United States Department of Agriculture **Forest Service** **Pike and San Isabel National Forests Cimarron and Comanche National Grasslands**

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File Code: 2520-3 **Date:** May 6, 2002
Route To:

Subject: Burn Area Emergency Rehabilitation - Snaking Fire

To: Regional Forester

Attached is the Burn Area Emergency Rehabilitation (BAER) report for the Snaking Fire (CO-PSF-150) on the Pike National Forest. The 2,312-acre human-caused Snaking Fire started April 23, 2002 and was proclaimed controlled on April 29, 2002. The Forest is requesting approximately $8,757 to cover the cost of the assessment and monitoring of noxious weeds and invasive plants. The assessment indicates that this fire had minor effects to resources and poses little risk to human life or property. Funding requests on private land, as proposed by the Natural Resource Conservation Service (NRCS), amount to $38,818 including assessment cost.

The project file for the Snaking Fire Incident will be located on the South Platte Ranger District.

/s/ Abigail R. Kimbell
ABIGAIL R. KIMBELL
Forest Supervisor

cc: Randy Hickenbottom, Tim Sullivan

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

Date of Report: 5/6/02

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: Snaking Incident

B. Fire Number: CO-PSF-150

C. State: Colorado

D. County: Park

E. Region: 2

F. Forest: Pike-San Isabel NF (PSICC)

G. District: South Platte Ranger District

H. Date Fire Started: 4/23/02 12:00

I. Date Fire Controlled 4/29/02 19:00

J. Suppression Cost: approx 2.6 as of 4/29/02

K. Fire Suppression Damages Repaired with Suppression Funds

1. Fireline waterbarred (miles): 4 plus miles (mostly dozer line, handline was also waterbarred), slashing of the handline did not occur at this time due to nature of fire and potential risk, however it is recommended that the district staff follow up with

raking in berms and slashing handlines after sufficient moisture has fallen or later in the fall, when risk of fire restarting or escaping is significantly diminished.

2. Fireline seeded (miles): 0
3. Other (identify): the helispot up on split rock was within suitable lynx habitat. Trees cut to create helispot were piled to create hiding/forage habitat for snowshoe hare at the boundary of the forest and the newly created opening. No further suppression rehab was deemed necessary at this site.

L. Watershed Number: 101900020303, Bailey Composite

M. Total Acres Burned: 2312 (from 4/30/02 fire info fact sheet)
NFS Acres (1555) Other Federal (67 BLM) State ( ) Private (690)

N. Vegetation Types: Plant communities are dominated by Douglas Fir-Woodland & Spruce Fir in the higher elevations within the fire area (approx 30%) and Ponderosa Pine-Mountain Mahogany at lower elevations (approx 65%). There were small portions of lodgepole pine affected on north slopes (approx 5%). Forage estimates of pre-burn grasses and forbs are about 180 –220 lbs/acre at higher elevations associated with rockier slopes and douglas fir. Forage increases at lower elevations averaging about 800 lbs/acre, with maximums of about 1000 lbs/acre in openings on benches with deeper soils. Grasses are mainly cool season species: Arizona fescue, mountain muhly, spiked fescue, western wheat with minor amounts of alpine bluegrass, june grass and blue grama. Forbs consist mainly of shrubby and herbaceous cinquefoil, buckwheats, and loco weeds. Dominant shrubs include mountain mahogany, currents, kinnickinick, and fringed sage. During the reconaissance, minor regreening of some of the grasses in the moderate to high burn severity areas was noted. If enough moisture is present in the soil, given that this was a spring burn, some recovery of grasses and forbs before the summer monsoon season is expected. Some needlecast in the moderately burned areas is also beginning to occur.

O. Dominant Soils: Dominant Soils: Security, Cathedral, and Legault families. Depths range from shallow to moderately deep. Particle size classes are primarily loamy-skeletal. Mineralogy is mixed. Parent materials are slopewash, residuum, and colluvium derived from metamorphic and igneous rocks. Subgroups are Mollic Eutroboralfs, Lithic Haploborolls, and Typic Cryorthents. Steep slopes make these soils highly erosive (estimate 61% of area is high erosion hazard and most of the high severity burn area is in this category).

P. Geologic Types: Dominant geology is northwest-southeast trending gneiss, with lesser amounts of schists and granite.

Q. Miles of Stream Channels by Order or Class:

22.73 total stream miles, most are ephemeral and intermittent.

R. Transportation System:

8.55 miles roads and trails (most of this is roads)

PART III - WATERSHED CONDITION

A. Burn Severity (percent): 37.3 (low) 48.9 (moderate) 13.8 (high)

Severity class definitions:
High: ground and canopy fire, 75-100% canopy burned, needles consumed, shrubs burned to root crowns, most duff consumed to black or white ash, moderate to high hydrophobicity
Moderate: ground and canopy fire, greater than 40% canopy intact or scorched with needles still on, some duff remains below ash, even if it is scorched, moderate to low hydrophobicity,
Low: primarily ground fire, although individual tree canopies may have scorched, usually less than 5-10%, greater than 50% of original duff and litter remains, moderate to low hydrophobicity (little or no increase over unburned state).

