USDA-FOREST SERVICE FS-2500-8 (7/00)

Date of Report: August 2, 2002

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

[**X**] 1. Funding request for estimated WFSU-SULT funds
[ ] 2. Accomplishment Report
[ ] 3. No Treatment Recommendation

B. Type of Action

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

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

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

PART II - BURNED-AREA DESCRIPTION

A. Fire Name:Red Waffle

B. Fire Number: MT-CNF-106

C. State:Montana

D. County: Carbon

E. Region:01

F. Forest: Custer

G. District: Beartooth

H. Date Fire Started: July 14, 2002

I. Date Fire Controlled: Unknown (75% Contained)

J. Suppression Cost: $1.8 MM

K. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles): 1.5 dozer and handline have been waterbarred
2. Fireline seeded (miles):Will be seeding 1.5 miles dozer and hand line prior to mid Oct.
3. Other (identify):

L. Watershed Number: 100800100502, 100800100503, 100800100505 (6^{th} Level HUCs)

M. Total Acres Burned: **5,859**
NFS Acres(**5,139**) Other Federal (**720**) State (**0**) Private (**0**)

N. Vegetation Types: Doug Fir (3400 ac.), Grass/shrubland (2300 ac.) Limber pine (180 ac.)

O. Dominant Soils: Alfisols and Mollisols

P. Geologic Types: Sedimentary Limestones, shales and sandstones

Q. Miles of Stream Channels by Order or Class:

Intermittant: 9.9 miles Perennial: 5.4 miles

R. Transportation System

Trails: miles Roads: 16.4 miles

PART III - WATERSHED CONDITION

A. Burn Severity (acres): 385 (low) 382 (moderate) 4530 (high)

B. Water-Repellent Soil (acres): 4530

C. Soil Erosion Hazard Rating (acres):
385 (low) 382 (moderate) 4530 (high)

D. Erosion Potential: 29 tons/acre

E. Sediment Potential: 11,180 cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 3

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

C. Equivalent Design Recurrence Interval, (years): 25

D. Design Storm Duration, (hours): .5

E. Design Storm Magnitude, (inches): 2.2

F. Design Flow, (cubic feet / second/ square mile): 9.8 to 12.3

G. Estimated Reduction in Infiltration, (percent): 60

H. Adjusted Design Flow, (cfs per square mile): 36.7 to 51.4

PART V - SUMMARY OF ANALYSIS

A. Describe Watershed Emergency:

- Water Quality, Fisheries, and Aquatics, both within the fire area and downstream.

The Red Waffle fire severely burned approximately 85% of the fire area consuming much of the protective organic material and creating large expanses of hydrophobic soils. Initial assessment revealed that severe hydrophobic conditions existed in all moderate and high severe burn areas. (Water drop remained for longer than 3 minutes!). This included areas around several intermittent streams such as Gooseberry Hollow, Bridge Hollow, and Demijohn Hollow. During the fire, a thunderstorm on 7/23/02 dropped an estimated 1-3 inches of rainfall on the fire in approximately 6 hours. This corresponds to a 50-100 year precipitation event. This event caused rill and sheet erosion that produced very flashy flows and "blew out" all channels in the fire perimeter to some extent. This produced a drainage network where steep sections of headwater streams are scoured to bedrock while other locations are storing huge quantities of sediment ranging from fines to boulders. Ash flows from this event were evident five miles downstream. This material is loose and not stabilized by vegetation or woody debris (which either blew out or was consumed by the fire). This sediment will continue moving towards the 303(d) listed Crooked Creek during subsequent thunderstorms and next springs snow melt.

Crooked Creek also supports genetically pure populations of Yellowstone cutthroat trout, (Oncorhynchus clarki bouvieri) which is currently listed as *Species of Special Concern* by the Montana Fish, Wildlife and Parks, and a *Sensitive species* by the Forest Service. The Crooked Creek Yellowstone cutthroat trout population is one of three small genetically pure populations of Yellowstone cutthroat known to exist in the Pryor Mountains. The intense rainstorm event resulted a large debris flow out of Gooseberry Hollow into Crooked Creek near the upper end of the fire. This resulted in a massive delivery of debris including; fine sediment, wood, and rock particles ranging in size from boulders to small gravels. The energy behind this flow resulted in the mobilization of the majority of bed material and woody debris in Crooked Creek effectively modifying the entire stream channel downstream of Gooseberry Hollow to approximately Lost Water Canyon. Due to the highly confined valley bottom in the upper drainage and lack of off channel refugia from the debris flow, a complete fish kill was likely from Gooseberry hollow downstream to private lands, effectively eliminating all biota in the lower 1.5 to 2 miles of previously occupied cutthroat habitat upstream of the barrier and continued downstream for about 2 miles below the barrier.

