United States Department of Agriculture | Forest Service | Gallatin NF

REPLY TO: 2520 Watershed Protection
5130 Fire Supression

Date: 10/23/91

SUBJECT: Boswick Fire Rehabilitation

TO: Bozeman District Ranger

On October 20, 1991 Mark Story and Sam Redfern reviewed the Boswick Fire for an assessment of watershed damage and potential for burned area emergency rehabilitation. Most of the fire burned on 10/16, only a few spots were smoldering at the time of this review. Perimeter acres total 1113 of which only 800 is actually burned. This memo is the final version of the 2520, 10/~~20/91~~ memo referenced in Henry Shovic's 10/22 memo.

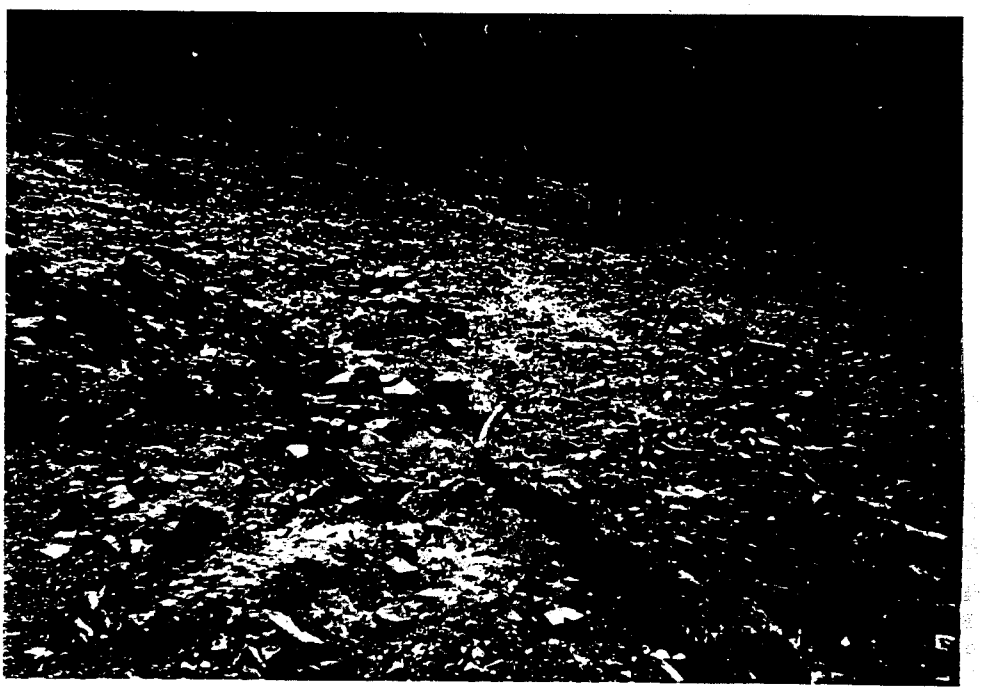
Two concerns were addressed in this review:
1) Extent of watershed damage and potentially adverse soil erosion and water quality effects from the fire.
2) Potential for emergency watershed stabilization and a funding request per FSM 2509.13 (Burned Area Emergency Rehabilitation Handbook).

The field review consisted of 1) talking with several members of the fire supression team concerning observations and rehabilitation suggestions 2) a helicopter flight over the entire burned area and 3) dropoff at H3 and a walk through much of the fire area focusing on areas most likely to need watershed stabilitation.

Parent material in the Boswick Fire area is shown on the Gallatin Geology Map (1978) as Madison Limestone on the Bridger range crest, flanked by Cambrian limestones and Precambrian metamorphic rocks. These formations tend to form coarse textured soils of moderate soil erosivity. Soil types (Gallatin NF Soil Survey, 1984) consist of 12-A, 54-1B, 54-1G, and 87-1A on the Bridger Crest. These rocky soils are all excessively to somewhat excessively drained, steep slopes (many 45% and steeper), moderate soil erodibility, and low to very low landslide potential. Sediment delivery efficiency varies from low in 12-1A, medium in 54-1G, and high in 54-1B. Elevation in the fire area range from about 6600 feet to 8400 feet in the scattered burn areas below Saddle Peak. Average annual precipitation varies from 29 inches to about 42 inches. Rainfall intensity in a 2 year-6 hr storm is 1.1 inches and the 10 year-6hr storm is 1.6 inches (NOAA, 1973, Precipitation Frequency Atlas of the Western United States, Vol.1-Montana). Below the Forest Boundary Boswick Creek flows for about 8 miles before joining the East Gallatin River. Several irrigation diversions occur on Boswick Creek below the Forest Boundary.

