Date of Report: August 23rd, 2006

BURNED-AREA REPORT

(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report:

[X] 1. Funding … request for Emergency Stabilization Funds

[ ] 2. Accomplishment Report

[ ] 3. No Treatment Recommendation

B. Type of Action:

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

[X] 2. Interim Report # 1

[X] Updating the initial funding request based on more accurate site data or design analysis

[ ] Status of accomplishments to date

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

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Magpie

B. Fire Number: UT-FIF-000413 (Wildland Fire)

C. State: Utah

D. County: Millard

E. Region: Intermountain - 04

F. Forest: Fishlake National Forest

G. District: Fillmore - D1

H. Fire Incident Job Code: P4C3B1

I. Date Fire Started: 08-08-2006 @ 1900

J. Date Fire Contained: 08-14-2006 @ 2000

K. Suppression Cost: $ 300,000 … Type III – Final Incident Summary / 08-14-2006 (Estimated Final Cost)

L. Fire Suppression Damages Repaired with Suppression Funds

1. Fireline waterbarred (miles) ~ ½ to ¾ of a mile of hand line was rehabilitated (SW part of the burn)

2. Fireline seeded (miles) To my understanding, none of the hand line was re-seeded – instead, it was thought the seed source existing within the topsoil would be adequate to complete the job; it should be noted, some areas were simply too cobby or too stony to really consider seeding as an option

3. Other (identify) Light rehabilitation was completed on the Helispot (Northern peak near the burn)

M. Watershed Numbers: 160300051401 / North Fork of Chalk Creek – 6th Field HUC

N. Total Acres Burned: 711

(Summary of Acres Burned by Land Ownership)

711	**NFS Lands**	-0-	**Other Federal**	-0-	**State of Utah**	-0-	**Private**

O. Vegetation Types: Pinyon–Juniper, Gambel oak, curlleaf mountain-mahogany and mountain big sagebrush along with perennial grasses occurred along moderately steep mountainsides and steep ridgetop areas (57%); Gambel oak with perennial grasses was observed on the deeper soils located at higher elevations within the burn (38%); a small, but distinct, riparian zone was mapped along the North Fork of Chalk Creek (3 %) and a small patch of mixed conifers consisting of white fir and Douglas fir were visible on a NW facing slope located ½ mile SE of Black Cedar Hills Spring (2 %).

P. Dominant Soils: The mixed conifer site had Mollic Haplocryalfs, Typic Haplocryalfs and Lithic Haplocryalfs as the primary soil types; the areas supporting curlleaf mountain-mahogany were mapped as Lithic Haplustolls and Lithic Argiustolls; the Gambel oak sites located on the deeper mountainsides were identified as Pachic Argiustolls, Pachic Haplustolls and Typic Argiustolls; the mountain big sagebrush meadows were documented as Typic Haplustolls; the PJ dominated lands at lower elevations were mapped as Aridic Argiustolls and Aridic Haplustolls and the remaining riparian soils were Cumulic Haplustolls and Torrifluventic Haplustolls..

Q. Geologic Types: The lower toeslopes of the burned-area had wildland soils formed in colluvium and residuum from the noncalcareous, Nugget Sandstone Formation; the remaining backslopes, shoulderslopes and ridgetop areas had soils derived from hard deposits of Tintic Quartzite; the term quartzite is commonly used to label metamorphosed sandstone rocks. The riparian soils mapped along the North Fork of Chalk Creek were formed in mixed sediments of various sedimentary rocks.

R. Miles of Stream Channels by Order or Class:

Stream Names	Zero Order	1st Order	2nd Order	3rd Order
Includes two un-named 1st Order tributaries – and, the North Fork of Chalk Creek	-0-	1.25	-0-	2.5

S. Existing Transportation Systems (2)

Trails: One large segment of unauthorized trail exists right in the center of the burned-area; this unimproved trail surface follows along the contour of the landscape; some of the trail was affected by a severe burning disturbance; much of the trail is covered with stones and boulders; as expected, there are no culverts in the channels – travel is hazardous; the area should be signed, closed-off and obliterated to protect the public. A second ATV trail occurs along the north and western perimeter of the burn. Most of this trail is in good condition … a few areas of trail should be re-conditioned in order to prevent a loss-of-water-control associated with the recent disturbance.

Roads: None

PART III - WATERSHED CONDITION

A. Burn Severity … based on low-level flights and on-the-ground field sampling (# of acres)

451	**Low**	133	**Moderate**	127	**High**

B. Estimate of Water-Repellent Soils (acres): 211 (~ 30 % of the entire burned-area)

C. Soil Erosion Hazard Rating (# of acres)

421	**Low**	121	**Moderate**	169	**High**

D. Erosion Potential: 19.3 tons / acre

E. Sediment Potential: 2,100 cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period	5 Years
B. Design Chance of Success	65 %
C. Equivalent Design Recurrence Interval	2 Years
D. Design Storm Duration	1 Hour
E. Design Strom Magnitude	0.79 inches
F. Design Flow	41 cfs / mi^2
G. Estimated Reduction in Infiltration	37 %
H. Adjusted Design Flow	103 cfs / mi^2

PART V - SUMMARY OF THE ANALYSIS

A. Describe Critical Values-at-Risk / Resources and Immediate Threats

➔ **The Potential Loss of Long-Term Soil Productivity** … about 35 % of this wildfire has moderate to high severity burns occurring upon moderately steep to steep mountainsides and very steep ridgetop areas. At this time, strongly hydrophobic ground conditions exist within 30 % of the burned-area. If the soil becomes truncated – meaning, its topsoil horizons are washed away from the most severely burned sites, then, there is a genuine concern about the type of plants that would become re-established within this disturbance. Most of the affected soils had a T Factor of 1 ton / acre / year – meaning, they were considered to be a fragile, non-renewable type of land resource. We need to get some protective plant cover re-established upon these fire-damaged sites as soon as possible. Although the soils in this area have a very low to low / water holding capacity … the ground is adequately recharged with water during the plant growing season – indicating, this burn is located within an Ustic Moisture Regime area. Mean Annual Precipitation is about 22 to 26 inches / year. Since the soils in this part of the Pahvant Range were formed from sandstone and quartzite … the ground consists of sandy textured material which is easily detached and transported away from unprotected areas during summer thunderstorm events. If the burned-area is impacted by a 10 –Year storm event, there is a high likelihood for mud and assorted debris to be flushed off its severely burned upper mountainsides and down into the North Fork of Chalk Creek from a sub-basin area drained by Tributary A (please see the Hydrologists Report and Maps at this time). We need to protect this resource from erosive conditions and allow it to function as critical winter range habitat for elk once again. Although much of the burned-area has a poor rating for conducting broadcast seeding treatments … meaning, anticipated success would be about 4 to 5 years out of 10 … the treatment remains a viable option because its intended to stabilize erosive ground conditions on fire-damaged terrain.

➔ **The Need to Re-Condition or Obliterate Existing ATV Trail Surfaces** … the BAER Team observed two well-defined ATV trails occurring within the burned-area. One trail is located in the vicinity of Black Cedar Hills Spring; it is authorized for administrative and public use. It is located right along the perimeter of the

fire in the NW part of this disturbance. A few segments of this trail surface will need to be re-conditioned, waterbarred and out-sloped in order to prevent a loss-of-water-control from occurring in areas where a severe burning disturbance has affected the edge of the trail surface. Secondly, there is an unauthorized, user-made trail going right through the middle of the burn. This trail is not being maintained by the Forest Service – and, it will not be shown as being open to the public for motorized travel on our new Travel Map. The existing trail continues along the contour over into the eastern edge of the burn where it finally plays-out along a rocky ridgetop. Part of the trail is located in a mountainous area affected by a severe burning disturbance. This segment of trail will likely be over-topped by rocks, assorted debris and eroding soil material when the surrounding hillsides are subjected to summer thunderstorm events. The trail crosses several drainage ways as the riders make their way up the canyon; none of these crossings have any armoring or a culvert to direct and manage the flow of water down the hillside. And … much of the trail surface is covered with cobbles, stones and boulders which make traveling it quite difficult and sometimes hazardous. Now that the wildfire has affected the surrounding terrain … parts of the trail surface will certainly act as a conduit flushing large volumes of water back upon the lower burned-area causing erosive ground conditions; the unmanaged channel crossings observed along the trail will be subject to accelerated flows of water causing the ground to downcut and form into gullies. Simply stated … this area needs to be signed, closed-off – and, to a certain extent obliterated in order to restrict motorized travel. It should be noted, the trail would be re-opened to the general public for hiking and equestrian travel once its potential for flooding had passed and the ground started to resume a normal type of hydrologic function.

➔ **Potential for the Establishment of Noxious Weeds and Invasive Plant Species** … several different weeds occur in close proximity to this burn, these unwanted plants are spotted knapweed, Scotch thistle, musk thistle, field bindweed, Dyer's woad and whitetop. In addition, there is a significant amount of cheatgrass already established on the neighboring BLM lands to the west. We (absolutely) do not want to have these undesired plants invade into the Magpie Wildfire area. Most of the soils located up on the charred mountainsides and ridgetop areas are capable of growing 500 to 850 lbs of forage / year under normal climatic conditions. We need to get the topsoil stabilized and returning to a normal type of hydrologic function once again – so, native, perennial grasses, forbs and shrubs can dominate the landscape – not, these undesired plants.

➔ **Threats to Human Life and Property** … the town of Fillmore, Utah is located about 5 miles west of the burned-area. In the past, our Forest has been concerned about potential flooding hazards that might be associated with any large incident of wildfire occurring up in the Chalk Creek drainages. Well. this burn was a relatively minor disturbance of 711 total acres – and, most of the impact was actually considered to be a low severity burn which is usually beneficial upon the landscape. Since the burn was small and it occurred so far away from town … there is little, if any, actual concern for human health and property connected with the wildfire. After flying over the fire and its surrounding terrain in a Bell 206 / L-4 helicopter … Mike Smith and Dale Deiter were in common agreement that 1) the fish barrier located at the entrance to North Fork Canyon would not be damaged by any increased flows, 2) the concrete diversion structure located 2 ½ miles downstream from the fire would not be compromised by increased flows, sediment or floatable debris and 3) the town itself would probably not be affected by any increased flows of water coming off the burn.

Still, there may be a large flush of water, mud and debris coming down from the NW part of the fire and flowing straight down an unnamed hollow directly into the North Fork of Chalk Creek. Our Fisheries Biologist / Jim Whelan says … a minor flood event may temporarily impact our fish populations in Chalk Creek – but, the overall affect may actually turn out to be beneficial in the long run. As such, he agrees with the recommended idea of using broadcast seeding to put ground cover on the most erosive part of this fire – but, thinks mulching, straw wattles, erosion blanket etc will (probably) not be necessary to protect the existing fish populations. The Fishlake NF / BAER Team agreed to monitor the burn for at least a year – and, if erosive conditions are adversely affecting our blue ribbon trout populations … then we will suggest the implementation of more emergency treatments in an effort to stabilize the fire-damaged landscape.

***** DEFINITION OF A BLUE RIBBON FISHERY *****

A. In order for a body of water to be classified as a blue ribbon fishery, it must provide the entire spectrum of recreational experiences. This would include 1) the quality and quantity of fish caught, 2) a scenic setting offering visual enjoyment, 3) the potential for viewing an abundance of wildlife and 4) a provision to protect the entire natural wildlife community.

B. The body of water must be reasonably accessible to the general population from public roads by either providing sportsman an access through easements, by negotiating access with private land owners or by any other reasonable alternative means of access.

C. The body of water must be located in an area that would provide reasonable accommodations to the angler from its close proximity to population centers, motels, restaurants, public or private camping facilities and other public support amenities.

D. The body of water must be capable of handling sustained angling pressure – and, still provide an abundance of angling opportunities.

E. The body of water should possess some type of natural capacity to produce and re-produce a sustainable / recreational type of fishery.

F. The body of water should be protected by environmental rules and by specific angling regulations, to promote a sustainable yield and viable angling opportunity for the future. This would include regulations to protect the entire natural ecosystem.

B. Emergency Treatment Objectives*:*

The entire purpose of the FS / BAER Program is to make a rapid assessment of severely burned-areas occurring on NFS lands. This action is followed by either 1) a No Treatment recommendation – or, 2) making a Detailed Work Plan which suggests land, channel, road and trail treatments along with protection and safety measures – all intended to quickly stabilize erosive ground conditions occurring within the disturbance during Year # 1. Additional treatments and activities can be financed by requesting NFN3 dollars from NFPORS or the FACTS Database for rehabilitation and restoration work in years 2 through 5 +.