In addition to water quality and fisheries issues the Crooked Creek road is the only legal access the Forest Service has into the Pryor Mountains. The fire and rain event caused culverts to plug and wash out at Gooseberry Hollow and Bridge Hollow road-channel crossings. Other road-channel crossings are plugged and at high risk for failure, as are ditch relief culverts. This road is at the lower 1/3 of the slope between Red Pryor Mountain and Crooked Creek and the majority of the high burn severity areas are above the road.

The Red Waffle Fire burned in and around two abandoned uranium mines in the vicinity of Red Pryor Mountain. No measured radioactivity levels have been available for review by the managing agencies (FS and BLM) at this time. However, it is reasonable to assume that based on preliminary information received from the Northwest Cave Institute, that **high levels of radon gas and radioactivity are present in the Old Glory and Sandra Mines**.

The primary concern with high levels of radioactivity would be safety to people working in the area and members of the public who visit the area.

Based on ore samples collected at the Old Glory after the Red Waffle Fire, preliminary analysis indicates that radioactivity levels may exceed published human health and safety thresholds. Additional information and analyses are being developed by the Regional Office but are not available for consideration and incorporation within the context of this report.

- Threats to Long-term Soil Productivity and Ecosystem Integrity

Field reviews within the burn indicate that there is a threat to long-term soil productivity and ecosystem integrity in some areas. The effect could be an increase in noxious weeds and the loss of species identified as species at risk through the Northern Region Overview (NRO). (See Table below for specific weeds.)

Scientific Name[1]	**Common Name**
Arctium minus	burdock
Bromus tectorum	**cheatgrass**
Centaurea biebersteinii (C. maculosa)	**spotted knapweed**
Cirsium arvense	**Canada thistle**
Cynoglossum officinale	**hound's-tongue**
Euphorbia esula	Leafy spurge
Leucanthemum vulgare	ox-eye daisy
Linaria dalmatica	Dalmatian toadflax
Linaria vulgaris	yellow toadflax

Note: Species in bold are those that were already known and established in the vicinity before the fire. The remaining species are not yet known from the area, but would be considered highly threatening if found.)

The spread of noxious weeds is expected to increase within the fire area, especially along roads. Depending on the burn severity and site potential, fire as a disturbance process has the potential to greatly exacerbate the infestations.

Soil quality within high and moderate burn severity areas is expected to decrease. Much of this acreage occurs on steep slopes. Erosion rates are expected to increase with a resultant long-term impact to soil productivity, water quality and fisheries as described above. The rain event and subsequent runoff and erosion has already adversely affected soil quality by removing litter and soil material from sites.

- Threats to Life and Property

There is a risk to property and life. As stated above the Crooked Creek Road (2085) is the only legal access into the Pryor Mountains. This road receives a lot of traffic including passenger vehicles, high clearance vehicles and ATVs. Risks include hazard trees along roads throughout the fire area, increased potential for flash flood or debris events, and downstream flooding on private property.

Portions of Custer National Forest System roads 2085, 2091, and 2096 have been identified as being at increased risk. High flows at crossings could result in failure of road prisms and delivery of sediment to critical streams (Yellowstone Cutthroat trout and 303d list).

Roads within the BLM area of the burn are also at risk from increased flows and potential failure of road prisms. These occur mostly in the Gypsum Creek drainage and those areas south of the Forest boundary.

Private lands affected or potentially affected by the fire and storm event were evaluated and no emeregency conditions were identified (Ray McPhail, NRCS Joliet, MT, personal communication 7/31/02).

[1] Nomenclature follows the USDA Plants Database: USDA, NRCS 1999. The PLANTS database **(http://plants.usda.gov/plants)**. **National Plant Data Center**, Baton Rouge, LA 70874-4490 USA.

B. Emergency Treatment Objectives:

- Minimize fire effects on water quality and fisheries habitat by reducing the amount of sediment delivered to streams.
- Mitigate effects on long-term soil productivity and ecosystem function/integrity by seeding and mulching targeted areas and by spraying existing noxious weed infestations.
- Provide for public health and safety by conducting hazard tree assessments and treatment, install road closure gates and signs indicating potential hazards, provide signs for hazards at abandoned uranium mines, and provide information pamphlets to the public explaining hazards.
- Minimize fire effects on the road system by restoring and improving drainage on roads and reduce the amount of runoff and sediment reaching roads.

