Burned Area Emergency Rehabilitation
Funding Request

Fire: Hash Rock
Forest(s): Ochoco

Request: $470,650 (per report)

Comments:

This request is outside Regional authority to approve and will need to be approved at the Washington Office (WSA). The majority of the treatment cost is associated with prepartion of the road system in the area to deal with the increased runoff expected as the result of the fire. There is a local concern about downstream effects on private landowners. Seeding in the wilderness area is intended to reduce fire effects on sediment, water quality, and to provide assurance to the private landowners that the Forest Service is effectively treating emergency source areas within the fire.

Changes to the Forest request for BAER funding authority are documented below.

Recommendation(s)

- Reduce the unit cost of treatment #18 to $250 and the treatment cost to $10,000 due to an apparent duplication of blading 21 miles of road (see treatment #9 for duplication). This reduction in unit cost was the recommendation of BAER team leader Carl Davis on 9/8/00
- Deny the authority for funding $7,000 to do stream temperature monitoring
- Deny the authority for funding $27,400 to do water quality/sediment monitoring
- Approve a reduced plan totalling $426,250

Bruce McCammon
September 5, 2000

Concur: /s/ Grant Gunderson *for* Phil Mattson (WFW)

/s/ Peggy Kain *for* Ron Escano (NR)

/s/ Richard Sowa *for* Harv Forsgren (RF)

BURNED-AREA REPORT

HASH ROCK FIRE
OCHOCO NATIONAL FOREST

USDA Forest Service Date of Report: September 7, 2000
1700

BURNED-AREA REPORT
(Reference FSH 2509.13, Report FS-2500-8)

PART I - TYPE OF REQUEST

A. Type of Report

[**X**] 1. Funding Request for Estimated FFF-FW22 Funds
[ ] 2. Accomplishment Report
[ ] 3. No Treatment Recommendation

B. Type of Action

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

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

[ ] 3. Final report - following completion of work

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: **Hash Rock Fire** B. Fire Number: **P60770**

C. State: **Oregon** D. County: **Crook**

E. Region: **Region 6** F. Forest: **Ochoco NF**

G. District: **Prineville & Big Summit Ranger Districts**

H. Date Fire Started: **8-23-00** I. Date Fire Controlled: **Unknown***

J. Suppression Cost: **$5,200,000 Projected (9-03-00 ICS 209 Report)**

* Containment @ 0600 on 9/2/00

K. Fire Suppression Damages Repaired with FFFS-PF12 Funds:

1. Fireline waterbarred (miles) **15 (32 Total; 22 dozer, 10 hand)**
2. Fireline seeded (miles) **None to date**
3. Other (identify) **20 miles road maintenance completed** (50 miles total needed)

L. Watershed Number: **17-07-03-05-07 (Mill); 17-07-03-05-09 (Marks)**

M. NFS Acres Burned: **18,500** Total Acres Burned: **18,500** **
Ownership type: **(All NFS lands)**

( )State ( )BLM ( )PVT ( )

** 19,000 projected final size

N. Vegetation Types**: Grand fir Moist Plant Assoc. Group (grand fir/beadlily, grand fir/columbia brome & grand fir/ twinflower) 40%; Grand fir Dry PAGs (grand fir pinegrass & grand fir elk sedge) 30%; Douglas-fir PAGs (15%) and some Juniper PAG and Miscellaneous Veg.**

O. Dominant Soils: **Volcanic ash over skeletal clay**

P. Geologic Types: **volcanic pyroclastic flows**

Q. Miles of Stream Channels by Class:

I-2.5 **II-18.4** **III-10.5** **IV-29.8**

R. Transportation System:

Trails: **20.0** miles Roads: **50.0** miles

PART III - WATERSHED CONDITION

A. Fire Intensity (*1) (acres): **8,547** (low-46%) **3,791** (moderate-21%) **5,564** (high-30%) **511** (unburned-3%)

(*1) Fire intensity figures based on 8/30/00 survey information (18,413 ac fire area).

B. Water-Repellent Soil (acres): **3450**

C. Soil Erosion Hazard Rating (*2) (acres):

6,400 (low) **9,200** (moderate) **2,800** (high)

(*2) Soil Erosion Hazard Rating figures based on E. Fork Mill Creek Watershed Analysis and were extrapolated to other areas.

D. Erosion Potential: **15** tons/acre

E. Sediment Potential: **3,200** cubic yards / square mile (*4)

(*4) Assumptions for items D and E:

1. Landform sediment delivery and routing efficiency is considered to be approx. 30%--which would deliver 5 tons/acre or 3,200 cubic yards/sq. mile. The 30% delivery ef fiency was based upon the following assumptions: 1) a storm interval of 10 years 30 minute convection storm with the high likelihood of hail, 2) high intensity burn areas will have a 70% reduction in soil infiltration creating 70% runoff, 3) projected design flow of 273 cfm. 4) most of the sediment is fine derived from Mazama Ash.

Given this information, it is felt that the correlation of erosion potential and sediment potential are appropriate.