Our suggested land treatments include weed monitoring and herbicide applications on specific areas that were targeted as potential sites for noxious weed invasion. The objective is to prevent the establishment and spread of these unwanted plants within the burned-area. The purpose of our broadcast seeding is two-fold. To a certain extent, we're going to combine the seeding with the other weed treatments as another means of limiting the growth of weeds and cheatgrass within the burn. And, our seeding is certainly intended to prevent a loss of long-term soil productivity from occurring on NFS lands by stabilizing erosive ground conditions on the fire-damaged terrain.

All of our recommended trail treatments are intended to … stabilize the existing transportation surface – and, to limit erosive conditions from occurring upon the surrounding terrain. In the case of the Black Cedar Hills Spring trail … the treatments are designed to minimize resource damage to our capital investment. And … in this particular instance, the planned trail closure and obliteration project is targeted at correcting a loss-of-water-control that would be flowing off the unauthorized trail surface.

Several explanatory signs will be used in an effort to protect the burned-area from curious people – and, to explain to local residents the potential flooding hazards that are commonly associated with a recent incident of wildfire. Specifically, one sign will be located along the western edge of the fire; it will be used for enforcement purposes to explain … why the unauthorized ATV trail is being closed and scheduled for obliteration. The remaining 2 signs will be posted along the NW perimeter of the burn; they will explain the hazards associated with the burn and the need to stay out of the emergency treatment areas.

******

We did not request funds for treatments that were unnecessary according to the current policy of BAER. The Fishlake NF / BAER Team had no hidden agendas related to livestock, wildlife, on-going District programs,

requests made by local units of government or special interest groups. We simply got together, made the assessment and recommended treatments in the spirit of BAER that were thought to be reasonable and prudent during Year # 1 in order to stabilize ground conditions occurring within the burn and water flows associated with the fire.

C. Probability of Completing Emergency Stabilization Treatments Prior to Storm Damaging Event:

Land	80 %	Channel	N/A	Roads / Trails	85 %	Protection / Safety	90 %

D. Probability of Treatment Success:

Treatment Types:	← Years After Treatment →		
	1	**3**	**5**
Land Treatments	75 %	80 %	85 %
Channel Treatments	-	-	-
Trail Treatments	85 %	75 %	70 %
Protection / Safety Treatments	90 %	85 %	80 %

E. Cost of Taking No-Action (Including Loss) $ 725,000 (fisheries, outdoor recreation, soil resources, transportation surfaces, diversion, utility lines)

F. Cost of the Selected Alternative (Including Loss) $ 145,000

G. Skills Represented on the Initial / Burned-Area Emergency Response Team:

X	Hydrology	X	Soils	X	Geology	X	Range		BLM
	Forestry	X	Wildlife		Fire Mgt.	X	Engineering		NRCS
X	Contracting	X	Ecology	X	Botany		Archaeology	X	Helibase
X	Fisheries		Research		Visuals	X	GIS Support	X	District Staff

Team Leader: Michael D. Smith / Soil Scientist

Email: mdsmith01@fs.fed.us Phone: (435) - 896 -1071 Fax: (435) - 896 - 9347

H. Treatment Narratives:

(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)

(Please see our GIS displays for noxious weed monitoring and recommended BAER Treatments at this time)

❶ Land Treatments – the Fishlake NF / BAER Team and members of the Fillmore Ranger District would monitor about 44 acres of pinyon – juniper, Gambel oak, curlleaf mountain-mahogany and mountain big sagebrush dominated landscapes occurring directly adjacent to the closed / obliterated ATV trail –

and, directly adjacent to both the northern and western edges of the burned-area for the establishment of noxious weeds – especially, musk thistle, Scotch thistle and spotted knapweed; in addition, they will monitor various suppression-related ground disturbances, such as the hand line areas, in an effort to limit the establishment and spread of these unwanted plants. In conjunction with the stated monitoring activities, the District will treat about 10 acres of noxious weeds with chemical herbicides in order to limit the growth of these undesired plants.

Another effective treatment associated with minimizing the establishment and spread of weeds and invasive plant species is to conduct broadcast seeding. Simply stated … the seeding treatment currently being planned for these steep mountainsides and ridgetop areas is intended to 1) prevent the establishment of weeds – and, 2) stabilize erosive ground conditions on fire-damaged terrain. We want to conduct the seeding operation on 165 acres using a Type III helicopter. Most of the target terrain is in the range of 20 to 60 % slopes. It should be noted, our seed mix was specially designed for mid-elevation landscapes having low to moderate water retention properties.

All of the areas selected for treatment are very susceptible to sheet, rill and gully erosion during summer thunderstorm events and spring snowmelt conditions. Accelerated rates of erosion adversely affect the soil resource by removing its organic layers and topsoil horizon – the nutrient reservoirs of the site. I suspect most of the helicopter work will involve using a Bell 206 / L – 4 type of aircraft to apply the seed mix; the cost associated with this type of operation will be about $ 700 / hour for the flight time + Driver, Fuel Truck and Helitack charges along with normal fees for Mechanic services. Currently, we have a Bell 206 available to us for the seeding work under an Exclusive Use Contract for the next 30 days – with, an option to extend the contract period for another 30 to 45 days if necessary. Since CY 2000, the Fishlake NF has always kept our Initial Attack / Helicopters under contract until about October 15th for fire suppression activities, reconnaissance flights and project work. If the District wants to implement the seeding treatment at a later date in the calendar year … it will be necessary to acquire the services of a Call-When-Needed (CWN) aircraft at a rate of about $ 900 to $ 1000 / hour.

(**Note**) – Mel Bolling started as the new District Ranger in Fillmore, Utah on Monday / August 7th; I'll have a better idea of when the District really wants to seed the Magpie Wildfire after having a brief discussion with Mel sometime during the next few weeks.

Native or Introduced	Species to be Seeded	Seed Mix for (22 – 26 " MAP)	Estimated Costs / Pound (PLS)
		Pounds / Acre (PLS)	
N	Big bluegrass " Sherman "	0.5	$4.50
N	Sandberg bluegrass VNS	0.5	4.25
N	Indian ricegrass " Rimrock "	2	4.00
N	Bluebunch wheatgrass " Goldar "	1	4.50
N	Slender wheatgrass " Pryor "	5	2.00
N	Snake River wheatgrass " Secar "	1	4.50
N	Thickspike wheatgrass " Bannock "	1	5.50
N	Thickspike wheatgrass " Critana "	1	5.50
	Total Pounds (PLS) / Acre	12.0	

Total Seeds (PLS) / Ft² 1/	59
Estimated Seed Cost / Acre	$42.38
Estimated Cost Seed Mix / Pound	$3.53

1/ Recommended rates for broadcast seeding mixes are about 50 – 100 seeds per square foot when followed by dragging to cover the seed (see Planting Guide for Utah). The guide also states for aerial seeding, " if it is not possible to cover seed, plant late in the fall and increase the seeding rate ."

Specific ecological attributes valued for some of the recommended species include the following:

Big bluegrass — " often found growing on drier, infertile, open side hills, and waste places…noted for early spring growth…used successfully for reseeding burned-over forest lands. "

Sandberg bluegrass — " important for soil stabilization and forage for wildlife… one of the first grasses to green-up in the spring…excellent in low rainfall native mixes "

(These two bluegrasses should be competitive with any cheatgrass that may be residual in the burned-area.)

Indian ricegrass — " valuable winter forage…one of the most drought tolerant native grasses "

Bluebunch wheatgrass — " long-lived, drought tolerant…one of the most valuable native range grasses "

Slender wheatgrass — " valuable in erosion control because of its rapid development "

Snake River wheatgrass — " adaptable to most areas suitable for bluebunch wheatgrass, but is more vigorous and drought tolerant…originally released as a bluebunch wheatgrass variety "

Thickspike wheatgrass — " adapted to disturbed range sites and dry areas subject to erosion "

❷ Channel Treatments - None

❸ Trail Treatments – we want to re-condition about a mile of existing ATV trail; currently, the trail comes up into the burned-area from nearby Black Cedar Hills Spring. The trail surface continues for 0.9 mile along the NW perimeter of this fire. Simply stated, the recent fire has already started to compromise the performance of the trail surface; in some areas there is a distinct loss of water control as the transportation surface is first collecting - and then, subsequently flushing large volumes of water back upon the fringe of the burned-area causing erosive ground conditions. The trail needs to bladed, waterbarred and outsloped using a backhoe or Trail Cat to accomplish the job. If this trail is left as is … the transportation surface will continue to move overland flows of water across the burn and down the trail resulting in numerous rills and gullies.

A second ATV trail currently exists right in the middle of the burned-area. Much of this user-made trail occurs along the contour of a steep mountainside recently affected by a high severity burn. This unauthorized segment of motorized trail crosses over several drainages causing streambank erosion. The District has approved non-motorized types of recreation for this area – specifically day hiking and equestrian pursuits … but not ATVs. The recent fire event is going to aggravate the already erosive ground conditions – especially, within the fragile stream channels. We need to sign, close and to the extent possible, obliterate this trail surface in a timely manner. Otherwise, much of the trail will be covered with soil material, assorted debris and mud creating a genuine hazard to anyone attempting to navigate its surface to observe the burn.

****

(**Note**) – **Additional clarification concerning our planned trail obliteration project** – if funded, this project will probably be completed by the Engineering / Road Crew of the Fishlake National Forest sometime during the next 2 to 3 weeks – certainly, no later than September 30th, 2006. A backhoe (Cat – 436C) will be used to obliterate the existing prism of the unauthorized trail surface. The operator will use his bucket to scarify, berm

and pock the ground surface making foot traffic and equestrian travel difficult - but possible. However, his actions will prevent motorized vehicles from entering and traversing upon the burned terrain. Waterbars will be constructed in several areas to divert and dissipate the increased flows of water coming off the burned-area and its trail systems. It was determined a total of $ 3,200 would be needed to accomplish this minimal amount of BAER treatment. The current rate for the backhoe and its Operator amounts to about $ 650 / day. We figured a ½ day to mobilize the equipment over to the burned-area; another ½ day to demobilize the equipment away from the site and 4 days to complete the job of closing the trail – meaning, creating waterbars, out-sloping the ground surface, putting a natural flow back into one unstable stream channel in order to prevent further downcutting – and, it includes, posting the explanatory sign to keep the general public out of the treatment area. If necessary, some of the fragile areas located directly adjacent to the trail can be re-seeded to stabilize erosive ground conditions caused by this wildfire; the seed mix would be identical to the mix approved for our broadcast seeding treatment.

****

Research Findings on Waterbars, Roads, Trails and Drainage

To remember how to make an effective waterbar, just remember the 6-D System. The six D's are: Drainage Area, Distance, Diagonal, Divert, Discharge and Dissipate.

The purpose of waterbars is to control erosion on roads, trails and firelines. To be effective, waterbars must break up drainage areas so that runoff during heavy storms can be handled by the soil with little or no erosion. Road and trail surfaces usually cause runoff during heavy rainfall and snowmelt. Waterbars break up runoff into small enough units so that it doesn't have enough energy to erode our soils. Waterbarring approximates the energy-dispersing drainage effect of an outsloped road or trail.

Effective waterbarring can make the difference between an eroding, degraded site or trail; and a stable, productive, and accessible natural system. Of course, locating roads and skid trails on higher, flatter, drier, and rockier ground and away from steep, wet, or unstable ground is the most important erosion control measure.

This brings us to the first D -- Drainage Area. When deciding where to put waterbars, study the situation and get a good estimate of the Drainage Area. Waterbar spacing tables are based on a standard width of road or skid trail (the runoff area); about 12 feet. If the road or trail is about 12 feet wide then you're OK using these tables. However, if the road or trail is wider, or several are coming together, or the cut bank " leaks " water, then you have to adjust because the Drainage Area is different than the tables account for.

The adjustment is simple; which brings us to the next D -- Distance.

Distance means the distance between waterbars on a road or trail, or between a waterbar and the next upslope drainage break. Firstly though, if there is a " leaky " cut bank or a small stream crossing the road or trail, it's best to put a waterbar at that point so that the water can keep going downhill in the same place it is accustomed to. During the dry season, finding these can really test your ability to read the land. Missing these is a major cause of erosion.

Where two roads or trails come together or they are wider that 12 feet; simply figure the proportional difference between the surfaces you're considering and 12 feet. Then modify the Distance in the table you're using by that proportion. For example, if the road is 15 feet wide instedad of 12 feet, it is one-quarter wider; it's Drainage Area is one-quarter greater; and it's Distance to the next upslope break should be one-quarter less than the table indicates (be sure to modify in the right direction). Another example: If two trails are coming together downslope and each is 12 feet wide, their combined

Drainage Area is double so the Distance should be halved. Some of these might take a pocket calculator, but you should be able to get by most of the time without taping or pacing the entire Drainage Area.

After deciding where to put the waterbar, the next decision is how to construct it so that it does the job. An important principle in working with flowing water is that the more you oppose the water's energy, the tougher it is to get it to do what you want and keep it that way.