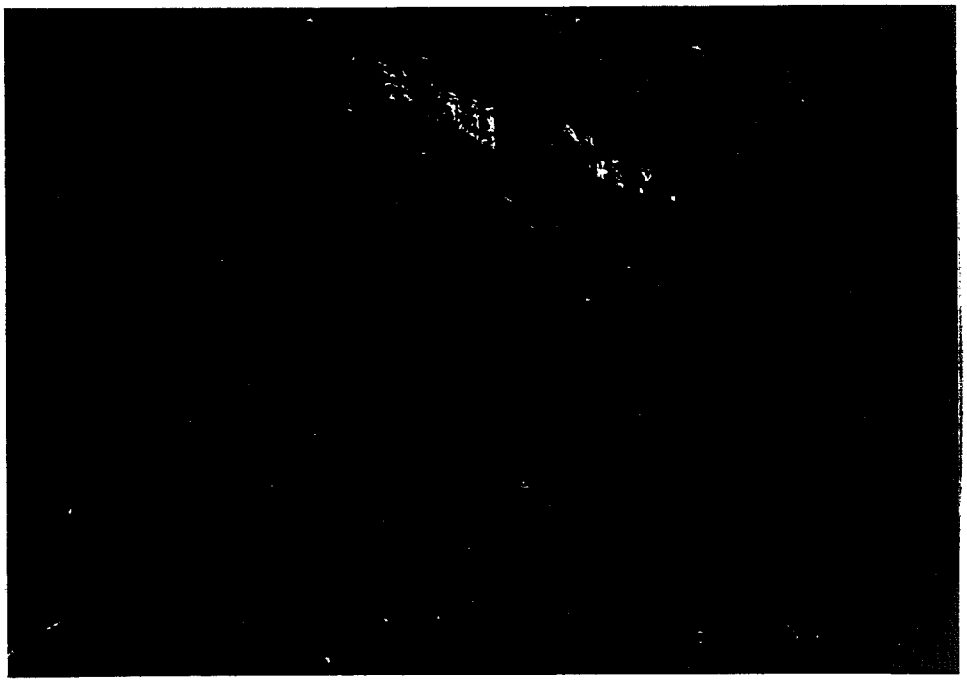
The FSH 2509.13 Burned Area Emergency Rehabilitation Handbook delineates a process of fire damage assessment, identification of a potential watershed "emergency", a procedure to document and assess treatment options, an economic analysis format to evaluate if proposed treatment methods are economically viable, and a series of forms to request emergency watershed rehabilitation funds. In order to qualify for emergency funding, a definite watershed emergency must exist and the analysis must demonstrate that the proposed treatments are economical (at least a benefit:cost of 0.7).
The FSH 2509.13 definitions of Fire Intensity (23.31) were used to compare the observed degree of "damage" in the areas observed on the ground to a 10/19/91 generalized map of canopy burn intensity provided by Sam Redfern. The 474 acres of 100% canopy burn in the hottest part of the Boswick Fire, although a high intensity canopy burn, were judged to be a medium fire intensity with the soil surface litter and humus destroyed on less than 40% of the area and some intensive heating of the A horizon. The other 326 acres of actual burned area as judged to be low fire intensity as soil surface litter and humus were not destroyed and root crows and surface roots will resprout. No high fire intensity areas (greater than 40% soil surface destroyed, crusting and water repellant soils, and all root crowns and surface roots killed) were found. It appeared that the fire moved quickly through the canopy during the main thrust on 10/16, and that the generally sparse ground fuels, and thin surface organic layer did not provide a hot ground fire. In many areas viable roots of shrubs and forbs were evident just below the ground surface. No hydrophobic soils were observed.