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period: **5** years

B. Design Chance of Success: **75** percent

C. Equivalent Design Recurrence Interval: **10** years

D. Design Storm Duration: **0.5** hours

E. Design Storm Magnitude: **0.4** inches

F. Design Flow: **<1.0 to 21.6*** cubic feet/second/square mile

G. Estimated Reduction in Infiltration: **40** percent

H. Adjusted Design Flow 35.3(E. Fork Mill); 52.4 (small tribs) ** cubic feet/second/square mile

* Based on Crook County frequency curves.

** Based on reduced infiltration and interception. Increased flows and sediment transport resulting from the burn can be anticipated to aggrade the channelized main stem of Mill Creek and re-initiate extensive bank erosion. Rain on snow events (usually below 5000 feet) resulting in higher flows typically occur every 20-25 years in the watersheds impacted by the Hash Rock Fire. The flood on December 31, 1995, which fell in this intensity range, caused extensive flooding of agricultural fields, deposited gravels/cobbles in some fields, bank erosion, loss of private bridges on Mill Creek, and aggradation in the upper main stem of Mill Creek. There is a 20% risk of a 25 year flood or greater in the next 5 years. The dark surfaces in the fire likely increases this probability. The fire will also cause increased

snow accumulation in the burn area due to decreased interception and will raise the elevation of the transitory snow line due to reduced canopy closure. A 25-year flood, without cumulative fire effects, is about 18.7 cfs/sq.mi. The increased flow following the fire will be much more responsive (flashy) and this will result in a significant cumulative increase in the magnitude of future flood events.

PART V - SUMMARY OF ANALYSIS

A. Describe Watershed Emergency:

The Hash Rock Fire area and potentially impacted areas downstream exhibit many important characteristics that were considered in determining the proposed course of action. The following summary describes the conditions that warrant emergency rehabilitation actions.

1. **Loss of Site Productivity** - This fire area has a history of serious sheet and rill erosion from relatively frequent storm events (10 year storm return intervals). Flooding within two to three years after fire events has been observed in other fire areas east of the Cascades in Washington and Oregon. Non-cohesive Mazama ash forms surface horizons approximately 12 to 18 inches in depth. These ashy surfaces overlie "clayey" (montmorillonitic) subsoils weathered from volcanic pyroclastic bedrock. The ash surface forms an abrupt boundary over the clayey subsoils, affecting the erodibility of these soil regoliths. The ashy surface is quite permeable while the clayey subsoil is not. The clayey subsoil forms a lubricated interface making the ashy surface prone to shallow landslides. With vegetation removal additional shallow landslides are expected to accelerate over the next five to 10 years.

As long as the ashy soils are vegetated, surface erosional processes are not significant. However, once the vegetation cover is removed, these ashy soils on steep slopes have very high erosion hazards. Sediment loading in tributaries as a result of previous storm events was observed. Steep landforms over much of the burned area are highly effective in delivering eroded material to stream channels. Hence, the moderate and high intensity burn areas will likely have accelerated surface erosion and shallow landslides risks.

Large portions of the burned area are also at risk to soil productivity losses as a result of noxious weed invasion in high intensity burn areas. Weed seed sources will likely exist along roadways, staging areas, adjacent to the fire area, as well as the fire camps.

2. **Loss of Water Quality -** Water quality in the Mill Creek drainage is critical for many uses including domestic/agricultural uses, aquatic habitat for Redband Trout, and recreation use. Within the Mill Creek drainage, immediately downstream of the burned area, there are numerous domestic/agricultural water diversions, and the heavily used Ochoco Reservoir (recreation and irrigation use).

Mill Creek Main Stem just below the Hash Rock Fire Area was channelized in the mid-1960s in response to a significant flood event. Fine sediment has been accumulating within this segment. With expected higher sustained stream flows, additional sediment will likely be moved down stream reducing effectiveness of irrigation diversions and water quality for benefiting uses.

With the increase in surface erosion and shallow landslides, delivered fine sediment into the tributaries of Mill Creek are expected. This increase in suspended sediments and bedload will reduce water quality and affect beneficial uses (irrigation and Redband Trout).

3. **Threats to Human Life and Property -** High risk for debris torrent initiated flooding exists in the drainages within and immediately adjacent to the Hash Rock Fire area. The typical debris torrent is a high velocity, channel scouring/depositional event that significantly threatens any facility in its path. The primary facilities within the fire area susceptible to flooding and debris torrents include roads, trails and irrigation diversions. Immediately outside of the fire area, there are a significant number of facilities and other developments at risk along both the Mill Creek and Marks Creek. In the mainstem Mill Creek drainage immediately below the fire, there are a number of homes, a church camp, out-buildings at risk. Additionally, over 1000 acres of productive hay and pastureland and numerous irrigation diversions are threatened in this drainage. In the east fork, the Wildcat Campground is threatened. A dwelling and a school are at risk along two tributaries of Marks Creek (Hamilton Creek and Cornez Creek).