B. Water-Repellent Soil (acres): approx 400 (17%), primarily in the Mountain Mahoghany & Jeffrey Pine

C. Soil Erosion Hazard Rating (percent):
34 (low) 5 (moderate) 61 (high)

D. Erosion Potential: 12 tons/acre

E. Sediment Potential: 6693 cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 2-3 years for grasses/forbs, 5-10 shrubs

B. Design Chance of Success, (percent): 75-80

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

D. Design Storm Duration, (hours): 24

E. Design Storm Magnitude, (inches): 0.15

F. Design Flow, (cubic feet / second/ square mile): 4.3

G. Estimated Reduction in Infiltration, (percent): 19

H. Adjusted Design Flow, (cfs per square mile): 3.5

PART V - SUMMARY OF ANALYSIS

A. Describe Watershed Emergency:
The Snaking Fire burned over the course of a week in late April; it was primarily a wind driven event that was contained and controlled by suppression efforts and cooperation of cooler and moister weather. Approximately 85% of the area burned at moderate or low intensity. The steepest rockiest portions of the fire area around Split Rock burned several hundred contiguous

acres at high intensity and severity, this was mostly in Douglas Fir-Woodland and some Ponderosa Pine, other areas of high intensity occurred at lower elevations but were mostly smaller spots surrounded by moderate or low severity burn. Most of the high severity burn area occurred in the upper portions of the watershed and is buffered by low and moderate severity burn in the lower portions of the affected watershed. Hydrophobicity seemed to be slight to none in the high severity burn areas associated with the Douglas Fir. The smaller spots of high severity burn in the Ponderosa Pine and Mountain Mahoghany showed an increase in hydrophobicity over unburned conditions in both the high and moderate severity burn areas. Most of the hydrophobicity observed would be considered to be in the moderate class (strong at the surface, strong or moderate to ½ inch or more, and generally slight below that).

Initial fire intensity maps, based on radiometry were developed as part of the fire suppression effort. These were used and evaluated by the BAER team to determine burn severity. It was determined that some of the areas mapped at high intensity were actually moderate severity burn. While initial mapping estimated approximately 20% of the area burned at high intensity, the team determined that approximately 12-15% of the burn was actually high severity. The remaining 5-7% was moderate severity.

Estimates of increased erosion and sedimentation as a result of the fire indicate that at least two to three times as much sediment is possible from the design storm event than in the preburned condition.

Threats to human life and property: *(additional hydrology and engineering information is in the project file stored in the Supervisor's Office of the PSICC)*
The western portion of the fire is dominantly National Forest System Lands and the eastern one third of the fire is predominantly private lands with homes. Resource values identified include these private homes and associated ponds, wells, and water developments, also roads, and the Bailey water supply inlet. The fire area drains into the North Fork of the South Platte River, which is part of the Denver Municipal water supply. The Bailey Sanitation Plant is downstream but well out of the floodplain and is not considered to be at risk. The Bailey water treatment plant is upstream of the burned area and is also not considered to be at risk. Due to the proximatey of homes within and adjacent to the fire and expected increases in sedimentation, there is some risk to water quality and any surface water developments that may exist in this area.

Since most of the national forest system lands that burned at high severity are extremely steep and rocky (erosion hazard is high), the feasibility and success of slope treatments is considered to be low and only a few areas were identified where treatments could be implemented effectively. The team identified a few acres at a slope break near the top of an ephemeral drainage below split rock that could benefit from slope and stream stabilization treatments to help trap and slow sediment that may be mobilized higher up in the drainage. On the private lands within the burn additional areas were identified that could benefit from slope stabilization treatments in order to minimize soil loss and sedimentation effects to these downstream resources.

Suggested treatment on National Forest System Lands will consist of contour felling of trees within the drainage contour to the slopes with tops in the ephemeral draw to provide surface roughness and sediment traps. Suggested treatments within the private lands include contour felling, raking, seeding, mulching &/or straw wattles, and possibly a few channel stabilization treatments such as strawbale check dams.

Threats to the ecosystem stability, threatened/endangered/sensitive (TES) species, and significant cultural heritage resources: *(also please refer to the wildlife and cultural heritage reports that are in the BAER project file stored in the Supervisor's Office of the PSICC)*

Invasive weeds are expected to expand into disturbed sites in the burn area, specifically along roads, trails, and the disturbed ground associated with ground squirrel activity. The area has not been surveyed, but some weeds were seen during the field reconnaissance. There are several factors that increase the risk of infestation as well as the spread of existing weeds. Weed seed sources are adjacent to the burn area. Aggressive species such as diffuse knapweed, Canada thistle and yellow toadflax occur along the Hwy 285 corridor and in private lands adjacent to the burn. Non-local weed seed (such as yellow star thistle and leafy spurge) may have been brought into the burn area on equipment used during the fire. Some of the equipment came from areas known to have extensive weed problems. Disturbed ground provides ideal habitat for weed seed and there are several sources in the burn area. Ground squirrel activity is fairly high, creating fresh mounds of soil; in addition there are about six miles of roads and trails that were freshly disturbed from human and vehicle traffic during the fire. The burn itself reduces competition from native plants and soil chemistry encourages weed seed germination. The threat of invasion is increased because nitrogen loss was assessed to be relatively high based on unusually dry soil conditions and that many weed species prosper in such nitrogen depleted disturbed areas. In the Buffalo Creek and Hi Meadow fires, we saw the rapid expansion of existing weeds into burned areas. We also saw that treatment during the year of the fire was successful in controlling weed expansion and reducing out-year treatments. The Forest recognizes that weed surveys are not to be funded through BAER, however, the Forest is requesting funds to monitor noxious weeds and invasive plants that could result due to the fire.