C. Probability of Completing Treatment Prior to First Major Damage-Producing Storm:

Land **85** % Channel **90** % Roads **90** % Other ___ %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land			
Seeding	75	85	90
Spraying	85	60	30
Mulching	75	80	90
Channel			
Check Dams	80	85	90
LWD	80	85	90
Roads	80	85	90
Cultural	80	80	80
Other			

E. Cost of No-Action (Including Loss): See Attached Cost Risk Analysis Document

F. Cost of Selected Alternative (Including Loss): See Attached Cost Risk Analysis Document

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: John R. Lane, Soil Scientist/Watershed Program Manager, Custer National Forest
Kim Reid, Range Program Manager, Custer National Forest

Email: **jrlane@fs.fed.us** Phone: 406-657-6200 FAX: 406-657-6222
kreid@fs.fed.us 406-657-6200 406-657-6222

H. **Treatment Narrative:**

(Describe the emergency treatments, where and how they will be applied, and what they are intended to do. This information helps to determine qualifying treatments for the appropriate funding authorities. For seeding treatments, include species, application rates and species selection rationale.)

Land Treatments:

Noxious Weed Control

Apply immediate herbicide control treatments on known noxious weed infestations along identified road systems. Identified sites have been ground-truthed and pose a threat for establishment, seed set, and spread into vulnerable areas. **Begin treatment as soon as possible and continue through the fall and into the spring.**

Critical Area Seeding

It was determined that aerial seeding could be an effective emergency watershed treatment to provide a buffer strip along the slope breaks where it is thought most eroded material might be deposited and along the road corridor to assist in site stabilization. Seeding would be used in conjunction with other application of mulch to establish vegetation and treat emergency conditions. Aerial seeding has been recommended for approximately 300 acres in a buffer strip running mostly north to south from Gooseberry Hollow to the Forest/BLM boundary. Critical area seeding in a buffer strip is also recommended below the abandoned uranium mines, if feasible, along portions of Crooked Creek Road, and along portions of Gooseberry, Bridge Hollow, and other tributaries to Crooked Creek. The total area recommended for seeding is 400 acres. Seed mixture prescribed by Agency representatives consists of:

Common name & variety	**Scientific name**	**PLS (lbs/ac) Broadcast**
Mountain Brome (garnet)	*Bromus marginatus*	10 lbs/ac

Canby Bluegrass (canbar)	*Poa canbyi*	2 lbs/ac
Big Bluegrass(sherman)	*Poa ampla*	2 lbs/ac
Slender Wheatgrass (pryor)	*Agropyron trachycaulum*	7 lbs/ac
Idaho (joseph or nez perce) or Sheep Fescue (covar)	*Festuca idahoensis or Festuca ovina*	2 lbs/ac
Total Pure Live Seed lbs/acre*		**23 lbs/ac**

Seed application rates have been designed to provide a mixture of species that would grow root quickly and provide an effective cover to hold soils within these areas. A well-established vegetative cover would also provide a filtration strip for sediment. Weather patterns, soil conditions, available micro-sites, etc. will determine seeding success for this area.

Contour Felling

It is recommended that contour felling and slashing of small diameter trees be conducted above critical cultural sites and along roads where feasible and possible. Contour felling is different from log erosion barriers in that these trees are not "keyed" into the slope and a trough is not established.

Other

It is recommended that sediment deflectors be established above spring development in Gooseberry Hollow and Bridge Hollow. These areas, because of the moister microenvironment did not burn. If large amounts of sediment are deposited on these springs there is potential to permanently impair the spring. Deflectors should also be placed above cultural sites identified by the forest archaeologist as critical sites. These deflectors should protect these sites until vegetation becomes well established above the springs.

The Lower Pasture of Crooked Creek was nearly entirely burned by the Red Waffle Fire. No livestock grazing can be authorized in this pasture until forage vegetation is healthy enough to withstand grazing. The rest period must be determined through vegetation monitoring, but is expected to be no more than two grazing seasons beyond the 2002 season.

Channel Treatments:

Where available trees should be felled into Gooseberry Hollow (1.5 miles), Bridge Hollow (1 mile), Demijohn Hollow (.5 miles), and Commissary Creek (.5 miles). These intermittent channels (they may even be ephemeral but the recent scour makes this determination impossible) need to move back into a stable condition where they provide sediment storage to protect downstream beneficial uses. In many locations trees could provide ample storage of sediments moving down from above. It was clear from the limited wood that had fallen into the channel from this event that if even a small portion of the tree gets into the channel it could begin to back up sediment. Whole trees would be used whenever possible to ensure long-term stability of the pieces. Multiple pieces would also be used to ensure longevity. Where appropriate trees are not available and rocks are, large rocks would be used to create check dams. These types of structures already occur in limited locations and they are storing sediments. An excavator should be used to increase the likely success of this treatment. This addresses the flows, coarse sediment, and fine sediment being produced in this upper portion of Crooked Creek (above Cave Creek).