The Mill Creek Watershed is subject to rain on snow events on a 25-year interval. These events cause dramatic "flashy" peaks which trigger significant flooding. In the mid-1960s Mill Creek below the fire was channelized and straightened following one of these events. The dikes and levies associated with this channelization is "by and large" no longer in good condition. Sediment deposition within the channelized segment has caused localized channel migration resulting in the erosion of the dikes and levies. A few dwellings and out-buildings are built along these levies and dikes Additional flooding poses a real risk to life and property for these few land owners. Appendix D is a listing of improvements that are at risk with a 25-year storm event.

B. Emergency Treatment Objectives:

A primary objective of emergency treatment is to establish conditions within the burn that support long-term, natural recovery. The application of the BAER treatments should assist natural recovery and downstream damage by reducing both erosion and downstream sediment delivery. Proposed non-structural land treatments are designed to accelerate soil cover and maintain natural soil infiltration. Proposed structural treatments to roads and trails are intended to reduce accelerated erosion and sedimentation from Forest Service facilities. Proposed channel treatments are designed to reduce stream bank erosion and channel head cutting.

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

Land **85** % Channel **80** % Roads **90** % Other **90** %

D. Probability of Treatment Success

	<----Years after treatment----->		
	1	3	5
Land	**80%**	**85%**	**90%**
Channel	**80%**	**90%**	**90%**
Roads	**80%**	**80%**	**80%**
Other	**80%**	**80%**	**80%**

E. Cost of No Action (Including Loss): **$6,500,000**

F. Cost of Selected Alternative (Including Loss): **$1,770,650**

G. Skills Represented on Burned-Area Survey Team:

[**X**] Hydrology	[**X**] Soils	[**X**] Geology	[**X**] Range
[X] Timber	[**X**] Wildlife	[ ] Fire Mgmt.	[**X**] Engineering
[ ] Contracting	[**X**] Ecology	[ ] Research	[**X**] Archaeology
[X] Recreation/Wilderness			[**X**] Fish Biologist

Team Leader: **\s\Carl Davis**

Phone: **(509) 662-4335** Electronic Address: **cedavis @fs.fed.us**

H. Treatment Narrative:

The following treatments have been proposed to mitigate the threats to life & property, and to reduce loss of site productivity and degradation of water quality as a result of the Hash Rock Fire.

Overall Goal of Proposed BAER Treatments: To complete a combination of comprehensive treatments to reduce concentrated runoff and effectively reduce the threat of severe flooding in and outside of the Hash Rock Fire which will reduce damages to private property and Federally administered lands. The land, channel, road and trail treatments form an integrated package.

Rationale Critical to Upland Treatment Selection in Wilderness
Inherent and critical to all proposed treatments are the need to use methods and materials that meet Forest Service policy to maintain the wilderness character of the Mill Creek Wilderness. Additionally, the historic fire frequency map in Appendix E suggests that the burn intensity from the fire was significantly higher in some areas from the historic range. These two factors strongly influenced the decision to limit the extent of wilderness treatments and treat those areas that burned unusually hot and also had the highest risk to adjacent downstream values. Further, the limited toolbox of upland non-structural treatments indicates that even treatment of all burned area through intensive seeding (given wilderness policy limitations) would not stop flooding potential from a 25-year flood event (Appendix E)

The primary upland treatment proposed is seeding of short-lived annual grains in areas that have the highest potential to contribute to downstream damage resulting from high intensity storms. These treatment areas include highly erosive soils, both in and out of the Mill Creek Wilderness, that experienced high intensity burns and that directly threaten downstream values. Without adequate ground cover these soils have a high risk of erosion and accelerated delivery of sediment into both Mill Creek and tributaries of Marks Creek. Without treatment, these soils will likely lose significant portions of the A horizon threatening future vegetation recovery and increasing accelerated sediment and water delivery downstream. Downstream beneficial uses and values would be threatened without this treatment including: redband trout habitat, irrigation diversions, hay and pasture lands, and dwelling and other building near the channels. Appendix E displays information supporting these conclusions related to vegetation recovery and soil loss.

Land Treatments

Purpose: Improve inadequate ground cover to reduce concentrated runoff and sheet erosion on sensitive hillslope soils. Treatments intended to reduce the threat of debris torrents, severe channel scour, and flooding on to private lands in the Mill and Marks Creek drainages. Treatments are also intended to encourage natural vegetation recovery, discourage the rapid spread of noxious weeds and maintain

wilderness values.

Treatment #1: Aerial seed (winter wheat) on high intensity burn areas outside the Mill Creek Wilderness.

Treatment #2: Aerial seed (winter wheat) on high intensity burn areas inside the Mill Creek Wilderness.

Treatment #3: Pull, Spray, and Hand seed known noxious weed infestations with perennial domestic grasses to compete with weeds. **Refer to appendices A through C for seed details.**

Channel Treatments

Purpose: To reduce the velocity and energy of concentrated storm runoff and minimize erosion of already degraded channel systems outside the wilderness in Mill Creek.

Treatment #4: Plant riparian shrub species that have been lost and begin the process of restoring streambank function.

Treatment #5: Strategically locate large rock into localized channel segments that have excessive channel head-cutting. Channel cutting is in response to culvert size and placement. Large rock will buffer the erosive nature of culvert delivery.