No known populations of TES plants occur within the fire area. Approximately 600 acres of denning and foraging habitat for lynx, a federally listed species, was affected. Potential Prebles meadow jumping mouse habitat occurs 2 miles downstream from the fire along the North Fork of the South Platte River and surveys suggest that the mouse occurs about 10 miles downstream of the burned area. A major flood event, although unlikely, could inundate riparian habitat that provides potential cover, nest sites and feeding habitat for the mouse.

Cultural heritage resources were identified on both the private and national forest system lands within the burn area and along the North Fork of the South Platte River. It was determined that cultural resources on the private lands did not occur in areas that were burned at high severity or are planned for emergency rehabilitation treatments, nor were sites identified downstream of the fire that are likely to be affected by flooding. Cultural heritage resource surveys on national forest system lands still need to be completed and if any areas requiring protection are identified an interim report will be filed. Surveys will also be done for proposed treatment areas and any identified sites will be avoided. The Office of Archaeology and Historic Preservation was contacted on 4/24/02 and notified of the fire, suppression, and potential BAER activities.

B. Emergency Treatment Objectives:

- Prevent the establishment of new populations of invasive plant species as a result of this fire through survey and treatment of weeds. (Accomplish through Forest)
- Stabilize slopes where slope treatments are feasible and are likely to be effective, in order to minimize soil loss. (Accomplish through Forest)

- Slow and trap sediment by providing surface roughness to sides of inner gorges of ephemerals as well as within the channels, where appropriate, in order to protect water quality. (Accomplish through Forest)

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

Land **100** % Channel **100** % Roads **NA** % Other **NA** %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	75%	80%	85%
Channel	60%	50%	15%
Roads	NA	NA	NA
Other	NA	NA	NA

E. Cost of No-Action (Including Loss): There is a high potential for loss of plant community diversity and productivity due to invasive plants/weeds and a lessor potential for soil loss and downstream impacts to water quality without treatment.

F. Cost of Selected Alternative (Including Loss): This alternative is expected to cost slightly more in the short term (survey, monitoring, and treatment), but could save significant expenses in lost productivity and weed eradication costs over the longterm. Although slope and channel treatments are minimal, it is likely that these treatments will help minimize erosion losses and potential sedimentation impacts to Prebles jumping mouse habitat and municipal water supplies, which are extremely difficult to quantify.

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Lisa Bryant assisted by Charlie Marsh

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crmarsh@fs.fed.us	719 539-3591	

H. **Treatment Narrative:**

The following treatments have been proposed to mitigate the threat to life, property, and loss of site productivity:

Land Treatments:

1. Contour felling – trees will be directionally felled and anchored into the slope on the contour in order to trap sediment on the hillslope. Approximately 3 acres of this type of treatment is proposed for the high severity burn areas that occurred on national forest system lands.
2. Straw mulching – mulch selected areas of high burn intensity to minimize soil loss. Mulch will be applied at a minimum of 1 ton/acre using certified weed free material. Mulch may also be used in conjunction with seed treatments to help protect seed, conserve moisture, and aid in germination. Approximately 10 acres is proposed for private lands within the burn.

3. Straw wattles – wattles will be placed on slope contours and anchored in with wood stakes or metal staples, this treatment is planned for about 30 acres on private lands within the burn area in order to minimize soil loss and reduce downstream impacts of sedimentation.

4. Seeding (includes site prep) – approximately 80 acres of private land that burned on highly erosive soils and/or at high intensity may be seeded to minimize erosion and help protect soil productivity. This treatment may also be used to encourage rapid establishment of natives and reduce potential invasion of non native and noxious weed species. Seed mix will reflect native species found in area with known erosion control properties and seeding rates will be determined on a case by case basis, depending on soil types and slopes and other site factors.

5. Based on the results of the initial survey, treat all occurrences of noxious weeds and invasive species under current Forest policy and direction for weed management. Weeds must be treated prior to seed development and dispersal in order for the treatments to be most effective. Based on the vigor of grasses, fobs and shrubs and extensive ground cover in adjacent unburned area, it is estimated that the burn area may only have 5 acres of weeds in widely dispersed patches.

Follow-up surveys need to be completed in the spring of 2003 and additional weed control will be needed for 3-5 years. Continue surveys and treatments annually until control is achieved, interim requests will be filed to request additional monies for treatment if weeds are identified. The re-establishment of native grass and shrub communities by 2004 should increase competition, reduce bare ground, and help reduce the occurrence of weed infestations.

Weed surveys are planned for the entire area, especially areas near known sources, treatment will occur only where populations are identified and it is expected that the total treatment acres will be five acres or less.

Channel Treatments:
1. Contour/directional felling – burned trees, preferably with tops still intact, will be directionally felled on the contour of the inner gorge, with the branchs near or in the ephemeral draw to help trap sediment and create surface roughness. Approximately 2

acres suitable for this treatment have been identified on national forest system lands and 10 acres on private lands.

2. Also recommend notification of downstream water utilities, Denver Water Board & City of Bailey, sending them a copy of this report and recommending that they consider shut down of inlets and not diverting and utilizing surface flows during high storm events to protect pumping and treatment facilities. Apparently both utilities have this capability and alternate sources of water for such emergencies.