In other words, don't bully the flow, lead it. Waterbars built directly across a road oppose the water's energy and tend to fail (unless they're huge). Waterbars built Diagonal to the road lead the water off and work much better. A Diagonal waterbar has a gentle slope along its base, and is easier to drive over. A simple rule is to add 5 to the gradient of the road and build the waterbar at that many degrees off perpendicular.

A good waterbar will Divert the water off the road or trail. To do this it must be sufficiently deep to handle all the flow and must also be durable so that it will do so for as long as it's needed (be sure to consider traffic). Excavation is much more effective than fill in making a durable and effective waterbar (a ditch or a dip beats a dike).

Divert and Diagonal go together.

Another feature of a good waterbar is that it will Discharge the flow. If it is a dam, it is likely to fail must have an open outlet.

Finally, a good waterbar should Dissipate the flow just below the outlet to exhaust its eroding power and cause it to infilter the soil. This can require placing slash, rock or debris below the outlet, or fudging a bit on Distance to take advantage of natural features that will Dissipate the water's erosive energy.

So remember, when locating and building waterbars; consider the Drainage Area, then place them the right Distance apart, at a Diagonal to the road, so that they Divert, then Discharge, then Dissipate the energy of the flowing water. And remember to make them deep enough so they'll be durable.

(The Six-D System for Effective Waterbars by Michael J. Furniss, WMC, Spring 1990)

****

❹ Protection and Safety Measures – like all wildfires occurring in close proximity to the urban interface, this burn requires several explanatory signs to alert the local residents about the potential hazards associated with the recent disturbance; The first sign needs to be posted at the entrance to the unauthorized ATV trail indicating this area is CLOSED to motorized traffic. In addition, the sign should briefly explain the hazardous conditions existing within the burned-area. Two additional signs should also be posted along the NW perimeter of this wildfire to explain the unsafe ground conditions – and, the need to avoid traveling into the emergency treatment areas.

I. Monitoring Narrative:

(Briefly 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)

(Projected Cost in Year # 1 - $ 5,800)

The implementation and effectiveness of our proposed treatments will need to be monitored. The placement of explanatory signs as well as there effectiveness will be monitored with a field visit. This will occur once the

signs are in place, late summer of 2006. The road closure sign as well as the obliteration of the ATV trail will be monitored for its effectiveness once the obliteration is complete.

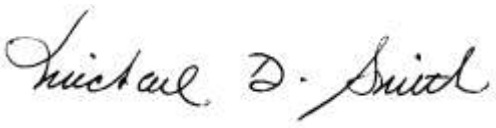
Vegetative monitoring will be done with walking transects through the treatment area in the spring and early summer of 2007. The species present will be noted and compared to the seeded species. Data will be collected as both a species list and as ocular estimates of cover by species. Seeding monitoring data additionally will include noting the seeded species that performed best, seeded species that did not do well, and whether the seeded species competed with cheatgrass and other invasive species. The general appearance of the overall vegetation response in the burned-area will be described, and photographed; this includes the post-fire response of the pre-burn vegetation.

The monitoring for noxious weeds will be done by traversing the terrain identified on our GIS display entitled Noxious Weed Monitoring Areas. If any noxious weeds are identified, appropriate chemical treatments will be used to reduce spread and eradicate those species from the area. If chemical treatments are used, the success of those treatments will, in turn, be monitored and reported to the BAER Team.

Post storm event monitoring will also take place by analyzing the movement of water off the Mountain, into the channels, across the roads and trails, and into the valley below. Two storms within the first year will be monitored. Data collected by a tipping rain bucket will be used as well in this analysis. The hydrophobic soil conditions will be checked while in the burned-area. The trail re-conditioning and minor drainage treatments should be monitored to check effectiveness as well with a field visit.

******

(A detailed Monitoring Plan will be submitted to Jeff Bruggink the R4 / BAER Coordinator with this 2500-8 / Initial BAER Report as a separate document)



Part VI – Emergency Stabilization Treatments and Source of Funds - Initial BAER Report

Line Items	Units	Unit Cost	# of Units	BAER $	Other $	# of units	Fed $	# of Units	Non Fed $	Total $
A. Land Treatments										
Weed Monitoring	acre	4	44	$176	$0		$0		$0	$176
Herbicide Application	acre	80	10	$800	$0		$0		$0	$800
Broadcast Seeding - T	acre	85	165	$14,025	$0		$0		$0	$14,025
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Land Treatments				$14,025	$0		$0		$0	$14,025
B. Channel Treatments										
				$0	$0		$0		$0	$0
N/A				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Channel Treat.				$0	$0		$0		$0	$0
C. Road / Trails										
Re-Condition ATV Trai	mile	1500	0.90	$1,350	$0		$0		$0	$1,350
Obliterate ATV Trail in	mile	2000	1.6	$3,200	$0		$0		$0	$3,200
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road & Trails				$4,550	$0		$0		$0	$4,550
D. Protection / Safety										
Explanatory Signs	sign	400	3	$1,200	$0		$0		$0	$1,200
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Structures				$1,200	$0		$0		$0	$1,200
E. BAER Evaluation										
BAER Team	job	10825	1		$10,825		$0		$0	$10,825
Helicopter - Bell 206 / L	hour	700	3		$2,100		$0		$0	$2,100
Supplies & Document I	misc	500	1		$500		$0		$0	$500
Temporary Seed Stora	month	100	2	$200	$0		$0		$0	$200
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Evaluation				$200	$13,425		$0		$0	$13,625
F. Monitoring										
Year 1	year	5800	1	$5,800	$0		$0		$0	$5,800
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Monitoring				$5,800	$0		$0		$0	$5,800
G. Totals				$25,775			**$0**		**$0**	**$39,200**
Previously approved				$22,575						
Total for this request				**$3,200**						

See Item C.2 – Obliterate 1.6 miles of ATV Trail in Burned-Area

PART VII - APPROVALS

1. /s/ Steve Rodriguez — August 23, 2006
   acting - Forest Supervisor (signature) — Date

2. _____ — _____
   Regional Forester (signature) — Date

Vegetation Report

The Magpie Fire burned-area ranges in elevation from 5,980 to 8,090 feet. Vegetation cover is characterized in the following vegetation components: mixed conifer forest with white fir and Douglas-fir (2 %); Gambel oak (38%); pinyon and juniper / Gambel oak / curlleaf mountain-mahogany (57%); riparian (3%). Mean annual precipitation (MAP) ranges from about 22 inches to nearly 26 inches.

Values-at-Risk (3)

Following the BAER Team's assessment of the burned-area, one major and two minor risks are apparent with respect to the vegetation component of this burned-area. These risks will each be described briefly.

Threat to Long-Term Soil Productivity

A couple of areas within the fire perimeter burned with high severity; other portions of the area burned with moderate severity. Moderate to strong hydrophobic conditions are present in these areas. From a vegetative perspective, the loss of soil productivity is the greatest value-at-risk. These areas may experience sheet, rill, and gully erosion during spring snowmelt and summer thunderstorms. Increased erosion rates reduce soil productivity when topsoil and organic matter are removed and soil nutrients are lost.

Impact to Critical Elk Winter Range

Most of the area burned by the Magpie Fire is mapped by the Utah Division of Wildlife Resources as critical elk winter range. The low and unburned portions of this burned-area will not have an appreciable loss of value for the critical winter range. However, those portions of the area that sustained moderate and high severity burns may have had the wildlife values temporarily compromised. This is considered a minor value at risk, but we note that is will take a few years for the browse species and structural diversity that provided hiding cover and thermal cover to re-establish.

Threat of Expanding Infestations of Noxious Weeds and Invasive Species

Bare mineral soil may lead to increased risks for invasive plant species to establish. Small populations of five noxious weed species occur within 1 to 2 miles of the Magpie Fire: Scotch thistle (wind-borne seed), spotted knapweed (wind-borne seed), musk thistle (wind-borne seed), field bindweed, and hoary cress. None of these species are known to occur within the burned-area, but the potential for the wind to blow seed into the area poses a minor threat. The possibility is greater of seed hitchhiking into the area on vehicles, people, or animals. Also, cheatgrass is present in and near the burned-area but only in small amounts. With precipitation similar to that which is annually expected in the burned-area, cheatgrass looses its competitive edge and should not be a major concern in the unburned and low burn severity areas. We deem these situations to pose a minor threat to the values at risk. However, the moderate to high burn severity areas will be slower to recover and there is some risk that cheatgrass might establish and spread in unoccupied space in these areas.

Because of the combined threats of lost soil productivity, the temporary reduction of critical elk winter range, and the possible risk of infestations of noxious weeds and cheatgrass, we make these recommendations:

- Use and all native seed mix since seeded introduced species were not observed in the burned-area during the field assessments.
- Seed most of the high and some of the moderate burn severity areas. The seeding, at the rate of only 12 lbs/acre, is intended to supplement the post-fire response of the existing vegetation, including Gambel oak, protect severely burned soil surfaces against loss of soil productivity over time, and compete with cheatgrass residual to the area that may increase in the burned-area if unoccupied space is available.
- Monitor the fire lines and travel corridors in the burned-area for the presence of noxious weeds.
- Hand treat any populations of noxious weeds that are discovered.

(Bob Campbell, Ecologist and David Tait, Botanist)

Aerial Seeding Treatments

This seed mix was developed specifically for emergency rehabilitation treatments within the context of Forest Service Manual (2523.2 p. 22; effective 5/26/2004): “Mulching, seeding, or planting of grass, forbs, shrubs, or trees when needed to prevent unacceptable erosion, to stabilize critical or significant natural or cultural resources, to prevent permanent impairment to critical habitat for Federal and State listed, proposed, or candidate threatened or endangered species, or to prevent detrimental invasion by non-native plants. “ Use only planted materials that should be effective within two growing seasons. ” We feel this is a seed mix “ of species known to be effective for erosion control, adapted to the target area and compatible with future management objectives ” (FSH 2509.13,20 p. 13). This is confirmed by past BAER monitoring in burned-areas on the Canyon Range, the Swains Fire east of Holden, and the Adelaide Fire east of Kanosh. This mix of all native species is designed to protect long-term soil productivity, help restore ecosystem function, and provide structural diversity.

Most of the seed mix will be applied in areas that receive about 22 to 24 inches of precipitation annually. However because of rock fragments, soil textures, and hotter (steep southerly) aspects, these sites behave like the effective annual precipitation is 18 to 20 inches. Our monitoring from the Swains Fire and burned-areas in the Canyon Range show that some of the species in this mix each have the ability to dominate a stand depending on the location. This underscores the value of multiple species in the seed mix. This provides the flexibility for different species in the seed mix to thrive in a microsite that is best suited for that certain species.

This seed mix includes the recommendations of Stan Kitchen (Botanist, Rocky Mountain Research Station, Shrub Sciences Lab, Provo) from August 17, 2006 along with suggestions from District, Forest, and Regional Office specialists. These discussions occurred earlier this summer for the Oak City Canyon Fire BAER report. We also referred to seed mixes previously used on the Forest (particularly, the BAER seeding projects for the Black Willow Fire—1994, the Leamington Canyon Fire—1996, the Mourning Dove Fire and Swains Fire, both in 2000). We also included information from the Tushar-Pahvant-Canyon Soil Survey Manuscript (draft), the Interagency Forage and Conservation Planting Guide for Utah, and the Intermountain Planting Guide, both from Utah State University Cooperative Extension Service, while designing these seed mixes to achieve the FSM objectives listed above.

Native or Introduced	Species to be Seeded	Seed Mix for 22 – 26 in. MAP	Est. Costs / Pound (PLS)
		Pounds / Acre (PLS)	
N	Big bluegrass “Sherman”	0.5	4.50
N	Sandberg bluegrass VNS	0.5	4.25
N	Indian ricegrass “Rimrock”	2	4.00
N	Bluebunch wheatgrass “Goldar”	1	4.50
N	Slender wheatgrass “Pryor”	5	2.00
N	Snake River wheatgrass “Secar”	1	4.50
N	Thickspike wheatgrass “Bannock”	1	5.50
N	Thickspike wheatgrass “Critana”	1	5.50

Total Pounds (PLS) / Acre	12.0
Total Seeds (PLS) / Ft² 1/	59
Estimated Seed Cost / Acre	$ 42.38
Estimated Cost Seed Mix/Pound	$ 3.53

1/ Recommended rates for broadcast seeding mixes are about 50 – 100 seeds per square foot when followed by dragging to cover the seed (see Planting Guide for Utah). The guide also states for aerial seeding, "if it is not possible to cover seed, plant late in the fall and increase the seeding rate."