Road and Trail Treatments

Purpose: Improve inadequate road/trail drainage and prevent concentrated run off from Forest Service road/trail systems in Marks Cr, West Fork Mills Creek, and East Fork Mill Creek Drainages. Treatments are intended to prevent road washouts and accelerated delivery of sediment to sensitive low gradient Redband Trout Habitat and downstream irrigation diversions in Mill Creek.

Maintenance Level 1 Roads

Treatment #6: Construct type B drain dips (drivable) with surfacing (with rock armored fill slopes). Straw bales or log structures will be installed below some dips to help further disperse runoff water.

Treatment #7: Construct waterbars. Straw bales or log structures will be installed below dips to help further disperse runoff water.

Treatment #8: Plant riparian shrubs (alder-willows) and/or seed grasses on suitable cut & fill slopes at stream crossings or where roads parallel riparian areas.

Maintenance Level 2-5 Roads

Treatment #9: Complete detailed road blading of approximately 21 miles of road to insure proper road surface drainage. This would include occasional outsloping of road prism to insure adequate drainage.

Treatment #10: Construct type A drain dips (drivable) with surfacing (with rock armored fill slopes). Straw bales or log structures will be installed below some dips to help further disperse runoff water.

Treatment #11: Construct type B drain dips (drivable) with surfacing (with rock fill armored fill slopes). Straw bales or log structures will be installed below some dips to help further disperse runoff water.

Treatment #12: Hand seed new road drain dips with domestic or native grasses depending on risk of noxious weed infestation.

Treatment #13: Construct reinforced low water fords or grade sags on selected perennial and intermittent stream crossings. Fords and sags will be designed to keep storm flow within the channel area.

Treatment #14: Apply native seed on primitive road# 27.

Treatment #15: Replace undersized culverts in order to better handle anticipated increases in surface runoff. Existing undersized culverts have contributed to accelerated stream bank and channel erosion.

Treatment #16: Armor culvert outlets to disapate energy and reduce headcutting and channel scour.

Treatment #17: Spot rock with native material ¼ mile of road to help reshape road prism to improve surface drainage.

Treatment #18: Clean ditches and existing culvert basins of fire debris. Complete detailed road blading of approximately 21 miles of road to insure proper road surface drainage. This would include occasional outsloping of road prism to insure adequate drainage.

Treatment #19: Install drain dips on 20.0 miles of recreation trails (Wildcat Trail #833, Belknap Trail #833A, and Twin Pillars Trail #832) within the burned area to divert anticipated increases in surface runoff. Dips will be constructed with peeled and anchored native wood material.

Treatment #20: Install relief ditchs in areas of concentrated runoff from road prism

Treament #21: Install trail drain dips to reduce runoff.

BAER EVALUATION

BAER Survey and Implementation Plan. Support completion of BAER survey and development of the Hash Creek BAER Implementation Plan

Stream Temperature Monitoring: Mill Creek is on Oregon States' 303d list for exceeding temperature standards. The East Fork is primarily wilderness and limited BAER treatments are proposed to improve fire related watershed impairments. Historically the vegetation in the East Fork of Mill Creek buffered temperatures through shading. However, with the Hash Rock Fire, shade has been reduced by approximately 50% throughout the drainage such that stream temperatures are expected to increase in Mill Creek. Temperature monitoring (for 3 years) above the confluence of the West Fork Mill Creek and the East Fork of Mill Creek will be beneficial to determine specific fire effects on Mill Creek.

Water Quality Monitoring Stations: Primary issues with Mill Creek are increased flows and sedimentation. The stream system is functioning at risk because of channelization and degraded bank vegetation. There are three monitoring stations that have been identified to help address sedimentation and flow effects related to the Hash Rock Fire. This information will be very useful in dealing with downstream irrigation users. Propose monitoring these stations for a three year period in order to develop some trend analysis.

BAER Treatment Monitoring: One of the other primary issues with the Hash Creek Fire is the establishment of perennial grass cover to reduce the spread of noxious weeds. Currently noxious weeds

are isolated in specific locations. With additional fire disturbance to existing vegetation cover and BAER road treatments a real concern exists with the spread of noxious weeds. Propose monitoring roads and known noxious weed infestations for three years for evidence of noxious weed spread. Additionally, transects will be established to ascertain the efficacy of the wheat seeding. It is also proposed that some area be hand fertilized to determine the efficacy of fertilizer use alone in high and moderate burn intensity areas.

Propose construction of a three-way exclosure to monitor establishment and longer term survival of planted grass species. This exclosure will enable the Forest to determine the effect of livestock and/or wildlife on recovery of disturbed sites.