Trees should also be fallen in Crooked Creek itself to provide large woody debris (LWD). The LWD would reduce the magnitude of bedload movement by acting as a physical barrier and by reducing local stream energies. This energy dissipation would occur as water flows over LWD and through turbulence created by the additional roughness. The likelihood of success is much higher where we can fall the tree

into the creek (in accumulations, at bends, behind large boulders etc…) as opposed to relying on the creek to re-distribute the tree after it is added to the stream. This would address the lack of "anchor point", the high bedload movement, and sediment levels above Cave Creek.

Roads Treatments:

With the large quantities of sediment and the new LDW being felled into Gooseberry, Bridge Hollow, and Demijohn hollows the stream crossings should be converted to fords. These crossings need to pass water, LWD, and sediment (both coarse and fine), but not fish. A concrete ford with an armored outlet is the structure most likely to meet these needs.

Surface stabilization should occur along specific portions of the Crooked Creek road to reduce erosion and subsequent sediment delivery to the 303(d) listed Crooked Creek This road travels through severely burned areas where increased runoff is expected. This increased moisture could result in severe erosion in several site-specific locations along the road. Where these locations are close to a drainage way water quality impacts are likely to occur. These areas should be treated. This addresses the fine sediment being produced along portions of Crooked Creek Road.

It is recommended that debris be cleaned out of several drainage crossings directly upstream of the crossing. Gooseberry Hollow, Bridge Hollow, the un-named drainage crossing north of Demijohn Hollow, Demijohn Hollow and Gyp Springs crossing (BLM) all have a significant amount of debris trapped above the crossing. It is also recommended all existing culverts be cleaned, four culverts in small drainages be removed and replaced with larger diameter structures and that eighteen new drainage structures be added primarily in the clay soil sections. The construction of 17 rolling grade dips was also identified as treatment. Other treatments proposed for this project includes the terracing some cut slopes, seeding and mulching the cut slopes.

Structures:

Replace approximately 1.4 miles of boundary fence (Forest Service/Bureau of Land Management) that was destroyed. Grazing will most likely occur on the BLM land south of the Forest. It is recommended that this boundary fence be replaced to keep cattle from impacting burned areas that are undergoing recovery. Cost sharing between FS and BLM is recommended.

H. **Monitoring Narrative:**

Seed Application Implementation and Effectiveness Monitoring

Monitor seed application to ensure desired rates of PLS/ft^2 are being applied. Monitor seeded areas in first year following treatment (2002) to determine success of revegetation efforts on slope and watershed stability within the fire area. Determine vegetation re-establishment on seeded areas as an effective cover for the stabilization of critical areas and the protection of downstream values at risk.

Channel Treatment Implementation and Effectiveness Monitoring

Monitor targeted tree and rock structure placement to ensure objectives are being met. Conduct survey and assessment during the fall of 2002 and early spring of 2003 to assess needs for additional treatment.

Noxious Weed Spraying Implementation and Effectiveness Monitoring

Monitor spraying to ensure objectives are being met.

During 2003, monitor effectiveness of the spraying and establishment of new weed populations. Accurately map new populations using GPS and GIS. Establish photo plots for documentation.

Post-fire Soil Erosion Potential Monitoring

Monitor to determine success of the natural revegetation and any associated soil erosion on areas where grass seeding was not prescribed. The Crooked Creek watershed is a MT. D.E.Q. *water quality limited* watershed, therefore the minimizing of potential sedimentation is important to the TMDL goals for the watershed. Because natural revegetation was the preferred prescription on the majority of the *moderate/high burn severity* sites some monitoring of the native vegetation re-establishment and the levels of soil erosion associated with those sites needed to be accomplished, to insure addition BAER stabilization treatment are not necessary for the protection of downstream values at risk. Determine if additional watershed treatments are required to protect spawning and rearing habitat for Yellowstone Cutthroat trout within the watershed.

Yellowstone Cutthroat Trout Habitat Monitoring

Monitoring post-fire fish habitat and population response will be critical to determine effectiveness of watershed treatments and to assess if habitat conditions are driving the population toward an accelerated extinction risk. Post-fire monitoring will include fish population distribution and strength through electrofishing, and evaluating fish habitat quality and quantity.

PART VII - APPROVALS

1. _____ _____
Forest Supervisor (signature) Date

2. _____ _____
Regional Forester (signature) Date