Seed Mix Cost and Application	Seed Mix
(Estimated Cost / Acre) Includes seed and helicopter	$ 85 to $ 90

The Planting Guide for Utah, and the Intermountain Planting Guide list these specific ecological attributes for these recommended species:

Big bluegrass— " often found growing on drier, infertile, open side hills, and waste places…noted for its early spring growth…used successfully for reseeding burned-over forest lands."

Sandberg bluegrass— " important for soil stabilization and forage for wildlife…one of the first grasses to green-up in the spring…excellent in low rainfall native mixes "

(These 2 bluegrasses should be competitive with any cheatgrass that may be residual in the burned-area.)

Indian ricegrass— " valuable winter forage…one of the most drought tolerant native grasses "

Bluebunch wheatgrass— " long-lived, drought tolerant…one of the most valuable native range grasses "

Slender wheatgrass— " valuable in erosion control because of its rapid development "

Snake River wheatgrass— " adaptable to most areas suitable for bluebunch wheatgrass, but is more vigorous and drought tolerant…originally released as a bluebunch wheatgrass variety "

Thickspike wheatgrass— " adapted to disturbed range sites and dry areas subject to erosion "

Price estimates were obtained from Maple Leaf Company in Ephraim, UT. Actual costs may vary depending on availability at time of purchase from the successful bidder. Seed mix specifications should include the following:

- The seed purchased will specify the variety claimed.
- No substitute species, or varieties, will be accepted.
- Seed source (origin) will be identified.
- The mix will be certified that NO noxious weed seeds are present.
- All quotes will be based on Pure Live Seed (PLS) which equals the percent of purity times the percent total germination (PLS = % P x % TG).
- Inert matter will not exceed 10 %.
- Mixing and seed test costs will be included in the quote.
- Seed will be mixed and packaged in 50 lb. bags.
- Quoted prices will include shipping.
- Specify an on or before delivery date.

There may be opportunities to add other species to the seed mixes. We suggest that District personnel contact the Utah Division of Wildlife Resources prior to actual purchase of the seed. Depending on seed availability and time of seeding, the Division may have seed for forb and browse species that could be added to the seed mix that would enhance both wildlife habitat and diversity in the area. Suggested contact in Cedar City is Tyler Thompson at (435) 865 - 6100. Species that may be appropriate to add to the seed mix (or possibly even use bareroot or tubelings for some of the shrubs) include antelope bitterbrush, big sagebrush (collected from near Beaver or Scipio), globemallow, Palmer (and / or Rocky Mountain) penstemon, Lewis

flax, cliffrose, and Woods rose. It would also be well to check with Sean Kelly, the UDWR wildlife biologist in the Fillmore area.

The Planting Guide for Utah gives the following information in the " Wildfire Seedings " section. "Steep slopes and rough areas that are not accessible to conventional ground equipment can be aerial seeded … if it is not possible to cover seed, plant late in the fall and increase the seeding rate ... burned sites, including forest and desert ranges are often seeded within a few days or weeks following the fire, in the mistaken belief that the ash will cover the seed … even if an ash residue or a loose seedbed is present, seed only during the appropriate seasons. Do not plant on a loose dry seedbed … plant in the late fall when seedbeds are firm."

The Magpie Fire is northwest of the Adelaide Fire (1996) and south of the Swains Fire (2000) that had excellent responses to the BAER seeding treatments that were implemented. We also have monitoring data from several fires in the Canyon Range north of Fillmore that have similar terrain to this incident: The Mourning Dove Fire (2000) east of Fool Creek, the Leamington Canyon Fire (1996) in Wild Horse Canyon, and the Black Willow Fire (1994) which burned the area surrounding Fool Creek Peak, Charley Johnson Canyon, and Cow Canyon. All of these areas were seeded in the fall just before the winter snows. The success of the rehabilitation seeding for those fires was evidenced by an excellent coverage of grasses on the rolling hills and steep slopes. We expect similar success in the areas of the Magpie Fire that are seeded with this recommended seed mix.

All seeding will be aerially broadcast without any additional ground treatment. The seed will be flown on in late autumn just before snowfall. Our estimate for helicopter aerial seeding is $ 40 to 45 per acre. Arrangements should be made through air operations on the Forest.

In addition to the seeding treatments, we expect on-site vegetation to re-sprout. The Gambel oak, whose crowns burned during 1994, 1996 and 2000 in the fires mentioned above, re-sprouted vigorously from roots that remained viable in the soil. Much of this burned are has Gambel oak, a fire adapted species, present. With the similar nature of the Magpie Fire, we expect to see a vegetative response from the oak brush like those seen at the Adelaide and Swains fires.

(Bob Campbell, Ecologist; David Tait, Botanist; Del Barnhurst, Rangeland Management Specialist; Steve Flinders, Wildlife Biologist; all with the Fishlake National Forest, and Stan Kitchen, Botanist, Rocky Mountain Research Station, Shrub Sciences Laboratory, Provo, UT)

TES Plants

There are not any federally listed threatened, endangered, proposed, or candidate (for proposed listing) plant species on lands administered by the Fishlake NF within 50 miles of the Sunset Canyon Fire. The actions proposed in this BAER plan will have " no effect " on any plant species with federal status that occur on lands administered by the Fishlake NF. Also, there are not any Forest Service, Intermountain Region, sensitive plant species known to occur within 10 miles of this burned-area. Our determination is that the proposed BAER treatments will have " no impact " on any individuals of sensitive, or management indicator, plant species or their habitats on lands administered by the Fishlake NF.

(Bob Campbell, Ecologist and David Tait, Botanist)

Soil Resource Summary

Introduction

All of the soils located within the perimeter of the Magpie Wildfire were formed in alluvium, colluvium or residuum derived from the Nugget Sandstone Formation or Tintic Quartzite – meaning, most of the geologic parent material occurring upon the steep mountainsides and corresponding ridgetop areas consists of sandy, non-calcareous sediments which have been weathered from ancient wind blown deposits. In most locations, the soil pH is considered to be about neutral …or, in the range of 6.6 to 7.3. The topsoil on the mountain

bench is about 6 to 16 inches thick under the Gambel oak, 4 to 6 inches thick in the PJ / mountain big sagebrush areas and 2 to 4 inches in thickness under the curlleaf mountain-mahogany. Most of the mixed conifer locations had 4 to 7 inches of topsoil located under a slightly decomposed mat of organic duff. Elevations within the burned-area ranged from about 5,980 to 8.090 feet. Soils occur in both the frigid and cryic temperature regimes. Mean annual precipitation in this part of the Fillmore Ranger District is about 22 to 26 inches / year. Soils occur in both the ustic and udic moisture regimes. The freeze-free period is about 60 to 90 days / year. The most common types of ecological units occurring within the fire were the 1) Mountain Stony Loam (Oak) and 2) the Mountain Shallow Loam (Curlleaf Mountain-Mahogany) range sites. The following types of soil were mapped, sampled and described on the Pahvant Range in 1989 – and, were later found to be occurring inside the burn:

(Subgroup Level of Soil Taxonomy, 2003)

Typic Haplocryalfs – Mixed Conifers	Mollic Haplocryalfs – Mixed Conifers
Lithic Haplocryalfs – Mixed Conifers	Pachic Argiustolls – QUGA
Typic Argiustolls – QUGA	Pachic Haplustolls – QUGA
Typic Haplustolls – ARTR-V	Aridic Argiustolls – PJ
Lithic Haplustolls – CELE	Lithic Argiustolls – CELE

Dominant Vegetative Communities Growing on these Soil Types

Mixed Conifers … white fir, Douglas fir, subalpine fir and scattered aspen

QUGA … Gambel oak with Rocky Mountain juniper and scattered conifers

CELE … curlleaf mountain – mahogany and perennial grasses

ARTR-V … mountain big sagebrush and perennial grasses

PJ … pinyon – juniper with perennial and annual grasses

Fragile or non-renewable type soils that are situated on steep mountainsides and very steep ridgetop areas have a maximum erosion tolerance of about 1 to 2 tons / acre / year. If accelerated rates of erosion surpass this stated threshold, it's not too long before the site is adversely affected and long-term soil productivity becomes an issue. However, when soil resources are found on deeper sites having nearly level to strongly sloping terrain, they demonstrate a better tolerance for erosion losses … in the range of 3 to 5 tons / acre / year. What we need to understand is … all of these fire-damaged soils can be stabilized, rehabilitated and restored to a normal type of hydrologic function once again. While the resource damage associated with a wildfire can be quite severe in some instances, it is not considered to be a permanent impairment of the ground.

Observations

Most of the soils located on the upper mountainsides and ridgetop areas about a ¼ mile SE of Black Cedar Hills Spring experienced a moderate to high severity burn. As expected, much of the terrain located above " Tributary A " is water-repellent at the ground surface – and, at a depth of 2 inches. Hydrophobic conditions are likely to persist for a period of 1 to 5 years – depending upon the intensity and residence time of the burn. Nearly all of the soils in this area are strongly hydrophobic – meaning, it takes longer that 40 seconds for water to infiltrate into the ground at a depth of 0 to 2 inches. The protective duff layer was completely consumed at these high mountain locations – meaning, a large transfer of heat went into the top 6 inches of the mineral soil as a direct result of this wildfire. **The entire mountainside should be considered to be a highly erodible landscape and subject to extreme flooding hazards and potential debris flows.** Since the ground is quite sandy in texture … the soils are easily detached and transported when the vegetative cover, surface litter and duff are missing as a direct result of a wildfire. A few of the perennial grasses growing on the mountainside

have been killed-off by the extreme heat of the fire; these plants will NOT re-sprout later this year when the site receives additional moisture.

Recommendations

- Monitor all disturbed areas associated with the recent burn for the presence or spread of noxious weeds – especially, Scotch thistle, musk thistle and spotted knapweed,

- In the event noxious weeds are observed within the perimeter of the Magpie Wildfire … eradicate the unwanted plants using chemical herbicides,

- Conduct broadcast seeding on 165 acres of severely burned terrain using a Type III helicopter to prevent or control erosion losses in an effort to protect long – term soil productivity,

- Re-condition a 0.9 mile segment of established ATV trail occurring along the NW perimeter of the burn to prevent a loss of water control,

- Sign, close and to the extent possible, obliterate an unauthorized segment of user-made ATV trail occurring in the middle of the burned-area in order to limit erosion losses – especially, within stream channels,

- Post several explanatory signs along the perimeter of the burned-area to alert the general public about the potential hazards related to flooding; secondly, the signs should be asking everyone to stay away from our treatment areas and monitoring locations.

Hydrologic Groupings

(Please refer to the GIS map identified as … Hydrologic Groups for a display of the Rating Zones)

Each bare soil is assigned to a Hydrologic Group based upon its infiltration characteristics and overall potential for surface runoff conditions following periods of prolonged wetting. These groupings of A, B, C or D are commonly used by professional Hydrologist's and Burned-Area Emergency Response (BAER) Teams to estimate overland flows based upon the results of modeling several typical storm events having different durations following a large incident of wildfire. These erosion / sediment models are frequently used in connection with flood prevention projects; they are normally considered when recommending emergency stabilization treatments or structures that would be effective in preventing a loss of water control. Some of the potential problems associated with flooding are threats to human life and property – including, damages to transportation surfaces, domestic water supplies, urban developments, recreational areas along with right-of-way corridors for power and utility lines.

- **GROUP A** … these soils have a low runoff potential. All of these locations will have rapid infiltration rates even after the ground is thoroughly wetted. Most sites consist of very deep, well to excessively drained sandy type soils; a few areas may contain gravel-sized rock fragments.

- **GROUP B** … these soils have a moderately low runoff potential. Most of the locations will consist of moderately deep to very deep, loamy type soils having a moderately slow to moderately rapid rate of permeability.

- **GROUP C** … these soils have a moderately high runoff potential. Most of these locations will consist of soils having a moderately deep restrictive layer within the subsoil or substratum that actually impedes the downward movement of water. A few examples of these restrictive layers would include 1) silica or carbonate hardpans, 2) soils having pronounced saline–alkali layers, 3) bedrock occurring between the depths of 20 to 40 inches in the profile and 4) soils which are moderately well or somewhat poorly drained – so, a water table exists between the depths of 18 to 36 inches in the ground.

- **GROUP D** … these fragile soils have a high runoff potential. All of these locations consist of soil types having a shallow restrictive layer within the profile that completely impedes the downward movement of water. A few examples of these restrictive layers would include 1) a well-developed claypan horizon, 2) indurated hardpans, 3) bedrock occurring between the depths of 10 to 20 inches in the ground and 4) soils which are poorly drained – so, a permanent high water table exists between the depths of 6 to 18 inches.

Topsoil Horizons

(Please refer to the GIS map identified as … Topsoil Thickness for a display of the Different Soil Properties)

Topsoil is defined as a dark colored mineral horizon that has been enriched with plant nutrients due to the decomposition of humified organic matter. It is located at or near the surface of the ground. Commonly, it consists of either granular or subangular blocky type structure; it is usually not massive and hard when dry. It is the most fertile part of the soil profile. It supports large populations of soil microbes – which are necessary for the process of nutrient cycling.