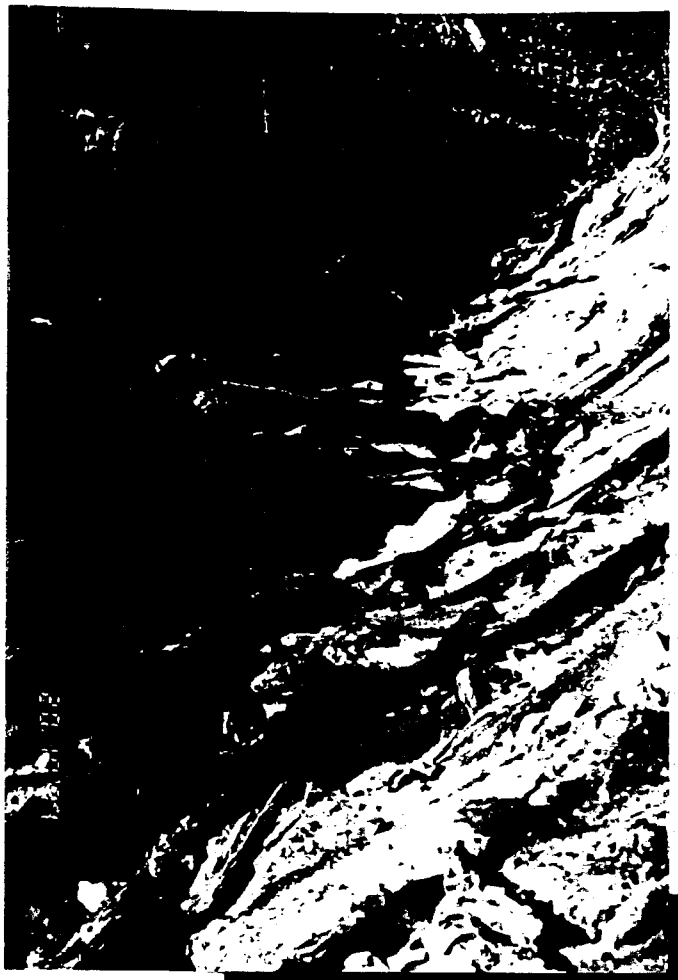
A few of the helicopter flight and ground examination observations will be shown in photographs.



Most of the upper slopes in the Boswick fire are very rocky. Some surface erosion will occur until vegetation is re-established but these rocky areas were not considered suitable for rehabilitation because of the difficulty (and questionable cost effectiveness) in constructing log erosion barriers and insufficient soil development for effective seed catch.

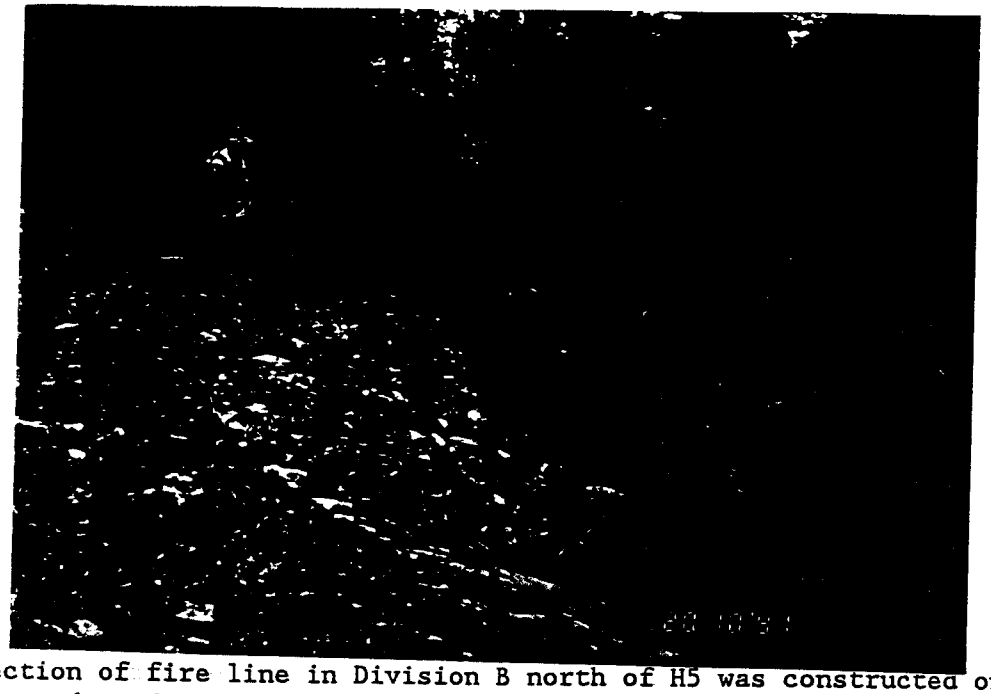
Several of the burned areas had only sparse ground cover. Much of the mid and upper slope position grass and forb plants were dormant prior to the fire. The brown areas (as opposed to the darker black burned areas) in these 2 photos are either unburned or lightly burned. These areas would be expected to recover vigorously in the spring/summer of 1992.