Roads and Trails

Roads/culverts were not identified to be at risk within the burned area, however field surveys indicated that county and state roads within and adjacent to the burn have culverts, ditches, and catch basins in need of maintanence; many culverts were ½ full with dirt/sediment. The team recommends sending copies of this report to appropriate agencies and recommend that roads in this area be made a priority for routine maintanence and culvert/ditch cleaning and consider additional storm patrols during the first year. Agencies identified include: County Roads Department, Forest Engineer, Colorado Department of Transportation.

I. **Monitoring Narrative:**

(Describe the monitoring needs, what treatments will be monitored, how they will be monitored, and when monitoring will occur. A detailed monitoring plan must be submitted as a separate document to the Regional BAER coordinator.)

Noxious Weeds

Based on our experience in the Buffalo Creek and Hi Meadow fires, it is likely that existing populations of noxious weeds will expand into the Snaking fire burned area. In 2002, we will survey and treat those existing populations using Forest funds, but will also need to monitor all areas of the burn to document noxious weed expansion.

The noxious weed control plan includes the initial survey of the burn area, monitoring document and mapping of noxious weed species. The initial survey must be completed in the 2002 field season, preferably during May or June. It is important that the survey is thorough and that all weed occurrences are detected.

Based on the results of the initial survey, treat all occurrences of noxious weeds under current Forest policy and direction for weed management. Weeds must be treated prior to seed development and dispersal in order for the treaments to be most effective.

Monitor the burn area in the fall of 2002 to determine noxious weed expansion. Based on this monitoring, future year treatments will be determined.

Part VI – Emergency Rehabilitation Treatments and Source of Funds by Land Ownership
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C

			NFS Lands				Other Lands				All
		Unit	# of	WFSU	Other		# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	SULT $	$		units	$	Units	$	$
A. Land Treatments											
Contour Felling	Acres			$0				$0		$0	$0
Noxious Weed Treatm	Acres			$0					814	$1,018	$1,018
Straw Mulching	Acres			$0				$0	10	$4,000	$4,000
Straw Wattles				$0				$0	30	$15,000	$15,000
Grass Seed and Applic	Acres								80	$7,200	$7,200
Subtotal Land Treatments				$0				$0		$27,218	$27,218
B. Channel Treatments											
Contour/Directional Fe	Acres			$0				$0	10	$500	$500
				$0				$0		$0	$0
				$0				$0		$0	$0
				$0				$0		$0	$0
Subtotal Channel Treat.				$0				$0		$500	$500
C. Road and Trails											
				$0				$0		$0	$0
				$0				$0		$0	$0
				$0				$0		$0	$0
				$0				$0		$0	$0
Subtotal Road & Trails				$0				$0		$0	$0
D. Structures											
				$0				$0		$0	$0
				$0				$0		$0	$0
				$0				$0		$0	$0
				$0				$0		$0	$0
Subtotal Structures				$0				$0		$0	$0
E. BAER Evaluation											
salaries				$7,500				$6,600		$0	$14,100
travel				$57				$0		$0	$57
F. Monitoring				$1,200				$0		$0	$1,200
G. Totals				**$8,757**				**$6,600**		**$27,718**	**$41,875**

PART VII - APPROVALS

1. /s/ Abigail R. Kimbell — 5/6/02
   Forest Supervisor (signature) — Date

2. /s/Richard P. Salazar (**for**) — 05/08/02
   Regional Forester (signature) — Date

Attachment A
Specialists Reports

The following reports are in hardcopy form in the project file, stored in the PSICC Supervisor's Office:

1. Private Land Cultural Resources – Marsha Sims, NRCS
2. Private Land Wildlife and Weeds – NRCS wildlife specialist

The attached reports were available electronically at the time of this report filing. Hardcopies are also included in the project file:

1. Engineering/Hydrology – John Andrews, NRCS
2. Wildlife/Weeds – Denny Bohon
3. Cultural Resources – Curtis Fair

1. Engineering/Hydrology – John Andrews, NRCS

SUBJECT: Trip Report - Snaking Fire
Park County, Colorado

DATE: May 3, 2002

T0: Lisa Bryant, BAER Leader, USFS
Leon Kot, Soil Conservationist, NRCS

A field investigation within the boundaries of the Snaking Fire, Park County, Colorado, was conducted May 1, 2002. The purpose of the investigation was to asses potential negative effects on natural resources, cultural resources, structures, roads and other improvements attributable to the post fire condition of the watershed. This report will focus on the hydrologic response of the watershed and potential impacts on channels, roadways and residences. Predictions of off site sediment delivery or other water quality effects will be discussed in other reports.

Background Information

The Snaking Fire is located in the northeast portion of Park County. The burn area encompasses about 2,300 acres on predominantly south facing mountain slopes, bounded on the north by the ridge top, on the south by Highway 285, and stretching east to west from Bailey to Shawnee. Land ownership is 65% federal (USFS and BLM) and 35% private. Land use within the burn area is predominately mature pine forest, with residential development scattered throughout the private land. Slope of the watershed varies from 5-6% near the valley floor to vertical at the ridge top, with elevations ranging from 8040 to 9898 feet above mean sea level. Soils in the lower parts of the area are coarse to fine sands formed from weathered granite with frequent outcroppings of weathered bedrock, which transition to predominately rock surfaces near the ridge top.