The numbers shown on this GIS display represent the average topsoil thickness for each map symbol occurring within the Tushar-Pahvant-Canyon / Soil Survey Area.

Available Water Capacity

(Please refer to the GIS map identified as … Available Water Capacity for a display of the Different Soil Types)

The water retention properties of a soil are primarily a function of its texture and organic matter content. Soil profiles made up of smaller sized mineral separates, such as silt and clay, have a large surface area within their pore network - which allows them to hold more water for plant growth. In other words, soils with a high percentage of fines have a higher water retention capacity when compared with coarse textured sites. The AWC Table located at the right illustrates the differences in water retention as influenced by soil texture. The organic matter content also influences a soils water holding capacity. As the amount of humified OM increases within the topsoil, the water holding capacity increases correspondingly because of the strong affinity the organic matter has for water.

Available Water Capacity by Soil Texture	
Textural Classes	AWC Numbers (Inches Water / Foot of Soil)
Coarse Sand	0.25 - 0.75
Fine Sand	0.75 - 1.00
Loamy Sand	1.10 - 1.20
Sandy Loam	1.25 - 1.40
Fine Sandy Loam	1.50 - 2.00
Silt Loam	2.00 - 2.50
Silty Clay Loam	1.80 - 2.00
Silty Clay	1.50 - 1.70
Clay	1.20 - 1.50

- **VERY LOW** … indicates the soil profile only retains about a ¼ inch to 3 inches of plant available water. These sites behave quite droughty due to 1) very shallow and shallow rooting depths, 2) the absence of organic matter, 3) sandy textures, 4) high bulk density measurements – meaning, limited amounts of pore space, 5) a large percentage of rock fragments occur within the ground or 6) the site has a large quantity of clay or soluble salts – which makes the water behave unavailable for plant growth.

- **LOW** … indicates the soil profile retains 3 to 6 inches of plant available water. These sites have a limited amount of water for the existing vegetative communities – especially, in Xeric Moisture Regime areas. These locations are commonly recharged with precipitation – but, the ground does not retain the moisture for long periods of time. Drought tolerant plants should be selected if disturbed areas are to be re-seeded in order to prevent accelerated erosion losses.

- **MODERATE** … indicates the soil profile retains about 6 to 9 inches of plant available water. Most of these locations have an adequate amount of moisture in order to sustain plant growth.

- **HIGH** … indicates the soil profile retains 9 to 12 inches of plant available water. All of these locations are soils with a high content of clay and few, if any, rock fragments. These areas commonly support aspen, silver sagebrush or tall forb plant communities.

- **VERY HIGH** … indicates the soil profile retains > 12 inches of plant available water. These soils have a significant amount of peat, mucky peat or muck occurring within the soil profile. Many sites are actually saturated with water during the plant growing season.

Soil Loss Tolerance

(Please refer to the GIS map identified as … T – Factors for a display of the Different Soil Qualities)

Soil loss tolerance is commonly expressed by using what's known as the T Factor; this factor is shown in units of tons/acre/year. It is used in calculations for both the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE). It is defined as the maximum rate of annual erosion that (still) permits long-term soil productivity to be sustained over indefinite periods of time. Simply stated … soil formation occurs at a rate either equal to, or greater than, the annual losses associated with soil erosion. The T Factors are integer values set-up in the range of 1 to 5 tons/acre/year. A T Factor of 1 ton/acre/year would be for a shallow / non-renewable type of site. In this instance, the term shallow indicates < 20 inches of soil material occurs over bedrock or an impermeable layer found in the ground. A T Factor of 5 tons/acre/year would be assigned to a very deep and renewable type of soil – sites having > 60 inches of soil material before encountering a restrictive layer. The label " renewable soils " means a site has favorable surface horizons, subsoil or substratum layers that can be improved by tillage, fertilizer applications, additions of organic matter or enhanced resource management. Initially, this concept was established to monitor the productivity of our agricultural lands. The Forest Service uses the concept of T Factors in order to identify fragile areas of non-renewable type soils – shallow sites that should be avoided … or, will require special mitigation measures in order to maintain long-term productivity and hydrologic function following a wildfire or the implementation of a land management treatment. Landscapes having a T Factor of 4 or 5 tons/acre/year identify areas " better suited " for continued management actions such as prescribed fire, timber harvesting, outdoor recreation activities, livestock grazing, sagebrush manipulation etc.

Soil Suitability Ratings for Broadcast Seeding in Disturbed Areas

(Please refer to the GIS map identified as … Potential for Broadcast Seeding for a display of the Rating Zones)

- **GOOD** … This interpretive rating indicates that a wide selection of plants may be successfully seeded in 7 or more years out of 10.

- **FAIR** … Fewer plants are adapted to these wildland sites and these particular soil resources can be successfully seeded in 5 to 7 years out of 10 in order to control accelerated rates of erosion.

- **POOR …** Only the most drought tolerant plants can be successfully seeded on these locations due to their limited water retention properties caused by rock fragments occurring at the ground surface, limited rooting depths or low amounts of annual precipitation; seeding within these disturbed areas will be successful in about 4 to 5 years out of 10.

- **VERY POOR** … These soils are generally not suited for seeding activities; however, seeding can be considered under emergency circumstances following incidents of wildfire or after mass movements such as slumps and landslides in order to control erosion and maintain long-term soil productivity. Seeding success will only be achieved in about 3 years out of 10 on these fragile sites.

(Michael D. Smith, Soil Scientist)

Watershed Condition Summary

Introduction

This report presents summary results from the hydrologic assessments done for the Burned-area Emergency Response report for the Magpie Wildfire. Map 1 shows the analysis watersheds that are expected to respond to the changed conditions created by the fire. The map shows that 11 areas drain off the burned slopes to North Fork Chalk Creek. This helps dampen potential flooding and erosion events by dispersing water and sediments.

There are some risks to human life along public trails that are located below and crossing through the fire. The foot and equestrian trail within the burn area, and the ATV trail along Chalk Creek. These are of particular concern because the foot trail crosses head water drainage that nearly burned out completely in both high and moderate severities, and because the ATV trail is the access for ATV users from the west side of the Pahvant Range and is used constantly throughout the warmer months by ATV enthusiast who access the Paiute ATV trail system. The community of Fillmore and outlying agricultural and residential areas are secondary values-at-risk in this case because of Chalk Creeks' ability to transport floods. However, there is one irrigation diversion below the fire that currently completely dewaters Chalk Creek near the Forest Boundary. These diversion works could be plugged by large amounts of ash, and debris from Chalk Creek in general, but more particularly from burn areas. Following the first few storms with enough water to runoff of the fire, ash will be washed off the burn unit, and into North Fork Chalk Creek. This is because the ash is loose, light, and not in a stable layer on the ground. The irrigation company should be informed that ash being washed into the diversion works with the stream flow because of the grate opening construction will likely have ash being put into their system. Other than the irrigation works, the flow path of Chalk Creek give us some certainty where floods will flow. If debris flows were to occur, it is most likely that large debris will deposited along the sides of Chalk Creek especially, in the area where North and South Fork Chalk Creeks meet and the channel has wider floodplains to function with compared to the narrower, steeper, and confined canyon closer to the fire area. Again, the ash and possibly sediment laden flows will go into the diversion works near the confluence, and then possibly further down channel if the floods are of higher magnitudes, and if the floods are carrying debris which could plug the diversion works.

Here are some things to be expected regarding flood behavior, but there are no guarantees:

- Most of the surface ash will be washed from the burned-area following the first storm events.

- Elevated flood responses should be expected from Tributary A, if large enough storm events were to occur, and the potential for debris flow(s) is probable from this channel given the large enough area burned at both High and Moderate Severities in the upper bowl shaped headwaters, the steep hill sides, and channel gradients. Tributary A resembles other drainages, on the Forest and in the region, which burned with similar severities, and topography to this drainage. These drainages are naturally prone to these events and they eventually had elevated flood events, and debris flows in many instances for a few years following the fire until enough vegetation recovery had occurred.

- In the smaller, or less burned drainages the contributing areas will lead to only slightly elevated flows, and thus will not change the flooding potential in most cases. Storm events will likely produce the same or similar flood events they would have before the fire. No site specific analysis was performed on these drainages, other than they were excluded from analysis because they did not appear to have enough high or moderate burn areas to justify analysis or trying to show change would be likely.

- Tributaries B and C, like most the drainages in the area given certain circumstances would be naturally prone to elevated flooding, and debris flows. However, one of the circumstances includes 40% of the drainages typically would need to be burned at high and moderate intensities for debris flows events occurrence. Tributary A above had 62% of the drainage area burned, Tributary B had 33%, and Tributary C had 30% and are therefore below the normal area needed for debris flow occurrence, which is a good sign unless and an extraordinary large storm event were to occur. However, there is the

likelihood of still increased flooding from these drainages, and elevated flooding is predicted from these Tributaries.

Map 2 shows the flow paths that fire-induced floods might follow. This map also shows the town of Fillmore in relation to the fire. Behavior of flows in Chalk Creek should be as predicted, even with the diversion on Chalk Creek. The wider riparian area below the confluence of North and South Fork Chalk Creeks will aid in elevated flood routing below the Forest.

Post - Fire Condition Summary

Post-fire conditions have been assessed to determine how fire induced changes to slope hydrology and soil conditions will impact the potential values at risk. Key to this assessment is the burn severity mapping shown in Map 1. Table 1 shows the number of acres affected by the different burn severities within the analysis watersheds. Field surveys indicate that the moderate and high severity burn areas are typically only hydrophobic at the surface. Therefore, fire-induced hydrophobicity should recover as surface soils are eroded. Surface sealing from rain splash will still be present as will the development of rill and gully networks. Therefore, elevated potential for post-fire floods will still exist.

Table 1

Watershed Names	Drainage Area	High Severity	Moderate Severity	Low Severity	Total Burned	Unburned
	acres	acres	acres	acres	acres	Acres
North Fork Chalk Creek	13,964	127	133	451	711	13,253
Tributary A	116	59	13	44	116	0
Tributary B	134	0	44	90	134	0
Tributary C	73	20	2	21	73	0

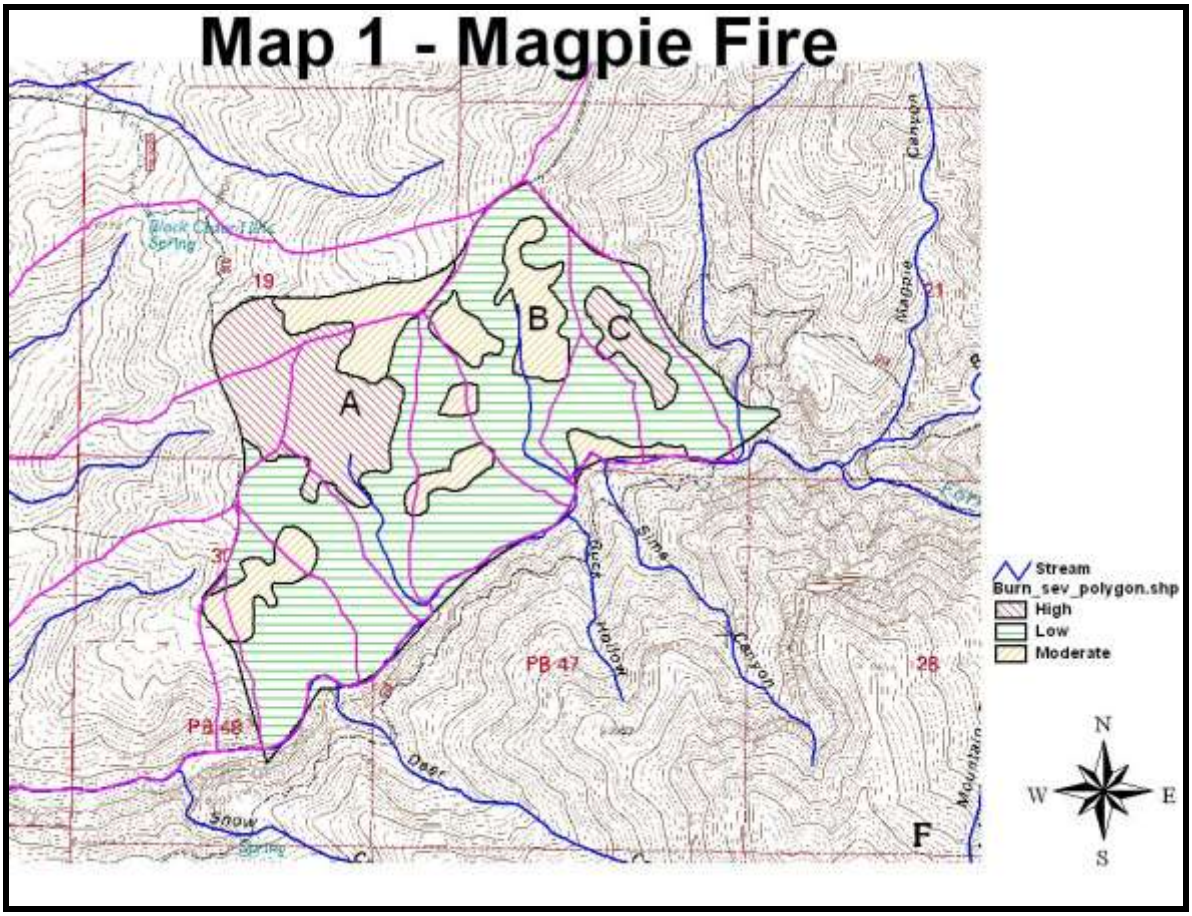
Table 2 shows the percentages of each burn severity class for each of the analysis watersheds. The loss of vegetation and soil impacts from the fire amplify inherent flooding risks. Floods and debris flows should normally be expected on steep watersheds of these sizes when roughly 40 percent or more of the basin is burned with moderate or high severity. These basins are inherently prone to debris flows because most of the steep portions of the burned slopes are drainages that concentrate water rather than disperse it. Tributary A has more potential for debris flows than other the other drainages affected by the fire because of its morphology and the percentage of high and moderate severity burn (see Table 2). Hyper concentrated floods from these slopes are also likely. Similar to those that occurred on August 1, 2006 on the Sunset Fire. If a debris flow were to occur, there is adequate distance between the bottom of the fire and the secondary values at risk including the town of Fillmore to avoid direct damage from debris. The foot trail within the burn, the ATV trail below paralleling Chalk Creek, and diversion works within the channel near the Forest are the exception because they are located where flood and debris flows if they occur will flow. Coarse sediment and debris from a debris flow would likely be deposited well before reaching Fillmore due to the long distance between the burn and Fillmore. However, sediment-laden waters are capable of reaching Fillmore within Chalk Creek as shown on Map 2.