Part VI - Emergency Rehabilitation Treatments and Source of Funds
by Land Ownership 1/

No.	LINE ITEMS	UNITS	Burned Area Emergency Rehabilitation NUMBER OF UNITS	UNIT COST	WFSU-FW22 AMOUNT	OTHER 2/ FUNDING
	A. LAND TREATMENTS					
1)	Aerial Seed Uplands non wilderness	ac	700	35	24,500	
2)	Aerial Seep Uplands in wilderness	ac	1400	35	49,000	
3)	Pull, Spray, Hand Seed noxious weed sites	Ac	50	200	10,000	
		ac				
	B. CHANNEL TREATMENTS					
4)	Riparian Plantings	Mi	5	1500	7,500	
5)	Channel Headcutting	Ea	20	1000	1,000	
	C. ROADS (Mtce Level 1)					
6)	Type B Drain Dips (surface+armor)	Ea	40	500	20,000	
7)	Waterbars	Ea	225	40	9,000	
8)	Riparian Plantings along stream segments	Mi	1	1000	1,000	
	Close Non System Roads					30,000
	D. ROADS/TRAILS (Mtce Level 2-5)					
9)	Road prism blading and shaping	Mi	30	250	7,500	
10)	Type A Drain Dips (surface+armor)	Ea	80	680	54,000	
11)	Type B Drain Dips (surface+armor)	Ea	40	500	20,000	
12)	Hand seed drain dip aprons	Ea	100	20	2,000	
13)	Construct Reinforced Fords	Ea	1	1000	20,000	
14)	Native Seed on Road#27	mi				30,000
15)	CMP (culvert) replacement	Ea	10	12,000	120,000	
16)	CMP (culvert) outlet armoring	Ea	40	150	6,000	
17)	Spot native rock	Mi	.25	3000	750	
18)	Clean Ditches & Culvert basins	Mi	40	250	10,000	
19)	Remove culverts (McGinnis Cr.)	Ea	2	3000	6,000	
20)	New Relief Ditch	Mi	10	500	5,000	
21)	Trail Drain Dips	Mi	19	2000	38,000	
	E. BAER EVAL./ADMIN.					
	BAER Survey & Impl. Plan				5,000	
	Stream Temp. Monitoring				0	
	Water Quality/sediment Monitoring				0	
	BAER Treatment Monitoring				10,000	
	F. TOTAL				426,250	

1/ All NF System lands - No other ownerships involved
2/ Other FS funding sources 60,000

PART VII - APPROVALS

HASH ROCK FIRE

1. /s/ Craig Courtright for
Tom Schmidt

Forest Supervisor Date September 7, 2000

2. /s/ Richard Sowa for
Regional Forester Date September 8, 2000

Appendix A

Hash Rock Fire
Seed/Fertilizer Treatments

All seeding rates are for certified seed. If certified seed is not available and you MUST use non-certified seed only if it is at least 90% pure and has 90% germination. ACCEPT NO SEED WITH ANY NOXIOUS WEED CONTENT!

UPLAND SEED SPECIFICATIONS

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ITEM/SPECIES	***$/LB***	***PLS LBS/AC***	***PLS SEEDS/ SQ. FT.***	***SEEDS / LB***	***$ / AC.***
Soft White Winter Wheat (Cold & Snow Mold Tolerant)	.15	20	6.5	14,000	3.00
Application Cost (aerial) ($20 seed; $14 admin.)					34.00
TOTAL ALL					**37.00**

WEED TREATMENT SEED SPECIFICATIONS

ITEM/SPECIES	***$/LB***	***PLS LBS/AC***	***PLS SEEDS/ SQ. FT.***	***SEEDS / LB***	***$ / AC.***
Intermediate Wheatgrass (Greenar or other)	4.00	15	30	90,000	60.00
Red Fescue (Jasper)	2.00	2	23	500,000	4.00
Mountain brome	3.00	8	18	100,000	24.00
Big Bluegrass (Sherman)	8.00	1	21	917,000	8.00
Total for Seed		26	92		96.00
Application Cost (ground)					25.00
TOTAL ALL					**121.00**

Appendix B

Seeding Rationale
Hash Rock Fire

On the Hash Rock Fire, which is predominantly in wilderness, there are other policy restrictions. Any seeding treatment must maintain the genetic integrity of the existing native vegetation. As a result, only local native plants (not available) or ephemeral non-native plants can be used in the wilderness seeding effort. An exception would be to seed domestic grass on areas outside wilderness infested with noxious weeds or with high potential for infestation. Domestic grasses can compete more effectively with weeds on disturbed sites.

Species for Fire Rehab seeding.

Experience on other fires ((the Dinkelman Fire of 1988 (53,000 acres) and the Chelan County Fires of 1994 (180,000 ac.)) suggest that cereal grains can be very effective in reducing erosion while not persisting long enough to significantly inhibit natives. In both of the above instances the cereal grain used was Madsen soft white winter wheat. It germinated better than the other species included in the mixes and did not persist over 3 years. Multiple species were used during the "kitchen sink" approach where we don't know what will work so we throw in a bit of everything. Also, multiple species are used to meet some objective--like more complete site occupancy due to different species filling different niches--or to add a legume in hopes of adding nitrogen to the site.

In the 1988 and 1994 fires in Chelan County, WA a number of species were seeded, including wheat. Wheat did very well--it germinated well, maintained itself for 2-3 years and then was gone. Another annual grain species might be somewhat more suitable to the higher elevation sites found on the Hash Rock Fire. The greatest limitation to stand establishment is weather effects on germination. The large size of cereal grain seed provides lots of energy allowing it to germinate when other species will not. If these large seeded grains don't make it, then other species won't either. Also, cereal grains (particularly wheat) are much easier to apply since it's seed broadcasts very well (as opposed to most grass seeds).