The burn area contains five distinct watersheds encompassing about 2170 acres, and about 130 acres of other areas mostly on slopes adjacent to the north side of Highway 285. The channels in each watershed are unnamed ephemerals, and have been designated A through E for the purpose of this report, as shown in Figure 1. Watersheds A-C outlet directly to the North Fork of the South Platte River via culverts under Highway 285. Watershed D outlets through Bailey and then into the North Fork, and Watershed E outlets to Crow Gulch about 1.2 miles upstream of its confluence with the North Fork.

The hydrologic condition of all watersheds was similar prior to the fire event. The soils, although porous are shallow and store very little precipitation, placing them in NRCS Hydrologic Group D. As a result of low fertility and moisture availability the existing vegetation had a small to moderate effect on enhancing infiltration and retarding precipitation runoff rates . The majority of sheet and rill erosion resistance was

provided by raindrop interception in the tree canopy and pine needles and rock fragments present on the soil surface. The average annual precipitation at the site is 16 inches, with about 20% falling as snow during winter months. The estimated average annual watershed yield before the fire is in the range of 0.15 to 0.2 inches or about 1% of the annual precipitation. Table 1 describes hydrologic characteristics of each watershed in the pre and post fire condition.

FIGURE 1. Snaking Fire Watersheds

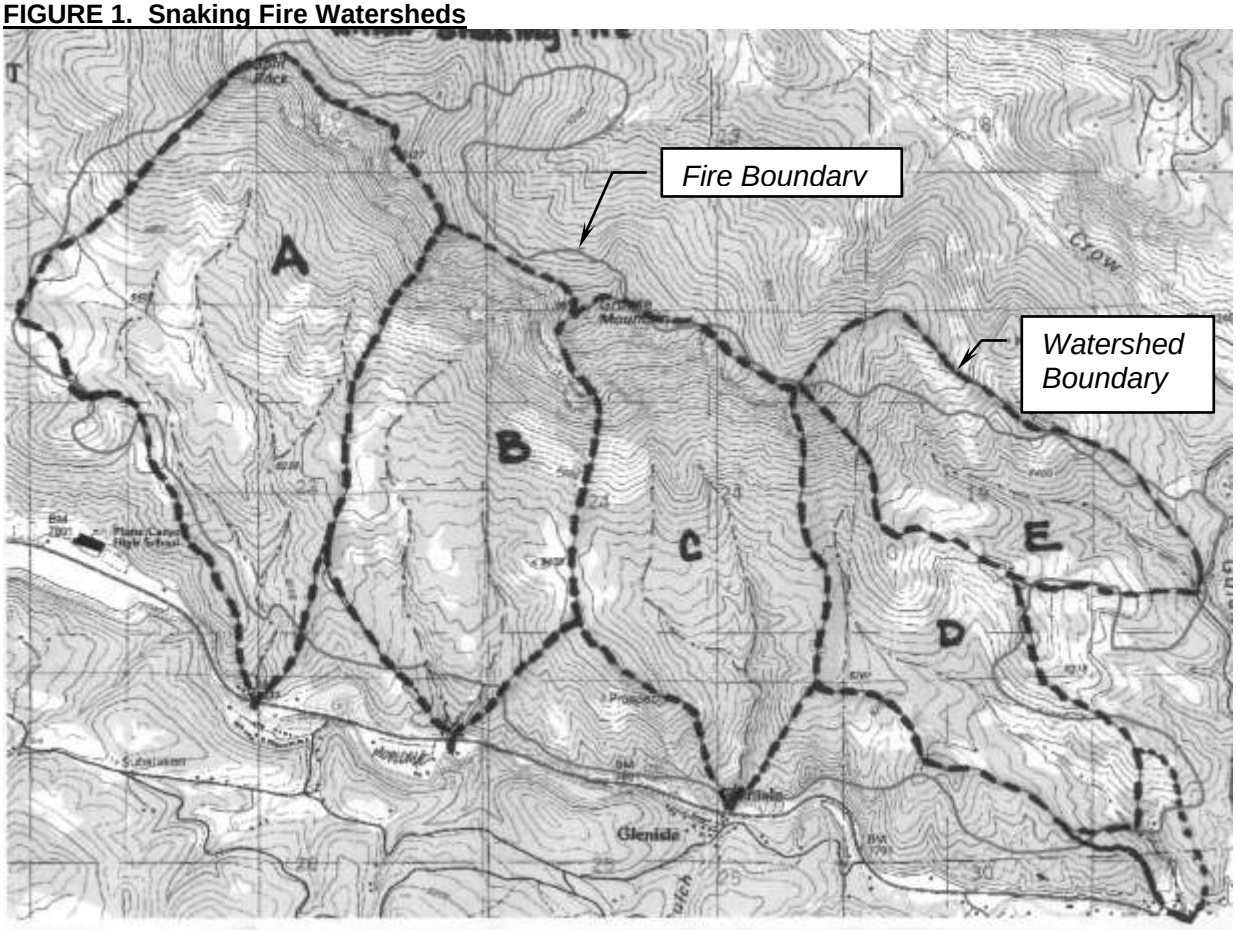

TABLE 1. Pre and Post Fire Watershed Characteristics

Characteristic	Watershed				
	A	B	C	D	E
Drainage Area (acres)	**668**	**472**	**420**	**344**	**267**
Federal Land Ownership	**85%**	**70%**	**100%**	**10%**	**6%**
Private Land Ownership	**15%**	**30%**	**0%**	**90%**	**94%**
Length of Defined Channels (miles)	**2.8**	**1.8**	**1.5**	**1.6**	**.6**
Length of Public & Private Roads (miles)	**1.9**	**0.6**	**0.5**	**2.4**	**2.0**
Area of Low Intensity Burn	**29%**	**20%**	**33%**	**29%**	**54%**
Area of Moderate Intensity Burn	**48%**	**59%**	**61%**	**33%**	**29%**
Area of Moderate/High Intensity Burn	**23%**	**18%**	**6%**	**14%**	**0%**
Pre Fire NRCS Runoff Curve Number	**77**	**77**	**77**	**77**	**77**
Post Fire NRCS Runoff Curve Number	**83**	**81**	**80**	**80**	**79**
Pre Fire Time of Concentration (hours)	**0.31**	**0.37**	**0.31**	**0.39**	**0.28**
Post Fire Time of Concentration (hours)	**0.29**	**0.33**	**0.29**	**0.36**	**0.26**
2yr frequency-24hr duration rainfall, (inches)	**1.4**	**1.4**	**1.4**	**1.4**	**1.4**
Pre fire 2yr-24hr flow rate	**73**	**47**	**46**	**33**	**31**
Post fire 2yr-24hr flow rate	**198**	**100**	**82**	**60**	**47**
10 yr -24hr rainfall, (inches)	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**
Pre fire 2yr-24hr flow rate	**418**	**274**	**263**	**192**	**176**
Post fire 2yr-24hr flow rate	**666**	**386**	**340**	**251**	**211**
Pre-fire Annual Watershed Yield (ac-ft)	**10.6**	**7.5**	**6.7**	**5.5**	**4.2**
Post-fire Annual Watershed Yield (ac-ft)	**37.3**	**16.9**	**10.9**	**8.9**	**5.1**

Post Fire Hydrologic Condition

The principle effects of the fire on the hydrologic aspects of the watershed are related to the reduction of ground cover. Fire induced soil hydrophobicity has had a significant effect on increasing runoff after fires in similar resource settings within the Pike National Forest. However field tests indicate the hydrophobic condition varies in scale and extent similarly in both burned and unburned areas within the Snaking Fire boundary, therefore its effect on post fire hydrology is expected to be small in comparison to the effects resulting from loss of vegetation. The loss of vegetation in the moderate and high intensity burn areas will in the short term increase the runoff potential, decrease plant evapotranspiration and thus watershed yield. This will result in channel flow rates after storm events that have shorter durations but higher