Table 2.					
Watershed Name	**Drainage Area**	**High Severity**	**Moderate Severity**	**Low and Unburned Severity**	**Total Burned**
	acres	%	%	%	%
North Fork Chalk Creek	13,964	1%	1%	98%	5%
Tributary A	116	51%	11%	38%	95%
Tributary B	134	0%	32%	68%	95%
Tributary C	73	27%	3%	60%	95%

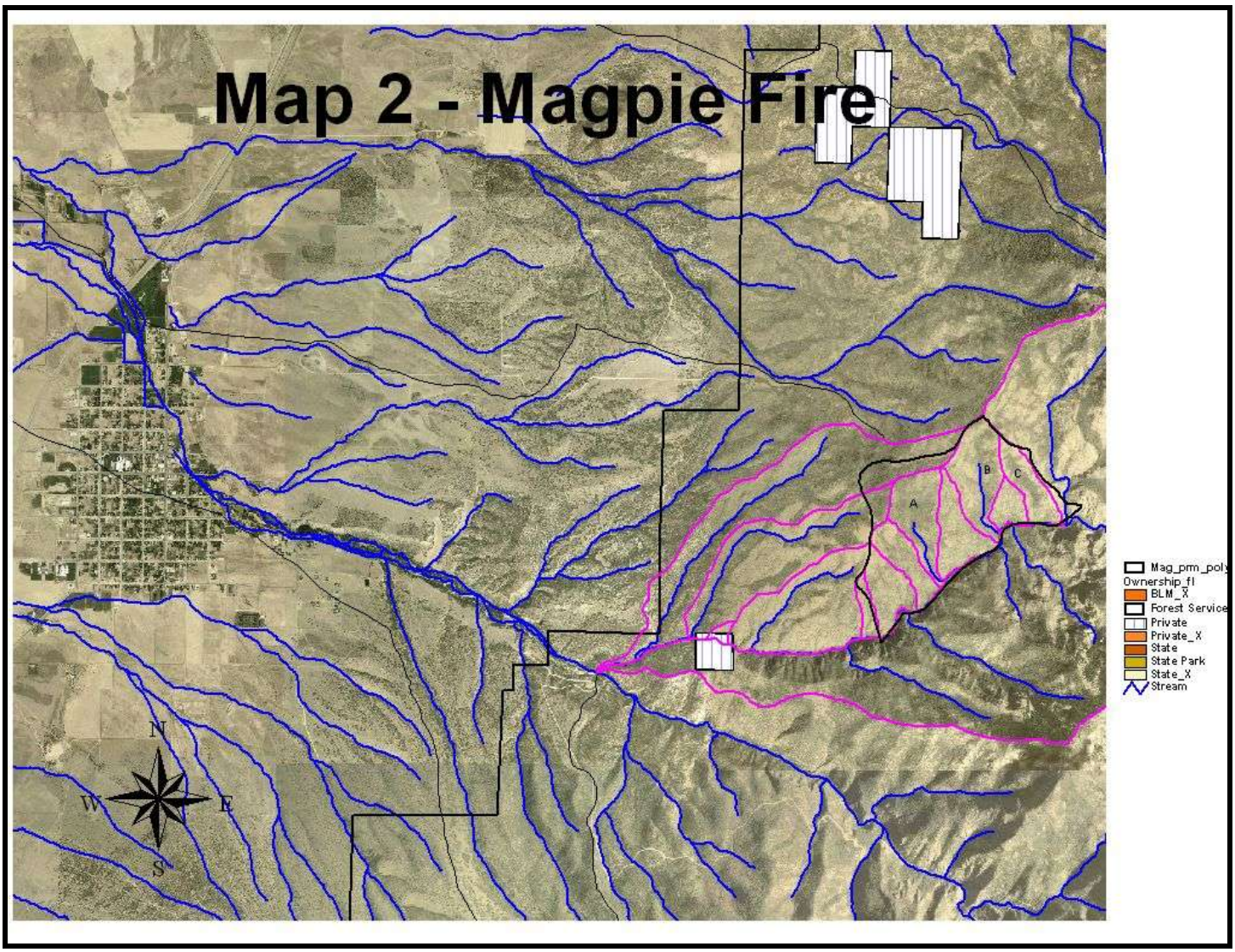
Table 3 shows predicted pre-fire estimates for flood sizes following summer thunderstorms of differing return periods. This modeling is based on the rational method using the SCS (NRCS) Curve Number method used in the Wildcat Model.

Table 3

Watershed Name	Pre-fire 2 Year Return Interval Flood	Pre-fire 5 Year Return Interval Flood	Pre-fire 10 Year Return Interval Flood	Pre-fire 25 Year Return Interval Flood	Pre-Fire 50 Year Return Interval Flood	Pre-Fire 100 Year Return Interval Flood
	Cfs	cfs	cfs	cfs	cfs	cfs
North Fork Chalk Creek	--	--	--	--	--	--
Tributary A	7	24	47	97	152	226
Tributary B	8	27	54	112	175	261
Tributary C	5	15	31	69	110	164



Map 1. This map displays the drainage areas and the burn severities within the drainages for the Magpie Fire. The analysis Tributaries are labeled as A, B, and C.



Map 2. This map displays the drainages in relationship to the fire and where the fire is in relationship to Fillmore. The flow paths from the fire, all end up in North Fork Chalk Creek. Chalk Creek below the fire is a wide channel with an extensive floodplain system below the confluence of North and South Fork Chalk Creeks.

Table 4 shows expected increases in flood size resulting from fire effects for the first year of recovery. Floods will now generate a larger flood by 1 or 2 return intervals than before the fire. For example, a 2 year storm will now generate a 5 or greater than 5 year return interval flow. Experience in Utah and other locations have shown that it often takes a few storms before the first floods occur. The early precipitation events fill in available slope detention storage and create the rill and gully networks that are necessary to fully induce the expected increase in flood response from short-duration high intensity rainstorms. Elevated flood responses will be more likely for the next two to three years until soil hydrophobicity subsides and sufficient vegetative cover returns.

Table 4

Watershed Name	Pre-fire 2 Year Return Interval Flood	Pre-fire 5 Year Return Interval Flood	Pre-fire 10 Year Return Interval Flood	Pre-fire 25 Year Return Interval Flood	Pre-Fire 50 Year Return Interval Flood	Pre-Fire 100 Year Return Interval Flood
	Cfs	cfs	cfs	cfs	cfs	cfs
North Fork Chalk Creek	--	--	--	--	--	--
Tributary A	29	72	120	203	279	374
Tributary B	11	37	71	140	212	306
Tributary C	11	32	58	108	156	217

Flood potential will decrease as soils re-vegetate, and infiltration capacity and slope roughness reestablish. However, recovery of the strongly hydrophobic soils may take as long as 5 years. Table 5 gives the probability that a storm of a given size will occur within the next three years, which is proportionally when most of the hydrologic recovery will occur.

Table 5

2 Year Return Interval	5 Year Return Interval	10 Year Return Interval	25 Year Return Interval	50 Year Return Interval	100 Year Return Interval
88 %	49 %	27 %	12 %	6 %	3 %

There is an 88 percent chance that a two year storm will occur before the slopes have hydrologically recovered, which makes it the most likely storm size that could lead to flooding. Table 4 shows that even a two-year storm will be capable of generating elevated peak flood flows.

The loss of vegetation and hydrologic changes will also lead to greater sediment delivery from increased slope and channel erosion. Disturbed WEPP modeling was used to estimates ranges for post-fire erosion rates that are shown in Table 6. For reference, pre-fire erosion rates in vegetated areas are estimated to be less than 1 ton per acre per year.

Table 6

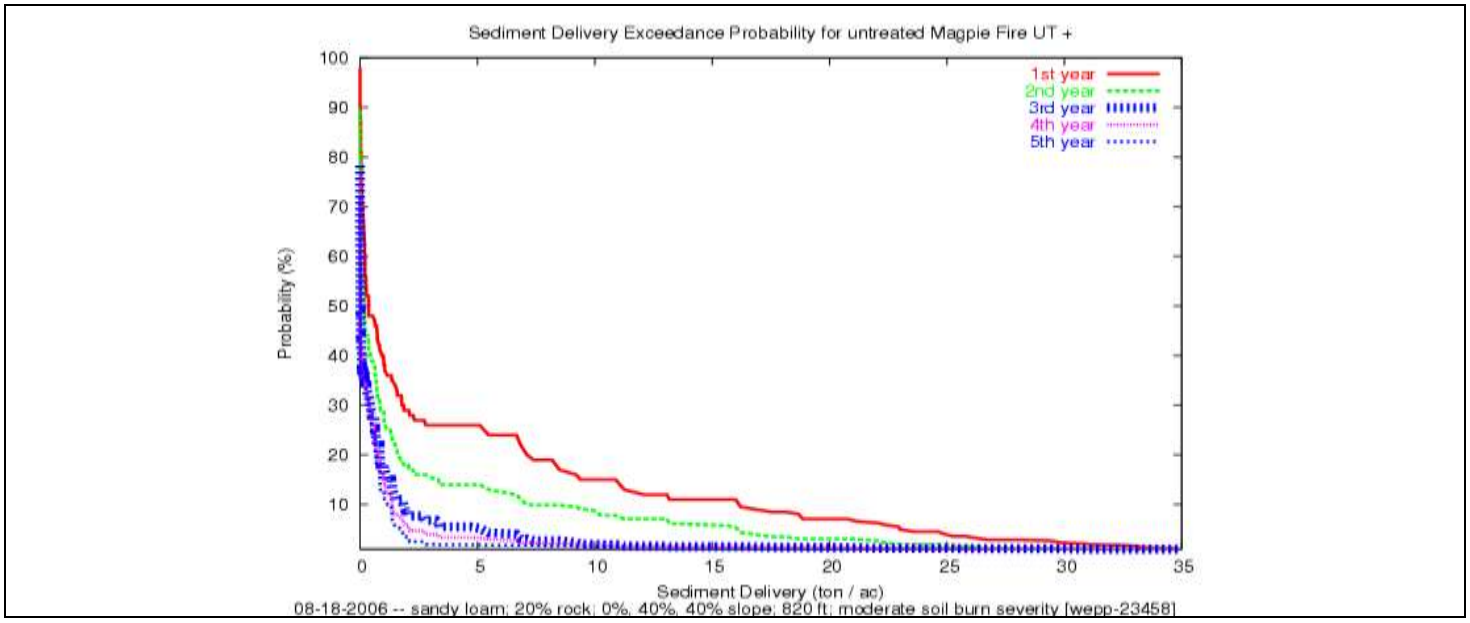
Burn Severity Class	Post-fire Erosion
	tons/acre
High	27.8
Moderate	20.4
Low	15.6
Area Weighted Average	**19.3**

The soil recovery from fire impacts, and effectiveness of potential slope treatments were evaluated using the Erosion Risk Management Tool (ERMiT). Erosion rates typically drop significantly within three years after the fire, which is reflected in the probabilities shown for sediment delivery in the following graph. The largest portion of this recovery occurs in the first one to two years following the fire. For the Magpie Fire, aerial application of seeding is being considered to protect long-term soil productivity. If successful, this aerial seeding could reduce the time needed to achieve hydrologic recovery, but this would be a secondary benefit

rather than the primary objective of the treatment. ERMiT modeling shown in Table 7 indicates that seeding will not have any impact on erosion until year 2, but that it should reduce erosion compared to no action. Aerial mulching though effective is not warranted on this fire given the values-at-risk dominance of unburned, low, and moderately burn severities exhibited within the fire perimeter. The steep high-energy slopes, which are typically the dominant source areas for floods are inherently flashy due to shallow soils with high rock content. Straw mulch would do little to change this. It is also expected that post-fire floods will not overwhelm the channel capacity of Chalk Creek.