Use of grass seeding to suppress Noxious weeds:

Noxious weeds are a concern in the fire area. The introduction and spread of noxious weeds can reduce the diversity and abundance of native vegetation, forage, diversity and quality of wildlife habitat, increase erosion and decrease water quality (ICEBMP 1997). Wildfire and suppression activity may increase the potential for weed introduction and spread by removing vegetation the litter layer and "A" soil horizon, thereby creating an ideal seedbed for noxious weeds. Noxious weeds inhibit natural stand development and reduce natural biological diversity. Weeds may also inhibit re-establishment of native plants including trees. A number of weeds are established in the area and without treatment, may increase as a result of the open stand conditions. Seeding adjacent to known weed populations should help to reduce their susceptibility to invasion. It is well documented that vegetated sites are more resistant to weed invasion than sites devoid of vegetal cover. Shelley at Montana State is a strong supporter of revegetation as a means to inhibit weed invasion. Larson and McInnes (1989) found that some grasses were particularly effective at inhibiting encroachment of diffuse knapweed. Perennial domestic grass species are proposed and should occupy disturbed sites that are at risk from nearby noxious weeds.

Terry R. Lillybridge — Plant Ecologist
Mark Lesko — Botanist

Appendix C

HASH ROCK FIRE
NON-STRUCTURAL LAND TREATMENT
ASSESSMENT NARRATIVE

GENERAL

The Hash Rock Fire is approximately 19,000 acres and includes most of the East fork of Mill Creek and part of the West Fork Mill Creek and Marks Creek. Approximately 14,500 acres lie within the Mill Creek Wilderness. See attached figure. Elevations range from 3,600 feet at the lowest point to over 6200 feet along the main ridge which bounds the north side. The fire is about 9 miles from east to west and 6 miles from north to south.

Slopes are very steep and soils erosive (predominantly). Re-distribution of ash has left bedrock exposed on the upper ridges. The area is densely forested with Douglas-fir, ponderosa pine and grand fir. Most of the fire area falls within the grand fir zone. Drier sites fall within the grand fir and Douglas-fir zones and support understory species such as pinegrass, elk sedge and snowberry. As moisture increases, grand fir remains the climax dominant but species such as twinflower and beadlily become common.

Fire intensity was mapped using the criteria listed in the 1995 Fire Rehabilitation Handbook. Mapping was completed from ground surveys with follow up helicopter surveys. Approximately 30% of the fire area experienced high intensity burn. About 46% was low intensity, 21% moderate and 3 % unburned. As is characteristic of high intensity fire, essentially all of the litter was consumed leaving white ash. Essentially no needles or leaves remained in the high intensity fire areas. There was some evidence of water repellant soils. Although most of the above ground parts of the understory plants were consumed, undoubtedly many will re-sprout in time.

Treatment Narrative

The non-structural treatments include seeding of High Intensity Burn areas and erosion control seeding of newly disturbed areas along the road system (only outside wilderness). The loose condition of the ash soils and the steep slopes result in extremely erosive conditions. The seeding is expected to increase soil vegetation cover to reduce the likelihood of severe accelerated runoff. Tree mortality has drastically reduced evapotranspiration-allowing for the soil profile to fill with water and predisposing the area to surface erosion from even moderate precipitation events. On high intensity burn uplands, erosion control seeding is designed to provide short-term (3 year) cover of wheat until native species can re-establish.

Roads contribute a significant amount of sediment and often serve as the point of initiation for overland water flow. Those areas along road corridors that have been freshly disturbed from such things as culvert replacement and drainage feature construction will be seeded to develop a perennial plant community to reduce the sediment contribution from road and risk of weed establishment. The wheat in the road mix is intended to serve as a nurse crop for the perennial species.