velocities and flow rates. In the short term watershed yield could double. Channel velocities could increase by about 30% and peak channel flow rates could double. The most pronounced differences will be observed from storms associated with the 2 to 10 year frequency events. The observed hydrologic response from extreme events, such as that resulting from a 100 year frequency storms or higher, is not expected to be much different than would occur from the watersheds in their pre fire condition. For the purposes of this report “short term” is defined as the period after the fire until ground vegetation reappears.

In the long term additional nutrients available after the fire have the potential to increase the amount of understory and ground covering vegetation, improving the hydrologic condition above that present prior to the burn. Lack of adequate moisture will retard the development of ground cover, and runoff from an extreme event could transport the existing unprotected topsoil down slope or offsite, permanently damaging recovery potential.

Potential treatments to hasten recovery could include scarification of slopes in the 5 - 10 % slope range, installation of straw wattles on slopes in the 10 - 20% range, and critical area planting. On a watershed scale the cost of these treatments significantly exceeds the potential damages and therefore wide area treatments are not recommended. However on localized areas of high intensity burns immediately above residential property or a significant public structure some treatment may be warranted. These areas will usually be limited to 1 to 5 acres, and the specific treatments recommended must be evaluated on a site by site basis.

Post Fire Effects on Channels

The channels within the watershed are ephemeral, and as such will only flow during conditions when rainfall intensity exceeds the infiltration capacity of the soil. The pre fire condition required rainfall events in excess of 0.7 inches to create any significant amounts of runoff. With the post fire condition the amount of rainfall needed to create runoff has been reduced to an average of about 0.5 inches within the fire boundary. Of course the rocky areas in the upper ends of the watersheds will shed water from any amount of rain while the more mildly sloping and lightly burned areas retain their initial absorptive capacity. The effect in the short term is that the channels will run more frequently at about 20% higher velocity and potentially at about double the peak flow rate. This increases the potential for nuisance flooding of improved areas adjacent to channel outlets. Channels that showed a great deal of integrity prior to the fire should remain stable. Channels that were only marginally stable prior to the fire will likely become unstable, via the formation of headcuts that proceed upstream. This effect will be exaggerated if intense rainfall events occur prior to recovery of vegetation on the watershed. The result of this channel instability will be increased sediment delivery to watershed outlets and increased maintenance at road crossings. The expected cost of the increased maintenance is estimated as $3,000 to $5,000 dollars per year during the recovery period. The cost of in channel treatment is estimated as $2,300 per mile or about $19,000 over the entire burned area, and therefore extensive channel treatments are not recommended. However at specific locations in high intensity burn areas where formation of a headcut may threaten a house or could cutoff a sole route of ingress/egress treatment may be warranted. Specific treatment recommendations must be developed on a site by site basis. In channel check dams should be restricted to sites with contributing drainage areas of 2 or 3 acres or less. Log felling across channels and straw bale check dams should be avoided. Post and wire structures, rock riprap checks, and similar practices are more sustainable and present lower risk of failure under both normal and extreme runoff conditions.

