Control**

- Monitoring is included within the EDRR proposal.

**Aerial Straw Mulching**

- During application: Contract inspectors will ensure that extent of aerial coverage and straw thickness meets the specifications of the contract by visiting each treatment unit and providing feedback to the Contracting Officer Representative (COR).
- Spring 2013: The amount of aerial coverage will be evaluated following spring runoff. Monitoring methods will include photo points (for qualitative estimates) and at least 10 representative 100-step transects measuring ground cover (for quantitative estimates) within each treatment area monitored. At least 50% of the treatment areas will be monitored. Indicators of wind impacts and surface erosion will be noted.
- Fall 2013: Monitoring will be repeated for the sites monitored in the spring. Indicators of wind impacts and surface erosion will be noted, as well as any vegetation growth.

**Aerial Seeding**

- During application: Contract inspectors will ensure that the application rate meets contract specifications by placing monitoring cards within the treatment units and providing feedback to the COR.
- Spring 2013: Representative areas within at least 50% of the treatment areas will be monitored to determine germination success rates over the winter, evaluate the extent of aerial coverage, inspect for invasive species, and identify whether the seed is providing protection from surface erosion.
- Fall 2013: Monitoring will be repeated for the sites monitored in the spring. Growth rates, extent of coverage, and signs of surface erosion stabilization will be noted.

**Road Treatments**

- Spring-Fall 2013: As part of Storm Inspection and Response** during the summer 2013 thunderstorm season, culverts, ditches, and rolling dips will be inspected after large storm events. These inspections will indicate whether previous treatments have been effective and what additional treatments are needed. Storm Inspection and Response would occur as needed, up to 5 times during the summer season.

**Road and Trail Hazard Warning Signs**

- Fall 2013: Monitoring will determine whether the signs remained in place during the first season, and dicussion with Forest staff will determine whether the signs achieved the intended result, or if additional or different signs are needed.

** Funding for monitoring will be requested in an interim BAER request prior to Spring 2013.*

*** This treatment will be proposed in an interim BAER request prior to Spring 2013.*

**Part VI – Emergency Stabilization Treatments and Source of Funds** **Interim # 1**

| | | | NFS Lands | | | | Other Lands | | | All |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Unit | # of | | Other | # of | Fed | # of | Non Fed | Total |
| Line Items | Units | Cost | Units | BAER $ | $ | units | $ | Units | $ | $ |
| **A. Land Treatments** | | | | | | | | | | |
| *EDRR Fall 2012 - Weed Crew | Days | $2,867 | 45 | $128,995 | | | | | | $128,995 |
| *EDRR Fall 2012 - Contracts | Each | $40,000 | 3 | $120,000 | | | | | | $120,000 |
| Aerial Straw Mulching | Acre | $1,000 | 3495 | $3,495,000 | | | | | | $3,495,000 |
| Aerial Seeding | Acre | $100 | 3495 | $349,500 | | | | | | $349,500 |
| *Insert new items above this line!* | | | | $0 | | | $0 | | $0 | $0 |
| *Subtotal Land Treatments* | | | | $4,093,495 | $0 | | $0 | | $0 | $4,093,495 |
| **B. Channel Treatments** | | | | | | | | | | |
| *Insert new items above this line!* | | | | $0 | | | $0 | | $0 | $0 |
| *Subtotal Channel Treat.* | | | | $0 | $0 | | $0 | | $0 | $0 |
| **C. Road and Trails** | | | | | | | | | | |
| *Colson Rd Armored dips/culverts | Days | 2266 | 10 | $22,660 | | | | | | $22,660 |
| *Salmon R. Rd Ditch cleaning (Fall '12 | Days | 3840 | 10 | $38,400 | | | | | | $38,400 |
| Culvert catchbasin cleaning (Fall '12) | Days | 1665 | 10 | $16,650 | | | | | | $16,650 |
| Indianola Trail Bridge Removal | Each | 1000 | 1 | $1,000 | | | | | | $1,000 |
| *Insert new items above this line!* | | | | $0 | $0 | | $0 | | $0 | $0 |
| *Subtotal Road & Trails* | | | | $78,710 | $0 | | $0 | | $0 | $78,710 |
| **D. Protection/Safety** | | | | | | | | | | |
| Road hazard warning signs | Each | 620 | 10 | $6,200 | | | | | | $6,200 |
| Trail hazard warning signs | Each | 80 | 10 | $800 | | | | | | $800 |
| *Insert new items above this line!* | | | | $0 | $0 | | $0 | | $0 | $0 |
| *Subtotal Structures* | | | | $7,000 | $0 | | $0 | | $0 | $7,000 |
| **E. BAER Evaluation (Est total as of 10/15/12)** | | | | | | | | | | |
| Salary | | | | --- | $34,000 | | | | | $34,000 |
| Fleet | | | | | $800 | | | | | $800 |
| *Insert new items above this line!* | | | | --- | $0 | | $0 | | $0 | $0 |
| *Subtotal Evaluation* | | | | --- | $34,800 | | $0 | | $0 | $34,800 |
| **F. Monitoring** | | | | | | | | | | |
| *Insert new items above this line!* | | | | $0 | $0 | | $0 | | $0 | $0 |
| *Subtotal Monitoring* | | | | $0 | $0 | | $0 | | $0 | $0 |
| **G. Totals** | | | | $4,179,205 | $34,800 | | **$0** | | **$0** | **$4,214,005** |
| Previously approved (items with *) | | | | $310,055 | | | | | | |
| Total for this request | | | | **$3,869,150** | | | | | | |

## PART VII - APPROVALS

1. */s/ Stefani Melvin* for Frank V. Guzman — 10/16/12
   Forest Supervisor (signature) — Date

2. /s/ Marlene Finley (for) — 10/17/12
   Regional Forester (signature) — Date