Table 7. **Mitigation Treatment Comparisons**

Probability that sediment yield will be exceeded [ ] %	**Event sediment delivery (ton ac^{-1})**				
	Year following fire				
	1st year	**2nd year**	**3rd year**	**4th year**	**5th year**
Untreated	**16.11**	**8.04**	**1.84**	**1.37**	**1.29**
Seeding	**16.11**	**2.16**	**1.37**	**1.29**	**1.29**
Mulch (0.5 ton ac^{-1})	**1.92**	**1.9**	**1.84**	**1.37**	**1.29**
Mulch (1 ton ac^{-1})	**1.77**	**1.58**	**1.84**	**1.37**	**1.29**
Mulch (1.5 ton ac^{-1})	**1.66**	**1.54**	**1.84**	**1.37**	**1.29**
Mulch (2 ton ac^{-1})	**1.57**	**1.52**	**1.84**	**1.37**	**1.29**
Erosion Barriers: Diameter [ ] ft Spacing [ ] ft					
Logs & Wattles	**16.11**	**8.04**	**1.84**	**1.37**	**1.29**



Conclusions

Post-fire flood events from the Magpie fire are likely following short-duration high-intensity rainstorms. Debris flows are also a possibility, especially from Tributary A, but are not likely elsewhere on the fire. These events can be created by 2-year return interval storms and would likely approach the town within an hour after the initiation of a sustained storm. The potential effects from these storms will be ameliorated, but not eliminated by distance and unburned riparian areas below the fire. Flooding is likely to be more of an annoyance than an event that will damage property. Although ash, which inevitably will wash off the hills, if it makes it into the diversion works might then lead to problems with irrigation systems. Increased costs for road, diversion, and irrigation maintenance should be expected however following larger storm events. If a debris flow were to occur, coarse sediment and debris would then be deposited before reaching the town of Fillmore. One exception is the ATV trail that parallels North Fork of Chalk Creek that is used heavily by recreational users. A flood or debris flow in this location could endanger human life if the site is occupied at the time.

Forest trails with inadequate cross-drainage within and below the fire could concentrate and reroute intercepted surface runoff. This could increase erosion and flooding and could result in damage to the route. Channel treatments are not needed and would not be effective in any case due to the steep slope and channel gradients in the area affected by the fire on the Forest.

Recommendations

1. Signs should be posted at locations of trails leading to the burn area to warn foot and horse travelers of the dangers from flash flooding.

2. Signs should be posted at major National Forest entry points below the fire. The signs should warn the public that flash floods are likely following thunderstorms.

3. The Forest Service was only able to conduct a cursory review of potential flooding risks to the town of Fillmore. The City should conduct their own assessment and consult with the Natural Resource Conservation Service to determine if flood protection measures are needed and can be funded along the portions of Chalk Creek.

4. The irrigation company who diverts the water near the Forest boundary should be informed about the potential for ash and other debris to be washed into their diversion works following some storm events. Irrigators should monitor storms over the fire and consider temporarily closing lines that are susceptible to intercepting ash laden flood flows following rainstorms.

5. The district should rest the suitable portion of the burned-area from livestock grazing for a minimum of two years to allow vegetative recovery.

6. ATVs have already been observed using foot trail with in the burn unit. The district should only allow motorized travel on designated routes. Signs explaining the need for resource protection and natural recovery should be posted at major National Forest entry points below the fire. Carbonite signs should be posted where the ATV trail ends and the foot trail continues within the burn. The foot trail could use some work to close it to ATVs. These actions aid in resource protection further up the canyon above the fire as well.

7. Aerial seeding areas with moderate and high burn severities may be warranted on suitable areas due to the high values at risk in the town of Fillmore even though that treatment will not likely begin to be hydrologically effective until near the end of the second year after the fire. By that time, natural recovery will have eliminated much of the fire-induced risks from flooding. There is some possibility that the treatment could be effective by the spring following the fall of 2006 seed application however.

8. The forest should monitor post-fire recovery to determine if emergency treatments are effective at addressing the emergencies stated in the 2500-8. At least 2 post-fire storms should be visually

monitored. A tipping bucket rain gage with a time recorder should be placed on the fire to improve the assessments of how precipitation influenced vegetative recovery and flooding events.

(Adam Solt, Hydrologist)

Wildlife Report

Introduction

This report will consider values of risk related to Threatened, Endangered, and Proposed (TEP) vertebrates; as well as to Forest Service Region IV sensitive and Management Indicator Species (MIS) vertebrates and recommend management actions to protect these values as well as suggest monitoring to evaluate success of action taken.

Threatened, Endangered and Proposed TE Species

No known threatened, endangered, or proposed TE vertebrate species or designated critical habitat exists within the fire polygon. Though bald eagles have been documented using the fire area during winter, as is the case on the rest of the Fishlake Forest, there are no known roost sites on the Fillmore District (Rodriguez 2005).

Intermountain Region IV Sensitive Species

No known occupied habitat exists within the fire polygon for any of the Region IV sensitive vertebrates. There is however suitable habitat for a number of species that will be affected until re-vegetation takes place. Seeding of the area will expedite this process and help to ensure fewer noxious and exotic plant species establish.

Management Indicator Species (MIS)

Birds

Adequate and suitable nesting and foraging habitat occurs outside the fire polygon for MIS birds and other neo-tropical migrants. Both long and short-term vegetative changes will occur in this area due to the fire which will in turn modify the suite of species using the area. The reseeding discussed below will speed up the re-vegetative process and help to ensure a more native and diverse vegetative structure rather than allowing invasive exotic species to dominate, e.g. cheatgrass (*Bromus tectorum*) and even other more noxious weeds which occur in abundance adjacent to the fire.

Big Game

The majority of the fire polygon is considered critical elk winter range (88%) and was occupied in years previous to the fire by approximately 15-40 head of elk—many of which were trophy bulls.

Potential Values at Risk

A- Deer & Elk Winter Range

The burned - area is located on the western edge of the Fillmore, Pahvant Wildlife Management Unit—as designated by the Utah Division of Wildlife Resources (UDWR). As such, this area supports one of the State's most noted trophy elk herds. Conservation permits for this area consistently sell on the open market for $35 - $60k and the drawing odds for the public permits are amongst the highest in the State. The majority of the fire polygon is considered critical elk winter range (88%) and was occupied in years previous to the fire by approximately 15-40 head of elk—many of which were trophy bulls. Bull elk are managed to average 5 - 7

years of age at harvest and have surpassed this average for the past several years. Resident elk will be displaced until this range is restored.

There are also abundant deer in the area. Traditional migration routes to areas far to the west of the fire were interrupted after the construction of Interstate-15 several decades ago. Recent game-proof fencing has worsened the situation making those wintering areas on the Forest in the Magpie Fire area very important.

Sagebrush, antelope bitterbrush, cliffrose, and mountain mahogany are some of the browse species lost in this fire, especially on the western edge at the lowest elevations. The loss of these woody species when combined with the expected increase in cheatgrass already present in the area along drives the need for supplemental seeding. Past management decisions of allowing fire exclusion, grazing pressure and invasion of cheatgrass has resulted in a burn area where vegetative succession processes have been interrupted. As a result, desired natural re-vegetation of the burn area is not expected to occur. Instead, it is expected that some of the burn area will see minimal production of natives that show low vigor, and that will, in very short time, be overtaken by cheatgrass and/or noxious weeds. This invasion will result in very poor range land condition and subsequent accelerated soil erosion and associated loss of long-term habitat effectiveness for deer and elk alike.

B - Unregulated OHV traffic could pose a risk of excessive disturbance to wintering big game.

Emergency Determination

A - Cheatgrass Invasion / loss of woody browse species-

An increase in cheatgrass will result in very poor range land condition and subsequent loss of winter carrying capacity for resident deer and elk. Cheatgrass and weed dominance will slow or halt the re-establishment of native browse through disruption of soil moisture regimes, soil temperatures and fire frequencies. Traditional migration routes are largely cut-off forcing to deer and elk to utilize winter ranges on the eastern side of I - 15 in the area of the fire.

B - Unregulated OHV Traffic - Excessive disturbance to wintering big game could occur from unregulated cross country ATV traffic.

Discussion / Summary / Recommendations

This fire typically had a good mosaic of unburned, low and moderate burn severity. The major threats to wildlife relate to cheatgrass & noxious weed invasion and loss of the high quality winter browse component for deer. Fire shape-files will be provided to the UDWR to investigate whether they are interested in participating in seeding efforts to provide more browse and forb species related to deer & elk preferred winter diets. We are suggesting they consider the following: antelope bitterbrush, mountain big sagebrush (collected from near Fillmore; Bonneville variety ?), globemallow, Rocky Mountain or Palmer penstemon, Lewis flax, cliffrose, Wood's rose, etc.

Treatments to Mitigate the Emergency

A1 - Treatment Type – Aerially seed the more severely burned-areas especially those areas nearest the threat of cheatgrass & noxious weed invasion and those which burned moderate to high severity. Water barring and debris placement on dozer lines around the perimeter of the fire are essential to allow re-vegetation and control OHV access. Bare-root or tubelings would also enhance the more rapid establishment of browse species.

A2 - Treatment Objective - To reduce the frequency and cover of cheatgrass / noxious weeds and provide a viable seed bank to restore deer and elk winter range.

A3 - Treatment Description - Aerially apply seed species that are aggressive enough to compete with cheatgrass / noxious weeds and also provides forage to wildlife in the area (see below for suggested species)

Big bluegrass "Sherman"

Bluebunch wheatgrass "Anatone"

Indian ricegrass "Rimrock"

Sandberg bluegrass VNS

Slender Wheatgrass "Pryor"

Thickspike wheatgrass "Bannock"

Thickspike wheatgrass "Critana"

A4 - Treatment Cost - Approximately $40 to $45 per acre for seed (plus UDWR seed) and $10 - $18 / acre for fixed-wing seeding and $35 - $45 / acre for helicopter seeding.

A5 -. Treatment Monitoring - Semi-annual deer herd classification to assess production, winter survival and subsequent recruitment of young. Pre-season elk classification and cooperate with UDWR aerial elk census that takes place during winter every three years.

B1. Treatment Type - Unregulated ATV Travel.

B2. Treatment Objective - Protect wintering deer/elk and vegetation/watershed damage from cross country travel.

B3. Treatment Description - Provide signage to enforce and educate OHV traffic from traveling across burned-areas.

B4. Treatment Cost - $1200; 3 signs at $4000 for signage and installation.

B5. Treatment Monitoring- Semi-annual deer herd classification to assess production, winter survival and subsequent recruitment of young. Pre-season elk classification and cooperate with UDWR aerial elk census that takes place during winter every three years.

References

Rodriguez, R.L. 2005. Life History and Analysis of Endangered, Threatened, Candidate, Sensitive, and Management Indicator Species of the Fishlake National Forest Version 4.1

UDWR 2006. Big Game Winter Range maps available at www.wildlife.utah.gov

Fire severity ratings were derived from Fire's Effects on Ecosystems (DeBano, et.al., 1998). These ratings were applied on this fire.

- **Low Severity Burns** leave soil color and structure unchanged. Vegetation can be consumed or charred, but surface organic matter is intact. There is a small amount of ash on the surface (DeBano, et.al., 1998). Many root crowns of grasses and shrubs survive the fire and sprout within a few weeks (Parsons, 2002). There is often unburned vegetation within the burned-area.

- **Moderate Severity Burns** can leave the top ½ inch of mineral soil charred but structure is not altered (DeBano, et.al., 1998). Weak or moderate water repellent conditions can exist in the soil surface. Duff layers contain recognizable fragments of needles, leaves and other litter. Light colored ash occurs on the surface. Vegetation is deeply charred, but some needles or leaves can remain on trees (Parsons, 2002).