Post Fire Effects on Roads and Residences
The roads and residences observed during the field investigation were located primarily on ridge tops and in general will not be subject to increased risk of damage from runoff during the recovery period. The principle area affected will be the five or six sites where roads cross drainage ways. Ash, sediment and other debris will accumulate on the upstream side of these crossings during low flow events. This is a positive effect in that the material will not be transported downstream to receiving water bodies, but negative in that additional maintenance will be required during the recovery period to restore debris storage capacity and culvert flow capacity at these sites. The recommended treatment is to monitor these sites after every rainfall event and remove debris and sediment accumulations after they occur. The cost of this work is included in the $3,000 to $5,000 per year maintenance cost associated with channels mentioned above. In addition stage markers should be posted at all crossings that will serve to identify the water depth in the inevitable event that the crossings overtop during extreme runoff events. Area residents should be made aware of the markers and instructed not to pass when the flow exceeds a safe depth or when the maker is missing (an indication that the road embankment has breached).

Summary
In general the Snaking Fire may result in improved hydrologic characteristics of the watersheds within its boundary over the long term. In the short term watershed yield will increase reducing the available soil moisture to assist recovery of vegetation. Runoff flow rates in channels after rainfall events exceeding 0.5 inches in 24 hours will be increased, resulting in increased maintenance at road crossings. Localized effects include increased potential for formation of channel headcuts that threaten structures or road crossings or other important sites. The level of risk is such that the recommended treatment is increased vigilance and prompt repair of any problems that develop. Wholesale preemptive measures are not recommended, except perhaps on small sites on private property that experienced high intensity burns. Land owners should be informed of the potential risks and directed to contact the NRCS or Conservation District in order to receive a site specific evaluation of the concerns and potential treatments applicable to their property.

Please contact me at (720) 544-2834 or by E-mail at john.andrews@co.usda.gov if the information in this report needs any explanation or if you have any concerns that I may be able to provide some assistance to address.

Sincerely,

JOHN E. ANDREWS, P.E.
State Conservation Engineer

CC: Herman Garcia, NRCS
Harry Smith, NRCS
Marsh Simms, NRCS

2. Wildlife/Weeds – Denny Bohon

Wildlife and Noxious Weed BAER Report for Snaking Fire
Denny Bohon, district biologist
5/3/02

The Snaking Fire was beneficial to some wildlife species and detrimental to others. The only potential threat to ecosystem stability is from the invasion of noxious weeds. A much smaller risk exists for Preble's meadow jumping mouse habitat that occurs two miles downstream from the burned area. Treatment is recommended for noxious weed control and a minor amount of sediment control.

Threatened, Endangered and Proposed Species

Canada lynx is the only federally listed species adversely affected by the fire. Approximately 600 acres of denning and foraging habitat was burned. Timber was removed on an additional acre to provide a helispot for fire suppression work and about three miles of fireline was constructed through lynx habitat. Lynx habitat is not at further risk from flood events as the forest on the north side of Split Rock/Grouse Mountain is mostly intact and the remaining lynx habitat on the surrounding lands is above the burn area. No treatment is recommended.

The lowest elevation on the fire is about 7800' near the town of Bailey. The burn area is above the elevation limit recognized for Preble's meadow jumping mouse (7600'). Potential mouse habitat occurs two miles downstream from the fire along the North Fork of the South Platte River. Recent surveys suggest that the mouse occurs about 10 miles downstream from the burn area. A major flood event, as occurred following the Buffalo Creek fire, could inundate riparian and upland habitat that provides potential cover, nest sites and feeding habitat for the mouse. Based on soil and hydrologic analyses, there is a low risk of flood occurrence and hence a low risk to the mouse. Directional falling of trees in the headwaters of tributary streams may further reduce this risk, though the team could identify only a few appropriate sites.

Big Game Species

The burned area includes approximately 1700 acres of open ponderosa pine shrublands which provided winter range for mule deer and elk. Mountain mahogany, the primary forage species, was in the early bud stage at the time of the burn. I expect that most of the mahogany in the low and moderate intensity burn areas will sprout from the existing stems or crowns this year; plants in the high intensity burn area will take longer to recover. Moisture this summer will encourage the recovery of this species. Overall, the fire will promote the regeneration of grasses, forbs, shrubs and aspen and improve winter range for mule deer and elk.

Raptors

Local residents reported that a pair of golden eagles was nesting on Split Rock/Grouse Mountain, and that the eagles left during the fire. It is unlikely that the eagles would re-nest this late in the breeding season. No treatment is recommended.