Since the Boswick fire was concentrated on upper slopes, the amount of burned streamside areas was limited. A primary focus of the field review was to examine the streamside areas. Most upper slope stream channels were quite rocky with good resistance to erosion. As pointed out in Henry Shovic's memo, however, some of the steepest tributaries are in the first order, high slope position channels in the area between H4 and H5, and have potential for debris flows if localized thundershowers occur. The timing of this fire in mid-October is favorable in that the most vulnerable time for debris flows is within a few weeks of the fire if the fire occurs during the period of high intensity rain events (July and August). Some revegetation and slope "hardening" will occur by July of 1992 although some debris flow activity during 1992 is possible.

In the NE part of the burn area riparian vegetation remains intact, which combined with the 2 miles of unburned riparian area along Boswick Creek should provide a considerable buffer (sediment filter and traps) to increased sediment in Boswick Creek below the Forest boundary.



A section of fire line in Division B north of H5 was constructed on 100% slope and needed some draining although the soil was only a few inches thick.

Some of the fireline in the lower section of Division B was dug in very deeply in an apparent attempt to trap burning debris from sliding downslope. Waterbar construction was very satisfactory.

Throughout the field review the potential for emergency rehabilitation was discussed. Feasibility of emergency rehabilitation is limited by the coarse textured nature of most of the soils, and frequent rock content. Log erosion barriers were not considered as feasible because of the generally rocky surface texture and steep slopes (which makes installation difficult and dangerous). Log sediment debris control structures were also not considered because all of the drainages observed (which included most of the drainages in the fire area) were rocky and/or had considerable debris for sediment retention. No road or trail related fire damage was observed which could be treated with emergency watershed funds. The only watershed treatment considered as potentially feasible for treatment is seeding.

In order to evaluate seeding feasibilty, a potential treatment of seeding the southern 300 acres of the 474 acre "core" of the Boswick Fire with 20# cereal rye per acre was evaluated. Cost of this treatment would be about $3600 for seed, $8000 for helicopter time, and $4000 for ground support for a total of $15,600.

The R1R4 Sediment Model (USFS, 1981, Guidelines for Predicting Sediment Yield from Forested Watersheds) was used to estimate baseline sediment, fire related sediment, and potential sediment reduction from the seeding. The sediment analysis was based on an accounting point on Boswick Creek at the Forest boundary. The 1992 sediment reduction from seeding is assumed to be very low since most of the fire "watershed flushing" would occur during snowmelt runoff. By 1993 and 1994 it was assumed that the cereal rye would reduce fire related sediment by 50% (which is probably an optomistic assumption).

Year	baseline sediment tons/yr	fire sediment tons/yr	total sediment tons/yr	sediment reduction from seeding tons/yr
1992	120	37	157	5
1993	120	8	128	4
1994	120	2	122	1
1995	120	1	121	0
1996	120	0	120	0

The sediment analysis results in an estimated 10 tons of sediment reduction for a cost of approximately $1560 per ton of sediment reduced. "Cost" of sediment varies from $1 to $10 per ton (depends of the downstream use of water) but even the higher figure would produce a benefit cost of 100: 15600 or 0.006 (much lower than the required 0.7). These actual estimates could be refined but it appears that seeding does not pose potential for a defensible funding request.

In conclusion:

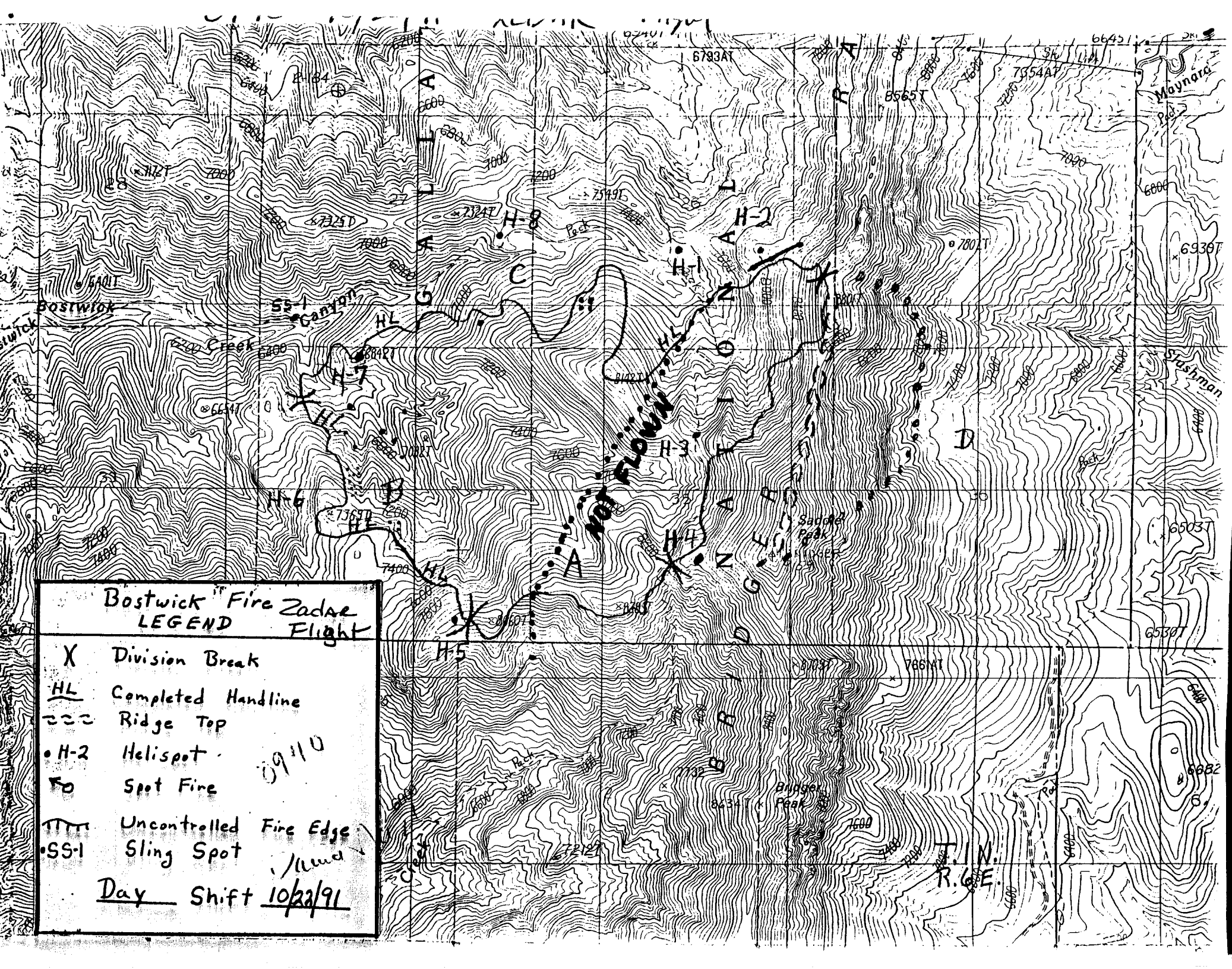
1) The Boswick Fire has relatively limited potential for massive soil erosion, and water quality (sediment) change due to the coarse textured, relatively low erosion hazard soils, retention of most of the Boswick stream system in unburned condition, and total burned acreage of only about 8% of the Boswick watershed above the Forest boundary.

2) A "watershed emergency" was not judged to exist.

3) An emergency watershed rehabilitation funding request (FSH 2509.13) is not recommended since an emergency is hard to justify, seeding success is doubtful on the coarse textured soils, and preliminary analysis indicates benefit:cost ratios of a seeding request is not favorable.

4) Fire suppression rehabilitation will consist of draining the remaining un-waterbarred fire lines, cleaning up the constructed helipads, and rehabilitation of the camp area.

Mark T. Story
Forest Hydrologist
Gallatin NAtional Forest


Bostwick Fire Zadar Flight
LEGEND
X Division Break
HL Completed Handline
Ridge Top
H-2 Helispot
Spot Fire
Uncontrolled Fire Edge
SS-1 Sling Spot
Day Shift 10/22/91
0910
Mud
NOT FLOWN
H-1
H-2
H-3
H-4
H-5
H-6
H-7
H-8
SS-1
A
B
C
D
Bostwick Creek
Canyon
Saddle Peak
Bridger Peak
Maynard Peak
Stashman
T. 1 N.
R. 6 E.