Large logs are not consumed but are charred. Small woody debris is generally consumed (DeBano, et.al., 1998).

- **High Severity Burns** leave the soil surface orange or red and can char the top 4 inches of the mineral soil (DeBano, et.al., 1998). Soil organic matter is consumed, destroying structure (Parsons, 2002). Vegetation and woody debris are largely consumed. A thick layer of light or white ash, containing almost no recognizable fragments of litter remains on the surface. Moderate or strong water repellent conditions can exist in the top 6 or more inches of the soil (DeBano, et.al., 1998).

(Steve Flinders, West Zone - Wildlife Biologist)

Range Management

Objectives

1. Develop grazing plan for the next two years for the North Fork Chalk Creek Allotment which was affected by the fire
.
2. Control invasion by noxious weeds and cheatgrass.

Issues

1. Protection from livestock grazing for up to two years in areas of moderate to high burn severity.

2. Areas infested with scotch thistle, musk thistle, knapweed, white top and cheatgrass up wind and within a mile of the burned-area.

Observations

Field reconnaissance of the area was conducted August 16 and 17th, 2006, to evaluate burn intensity, determine and document losses of vegetation destroyed by the fire. There are no range structural improvements in the fire area.

1. The Magpie Fire burned National Forest System Lands in the State of Utah. The fire perimeter is within the North Fork Chalk Creek Grazing Allotment.

2. The North Fork Chalk Creek Allotment lies in central Utah. Its Boundary encompasses 9,613 acres of National Forest System Lands. The allotment is currently managed under a deferred rotation grazing system. The allotment consists of four pastures, the Black Cedar Hill pasture was affected by the fire.

3. The Black Cedar Hill pasture was rested from grazing this year. The area affected by the fire is not grazed by livestock due to steepness of terrain and lack of water. Cattle are trailed through this area on the trail to get to the upper elevation pastures.

4. Much of the burn is in a mosaic pattern which did not damage overall forage values and may have improved forage in some cases. Some areas burned severely and will need to be seeded to fight against encroachment of invasive species.

Recommendations

Management

1. Utilize seed mixes that emphasize non-invasive introduced and native perennial species to provide soil stability and potential natural community and to reduce encroachment by cheatgrass, scotch thistle, musk thistle, white top and knapweed.

2. Find and treat any noxious weeds found in the burned-area.

Monitoring

1. Monitor seeded areas for vegetation recovery. Include litter-cover in vegetation monitoring.

2. Monitor areas of seed treatment for germination and % ground Cover.

3. Monitor burned-area closely for noxious weeds and cheatgrass.

(Noxious weed treatment costs-$ 30 / acre for chemical-$ 40 / acre for labor and $10 / acre in equipment and fuel for a total of $ 80 / acre for treatment. Estimate treatment will be needed on 10 acres.)

Need to request approximately $ 300 / year for three years to inventory for noxious weeds.

(Del Barnhurst, Rangeland Management Specialist and Bob Stevens, Range Technician)

Aquatic Biota Report

The North Fork of Chalk Creek has not been surveyed since 1999 during the tenure of the current Forest fisheries biologist. It is on our list to survey for fisheries after surveys in the Clear Creek drainage are finished.

There was no historical survey data in the Supervisor's Office files, as well.

Based on survey work on the lower South Fork and descriptions of fish seen in the North Fork, the portion of North Fork of Chalk Creek adjacent to the Magpie Fire likely has rainbow trout, rainbow x cutthroat trout hybrids, cutthroat trout, and possibly brown trout. Based on descriptions of the stream condition and survey results on the South Fork, I would expect North Fork of Chalk Creek to have trout biomass of average to above average for the Forest.

There is a chance that there are genetically pure remnant Bonneville cutthroat trout in the headwaters of the North Fork of Chalk Creek. This possibility needs to be evaluated by spot-shocking and inspecting the fish. If they appear to be pure cutthroat a genetic sample will be taken for laboratory analysis. If this case is true, it is most likely that these pure trout are above any influence from the Magpie Fire.

The Magpie Fire burned 711 acres. The fire severity map shows the majority of the burn to be low severity, especially the steep, rocky slopes adjacent to the stream. This should reduce potential impacts from the fire. The primary area of concern is the high severity burn in the head of the southwest most sub-watershed. This area will be seeded, which should reduce impacts in years 2-3 post fire. Some of this high severity burn drains to the west, further reducing impacts. Analysis by Adam Solt showed that this drainage is debris flow prone, and was affected by more than 40 % moderate-high severity fire making a debris flow likely if a rainstorm trigger event does occur. It is on the low end of the risk, however. The other 2 sub-watersheds came out below 40 % moderate-high severity fire, and are not so likely to produce debris flow events.

While North Fork of Chalk Creek has not been surveyed for fisheries resources, it has been surveyed by Petty (2004) using the Integrated Riparian Evaluation Level II methodology. Some useful information can be taken from this report.

Petty (2004) found North Fork of Chalk Creek to be at its potential natural condition for most of its length, making it one of the most pristine streams on the Forest. It had good bank stability. Almost all of the stream reaches were "A" type, or steep gradient naturally confined V channel types. The good condition is despite the fact that the stream incised tremendously in the last 100 years.

Petty (2004) noted that much of the substrate was cemented (more so in the upper reaches), which could limit food (aquatic macroinvertebrate) production and trout spawning habitat. Similar conditions have been noted on lower South Fork of Chalk Creek. Petty (2004) also noted charcoal deposits in the upper bank in reach G2-14, which would indicate episodic events of fire/burning and sedimentation have occurred in the past in this drainage.

Petty (2004) observed fish below reach G2-20, making the area from reach G2-2 to G2-19 potential trout habitat. Based on his data, these reaches cover over 34,000 feet or about 6.5 miles of trout habitat. Comparing the map of the Magpie fire to Petty (2004) reach map the fire burned along the creek from the lower-middle of reach G2-5 up to the lower end of reach G2-11. Based on this, I used the reach data to estimate that about 7,500 feet of stream were within/adjacent to the fire, which is about 22 % of the fish-supporting habitat. All of this length is within the low severity portion of the burn, however.

Another way to look at the potential for effects is empirical data based on other fires from southern. The majority of fires are located far enough from streams and are small enough that no deleterious effects are even noted. For example, a wildfire burned the north side the canyon above lower Chalk Creek in 2005, yet monitoring in 2006 showed the biomass at the lower station had increased (probably due to better stream water flow conditions in 2005).

Prescribed burning was conducted in Pine Creek above Sulphurdale in 2004. Approximately 11% of the watershed was burned in a spread out and mosaic fashion. Most of the burning was away from the creek and of low to moderate intensity / severity, although about 1/3-mile of creek was affected by moderate intensity riparian burning. Overall the fish biomass increased relative to 2001 when the 7 stations were monitored in 2005. Only the lower station directly below the burned riparian area decreased, and vegetation was resprouting in the burned stream bottom. Improved water conditions and resting from grazing apparently offset any negative effects from the burning, which were likely minimal (unpublished data in FNF SO files).

In contrast, a prescribed fire on Shingle Creek burned about ½ mile of stream bottom in high intensity. Fish were absent from the burned area for several weeks following the fire, and monitoring found about 80% fewer fish in the burned area for 2 years following the fire (unpublished data in FNF SO files).

The Oldroyd fire in 2000 burned in upper North Fork of Box Creek. The fire burned about 1500 feet of streamside riparian habitat in a high intensity/high severity fire, and burned about 30% of the sub-watershed in low to moderate intensity fire. Monitoring found no measurable decrease in fish even below the high intensity burned area, but did indicate that pool volumes may have been affected when compared to the upper control station (Whelan 2003).

In 1996 the Pole Mountain fire extripated a brook trout population in Birch Creek (E). This fire had high intensity/severity fire in a large proportion of the subwatershed, however, and the habitat was both naturally marginal and likely affected by land management activities.

The 2002 Sanford fire caused fish kills in 3 tributary streams of the East Fork of the Sevier River and in one tributary stream of the upper Sevier River. The fish kill actually extended downstream into the East Fork of the Sevier River, resulting in the elimination of trout in 37 miles of streams by UDWR estimates. Sanford Creek, the tributary on the west side draining into the upper Sevier River, was least affected. It had only 3% of the watershed receiving high severity burn, with 27 % of the watershed moderately severity burned, and 6% low severity (Sanford Fire BAER report). The fish in this drainage survived the initial fire and over the first winter, but were eliminated during the second summer. Sanford Creek was a naturally marginal stream due to low stream flows, but had beaver ponds that provided good habitat.

Deer Creek, one of the three tributaries on the East Fork of the Sevier River, had the next highest burn percentages. It had high severity fire on 10 % of the sub-watershed, 27 % moderate severity, and 3% low severity. The trout population was extirpated from Deer Creek, but it has been making good habitat recovery since the fire.

Cottonwood Creek, also on the East Fork of the Sevier River, had 6 % high severity, 39 % moderate severity, and 5 % low severity burn within its sub-watershed. Trout were also extirpated in this watershed.

Deep Creek was the most severely burned of the three tributary creeks on the East Fork of the Sevier River. It had over 60 % of the sub-watershed burned. The high severity burn covered 23 % of the watershed, 33 % was moderate severity, and 5 % low severity. Sampling within a week of the fire found no fish surviving within the portion of the stream that was burned over. Estimates were that only about 350 pure native Bonneville cutthroat trout survived the fire, all on BLM administered lands below the fire. About 225 fish were rescued and transplanted to alternative habitat. The remaining few fish were extirpated when a storm and flood occurred just a few weeks later. Effects to Deep Creek habitat have been severe, with many areas of aggradation resulting in limited channel and subsurface flow, but also downcutting in reaches and flash flood events with debris flows. The Deep Creek watershed has been slow to stabilize, and flooding in 2005 wiped out a small number of trout which were reintroduced into the watershed in July.

In contrast to these latter fires discussed above, the Magpie Fire was a relatively small portion of the total watershed that supports trout. At this level (<<15% of the watershed burned) one would expect only minor impacts unless other special situations (high severity burn right along the creek, debris flow prone watersheds) were present.

There is some potential for debris flow effects from the Magpie fire, however. While the total watershed area burned was small, the 3 small sub-watersheds burned were almost entirely burned, so the potential for sedimentation and flooding from these individual sub-watersheds is quite high. As noted above, the most western sub-watershed is debris flow prone and more than 40 % affected by moderate-high severity burn, making a debris flow event likely following a rain event. The contributing area of the sub-watershed is relatively small, however, and the high severity burn is also in the upper portion of the sub-watershed. Thus some sedimentation is likely to reach the creek, but the amounts would not be expected to cause a major fish kill

Another important point to consider is the placement of this debris flow prone sub-watershed in relationship to the trout population as a whole. The sub-watershed appears to enter the mainstem in reach G2-7. A debris flow would place aquatic biota below the confluence at some risk initially. I estimate that this confluence is about 37 % of the way up the trout-supporting habitat, but to look at it conversely this leaves about 63 % of the trout habitat, or about 4 miles, upstream of this point and likely to be unaffected.

As noted above, Chalk Creek is prone to having a cemented substrate. It is likely that some refreshment of gravels is a necessary condition to maintain loose gravel substrates for aquatic macroinvertebrate production and trout spawning. Some of this may come from rill erosion from hillsides adjacent to the stream, but courser material entering from the burn may have a similar beneficial effect.

Nutrient inputs from this fire may also provide an increase in productivity for downstream waters.

Finally, the fact that North Fork of Chalk Creek is at potential condition makes it better capable to respond positively to the ecological processes set in motion by the Magpie Fire, which should have positive effects in the long run. Fire may be less beneficial in cases where habitat is degraded by chronic sediment inputs, or where changes in riparian community (such as lost reproduction of key riparian woody plants) have occurred, but that is not the case in this drainage.

In summary, I expect that the Magpie Fire is well within the historic natural range of fire effects, due to the relatively small size of the Magpie Fire; the mosaic nature of the fire with a large percentage of the area in low severity burn; the relatively small area of high severity burn, its location away from the creek, and the seeding prescribed for this area; the location of the potential debris flow relatively low on the mainstem of the creek. While minor short-term effects to aquatic biota may occur, long-term effects should be positive due to the relatively healthy nature of the stream. There is no risk to the viability of the resident trout or the aquatic macroinvertebrate community in the North Fork of Chalk Creek due to this fire.

I would recommend visually monitoring of the effects of this fire when aquatic biota surveys are conducted in

this drainage over the next few years. It would be appropriate to place one fish population and/or aquatic macroinvertebrate monitoring station in the portion of the creek that was adjacent to the burn or downstream of the debris flow prone subwatershed.

(James E. Whelan, Forest Fisheries Biologist)