Noxious weeds

Invasive weeds are expected to expand into disturbed sites in the burn area, specifically along roads, trails, and the disturbed ground associated with ground squirrel activity. The area has not been surveyed, but some weeds were seen during the field reconnaissance. There are several factors that increase the risk of infestation as well as the spread of existing weeds. Weed seed sources are adjacent to the burn area. Aggressive species such as diffuse knapweed, Canada

thistle and yellow toadflax occur along the Hwy 285 corridor and in private lands adjacent to the burn. Non-local weed seed (such as yellow star thistle and leafy spurge) may have been brought into the burn area on equipment used during the fire. Some of the equipment came from areas known to have extensive weed problems. Disturbed ground provides ideal habitat for weed seed and there are several sources in the burn area. Ground squirrel activity is fairly high, creating fresh mounds of soil, as well as there are about six miles of roads and trails that were freshly disturbed from human and vehicle traffic during the fire. The burn itself reduces competition from native plants and soil chemistry encourages weed seed germination. In the Buffalo Creek and Hi Meadow fires, we saw the rapid expansion of existing weeds into burned areas. We also saw that treatment during the year of the fire was successful in controlling weed expansion and reducing out-year treatments. The Forest is requesting funds to survey, treat and monitor noxious weed species occurrence in the burn area.

Treatment Plan

Complete an initial survey of the burn area, document and map non-native and noxious weed species. Enter data into the GIS database. The initial survey must be completed in the 2002 field season, preferably during May or June. It is important that all surveys are thorough and that all weed occurrences are detected.

Based on the results of the initial survey, treat all occurrences of noxious weeds and invasive species under current Forest policy and direction for weed management. Weeds must be treated prior to seed development and dispersal in order for the treatments to be most effective. Based on the vigor of grasses, fobs and shrubs and extensive ground cover in adjacent unburned area, it is estimated that the burn area may only have 5 acres of weeds in widely dispersed patches.

Follow-up surveys need to be completed in the spring of 2003 and additional weed control will be needed for 3-5 years. Continue surveys and treatments annually until control is achieved. In 2003, it is likely that some of the existing weed populations will have been killed but new infestations will have occurred requiring more acres of treatment. With thorough monitoring and treatment, these occurrences should be reduced by 2004. The re-establishment of native grass and shrub communities by 2004 should increase competition, reduce bare ground, and help reduce the occurrence of weed infestations.

Treatment Costs

Initial survey……..…7 days@ $200/day = $1400
Mapping/database mgt……1 day@ $200/day = 200
First year treatment…….5 acres@ $200/ac = 1000
Contract prep/oversite…….2 days@ $200/day = 400

2nd Year survey……...7 days@ $200/day = 1400
Mapping/database mgt……1 day@ $200/day = 200
2nd Year treatment……...7 acres@ $200/ac = 1400
Contract prep/oversite…….2 days@ $200/day = 400

3rd Year survey……7 days@ $200/day = 1400
Mapping/database mgt……1 day@ $200/day = 200

3rd Year treatment……5 acres@ $200/ac = 1000
Contract prep/oversite……..2 days@ $200/day = 400

1st year costs…….= $3000
2nd year costs……= 3400
3rd year costs……= 3000

Total Treatment Costs……..= $9400

**Note, after discussing this with the Regional BAER coordinator and the weed specialist, only the first two years of survey and the first year of treatment were included in the initial request. If additional treatment and survey needs are identified, authorization for expenditures may be requested with interim 2500-8's.- Lisa Bryant 5/4/02.*

3. Cultural Heritage Resources – Curtis Fair

Snaking Fire
BAER Team
Heritage Resources
Curtis Fair
Zone Archaeologist Pike National Forest
3 May 2002

Beginning on the 23rd of April 2002 I was a member of the initial attack with the Snaking Fire. I had duel responsibilities: 1) Check In, and 2) Heritage Resource Advisor. Under the Heritage Resource Advisor responsibility, I contacted the Office of Archaeology and Historic Preservation (SHPO) on the 24th of April 2002 and talked to the Federal Project Review Mr. Jim Green, notifying him that a wild land fire, located on the South Platte Ranger District, Pike National Forest, was burning out of control and that heritage resource concerns associated with the fire suppression activities would take place at a later date. Associated with this correspondence I also requested a file search of known archeological resources located within and adjacent to the wild land fire. This information was relayed to the Incident Command. I continued doing both Check In, and Heritage Resource Advisor responsibilities until I was demobed from the incident on the evening of the 27th of April 2002.

I attended the BAER meeting on the 3rd of May 2002 at the South Platte Ranger District office. The following items still need to be accomplished in order to satisfy the Heritage Resource Concerns associated with the BAER:

1. determine area of proposed activities (work with Ken Kanaan and Denny Bohon)
2. develop survey strategy
3. notify SHPO and tribal groups
4. conduct back ground research
5. develop survey strategy
6. conduct archaeological survey and field monitoring
7. record and document heritage resources (historic and prehistoric sites)
8. complete final heritage resource documentation and send to SHPO for review and comment.

Site (s) located during the archaeological survey, within the area of proposed activity, will be avoided. In turn, making the documentation a “no effect” Cultural Resource Report. Within the BAER handbook, project activities can take place without SHPO concurrence.

Note: at the meeting Curtis reported that it was unlikely that he would be requesting any BAER treatments to protect archeological sites within the burn, the high intensity burn areas were not likely sites for cultural resources. His intention was to complete his survey as soon as possible and, if necessary, an update would be made to the 2500-8, therefore his concerns are more with identifying areas that would need to be avoided in order to protect them during any treatments for weeds or erosion control.—Lisa Bryant 5/4/02