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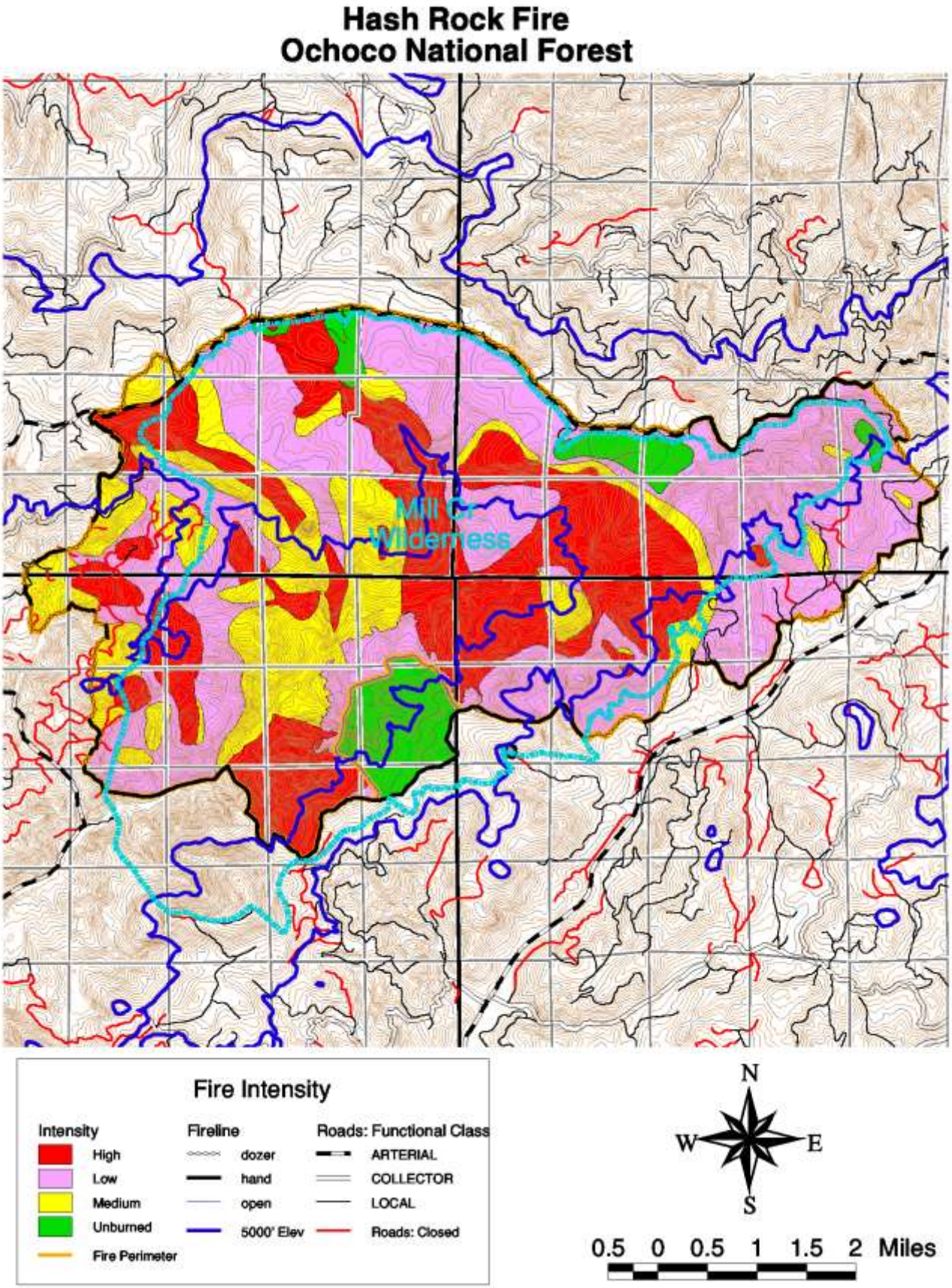

Light blue line is wilderness boundary.

Appendix D

Along drainages leading from the Hash Rock Fire, the following private and federal values are at risk.

Property at risk includes:	estimated value
Private Property	
1000 acres Hay/Pasture (crop loss + rehab)	$600,000
10 Irrigation developments	$50,000
Church Camp	$200,000
Barn, outbuildings/structures/dwelling	$1,500,000
County/FS Roads (14 mi.)	$2,100,000
Powerlines	$250,000
Federal Facilities (campground, 10 bridges)	$1,450,000
TOTAL	**$6,500,000**

APPENDIX E
Erosion, Vegetation Cover and Fire Intensity

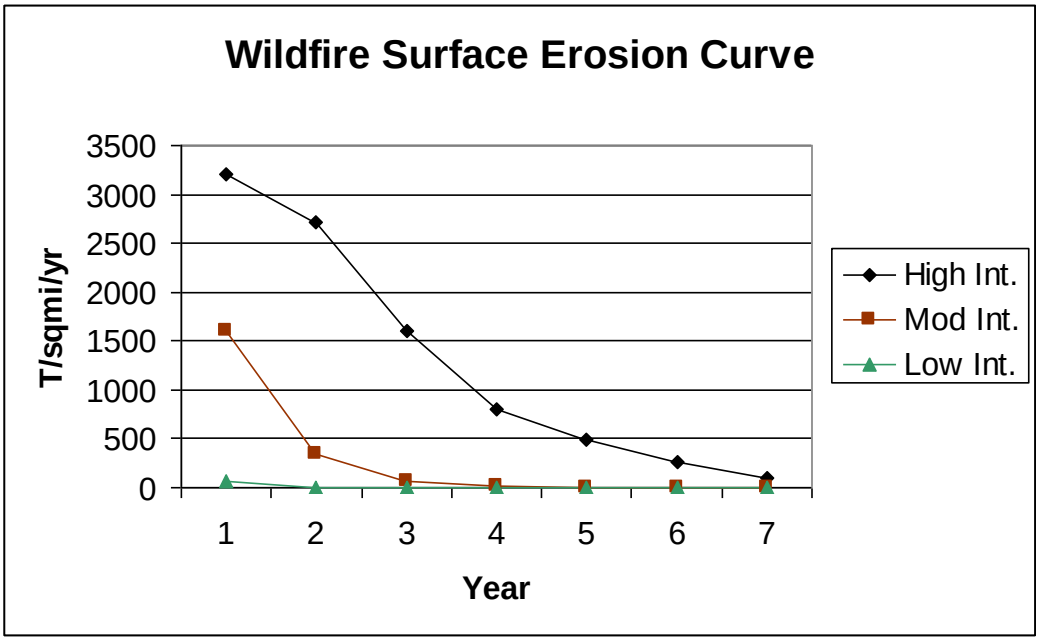

Figure E-1. Surface erosion for the Hash Rock Fire by fire intensity over time.

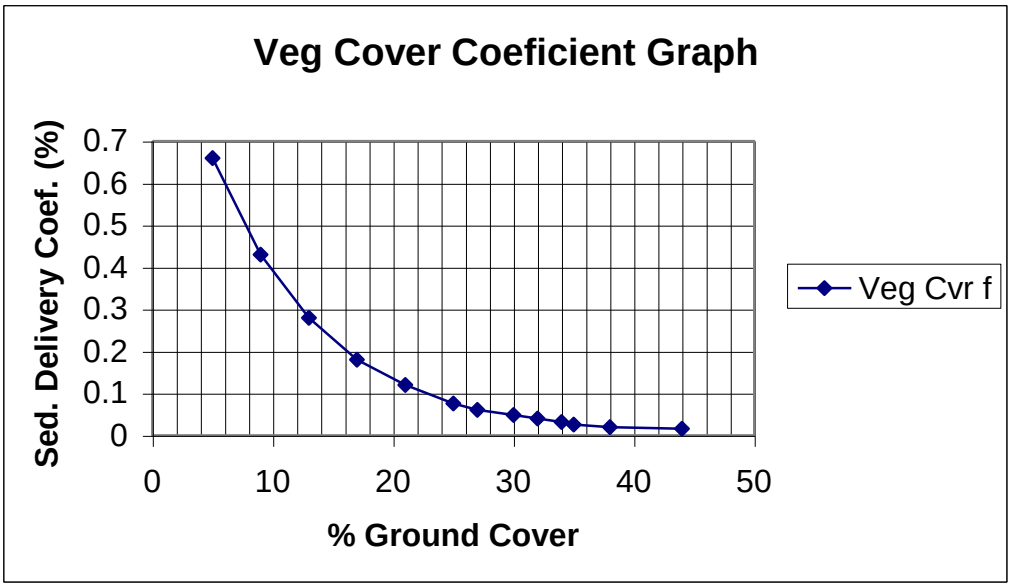

Figure E-2. Vegetation coefficient relationship used to predict sediment delivery potential. Erosion and sediment delivery decreases as ground cover increases.

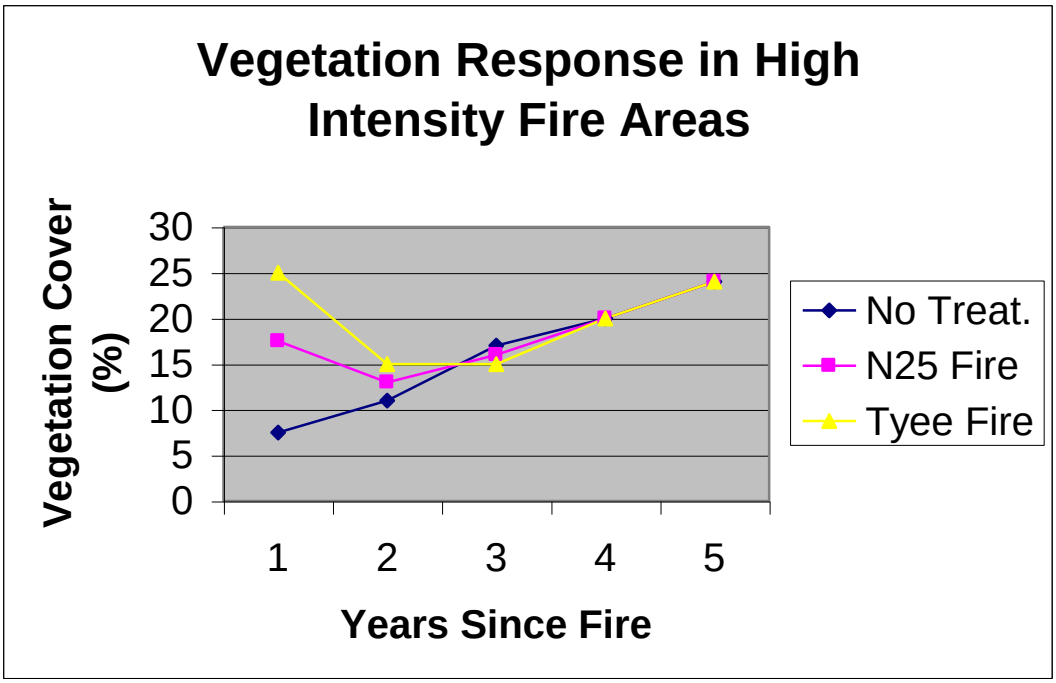

Figure E-3. Predicted vegetation response from sampling (1st year N25 Fire) and anecdotal information from Tyee Fire Complex (Both fires in Chelan Co. WA).

Note: Hard copy versions of this report include maps of both current and historic fire regimes.