TRIPOD COMPLEX FIRES
OKANOGAN & WENATCHEE NATIONAL FORESTS
BURNED-AREA REPORT

TABLE OF CONTENTS

Tripod Complex Fire
Synopsis and Summary

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The Tripod Complex fire has burned about 173,000 acres as of this date. The evaluation is based on a fire size of about 147,000 acres. The fire burned within the Douglas-fir and subalpine fir coniferous forest zones in the ridge system that separates the Methow from the Okanogan River Systems. Burn Severities are relatively high with about 24% high, 27% moderate, 47% low and 2% unburned. This represents about 83,000 acres of moderate and high severity in 14 6th field HUCs—several of which are completely burned and range in size from 10-40 thousand acres (See Appendices A and F). The burn severity map can be found in at): ftp2.fs.fed.us/incoming/r6/oka/tripod_baer/ (or see App. A).

The watersheds within the burned area (See App. F) drain into the Chewuch and Methow rivers on the west and into the Sinlahekin and Salmon Creek drainages to the east (then into the Okanogan River). These watersheds have been prioritized for treatment so that only those with the potential for serious erosion and delivered sediment to values at risk will be treated. Many of the partially burned watersheds will not be treated. There are numerous values at risk both within the fire area and below including: 259 miles of roads; 70 miles of trail; numerous homes, irrigation systems, and farmland; bridges; T & E habitat for bull trout, steelhead, salmon and cultural sites (See App. B).

This is a very large fire with substantial amounts of severely burned landscapes above values at risk. Drainages proposed for treatment have the potential to damage property. Roads and trails are common and are valued at over 17 million, and they pose a significant threat to soil productivity loss, increased sedimentation and to water quality. Literally thousands of hazard trees occur in the fire area and pose a risk to the public and BAER implementation teams. Noxious weeds are an important threat throughout the fire area and the extensive road system and open areas created by the fire have heightened this concern. Treatments proposed include: Invasive plant treatment and survey, road and trail work, cultural site assessment and protection, hazard tree reduction, public information, and land erosion treatments (aerial mulching, seeding and fertilization).

The fire has created a significant watershed emergency situation and substantial amounts of treatment will be required to reduce fire-caused increases in risk human life, property, safety and critical cultural and natural resources. There are erosion concerns (from roads and trails; and uplands), hazard tree concerns, and invasive plant concerns. Watershed land treatment options that have been analyzed to address erosion potential have included helimulching, aerial hydromulching, seeding and fertilization. We are proposing the treatment of high priority watersheds only including helimulching on highly erosive sites in high severity burned areas and fertilization on erosive Moderate severity burned areas.

“Big ticket” cost items are a result of the large size of the fire and the high cost of treatments. Road treatments are typically pretty straight-forward, but the hundreds of miles of roads in the fire result in a road treatment cost of approx. $7 million. The highest cost items, however, are the land treatments. There are very high acreages of high and moderate severity burn on erosive sites in the priority watersheds. Our preference for treating the most erosive and severely burned areas is helimulching (around $1300/acre). This treatment has a high probability of success. Our upland erosion treatments include helimulching high severity burn on high erosion sites; seeding high severity in less erosive sites; and fertilizing moderate severity erosive areas. Land treatment costs are about $20 million ($18 million of which is helimulch). Seeding and fertilization are much lower in cost, but with less chance of success.

This is one of the largest fire complexes that we have experienced on our Forests. Severity of the burn and the high acreages are remarkable on the Tripod complex fires. It will be a challenging task to complete treatments in a timely manner and availability of appropriate straw and contractors may also prove a challenge.

Date of Report: 9/8/2006

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

[X] 1. Funding request for estimated emergency stabilization funds
[ ] 2. Accomplishment Report
[ ] 3. No Treatment Recommendation

B. Type of Action

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

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

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

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Tripod Complex (Tripod & Spur Peak) B. Fire Number: WA-OWF-398

C. State: WA D. County: Okanogan

E. Region: 6 F. Forest: Okanogan & Wenatchee NFs

G. District: Methow Valley & Tonasket RDs H. Fire Incident Job Code: P6C06C

I. Date Fire Started: 7/24/06 J. Date Fire Contained: 45% on 8/26/06

K. Suppression Cost: 59,521,346 on 9/1/06

L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles):
2. Fireline seeded (miles):
3. Other (identify):

M. Watershed Number(s): 170200060301-West Fork Salmon Creek; 170200060302-South Fork Salmon Creek; 170200060303-North Fork Salmon Creek; 170200070301-Upper Sinlahekin Creek; 170200070303-South Fork Toats Coulee Creek; 170200080302-Windy Creek; 170200080306-Mainstem Upper Chewuch River; 170200080401-Twentymile Creek; 170200080402-Mainstem Lower Chewuch River; 170200080405-North Fork Boulder Creek; 170200080406-Boulder Creek; 170200080408-Chewuch River - Pearrygin Creek; 170200080604-Bear Creek; 170200080605-Upper Beaver Creek

N. Total Acres Burned: 159,381 (8/31/2006 GIS Report)
NFS Acres(148,690) Other Federal ( ) State (10,599) Private (91)

O. Vegetation Types: Nearly all coniferous forest; Douglas-fir zone with ponderosa pine and bunchgrasses make up the lowest and/or warmest areas of the fire. Douglas-fir with pinegrass is the most common middle elevation type. The majority of the upper elevation fire area falls within the Subalpine fir zone although the stands are often dominated by lodgepole pine. The highest elevation areas support alpine meadows and rockland or scattered stands of whitebark pine or subalpine larch. Riparian hardwood and riparian shrublands occupy the stream channels.

P. Dominant Soils: "sandy"-skeletal soils derived from volcanic ash over glacial drift.

Q. Geologic Types: volcanic ash over mixed granitic glacial outwash and till over mixed granitic and metamorphic litholigies. Landforms are glacially scoured.

R. Miles of Stream Channels by Order or Class:

Stream Class	Length (miles)
I	1.7
II	26.2
III	41.9
IV	270.8
Unknown	18.8
Total =	359.3

S. Transportation System

Trails: 70 miles Roads: 259 miles

PART III - WATERSHED CONDITION

A. Burn Severity (acres): 61,876 (low) 45,490 (moderate) 35,533 (high) 4,075 (unburned) -8/28/06 mapping (See Appendix A)

B. Water-Repellent Soil (acres): 7100 ac (estimated at 20% of High)

C. Soil Erosion Hazard Rating (acres): see table: 24,334(low) 110,736 (moderate) 24,334 (high)

Erosion Hazard Rating	Low Burn Severity (acres)	Moderate Burn Severity (acres)	High Burn Severity (acres)	Total (acres)
High Hazard	5,461	1,590	1,283	8,335
Moderate Hazard	46,708	34,724	29,304	110,736
Slight hazard	9,707	9,180	5,447	24,334
Total =	61,876	45,494	36,034	143,404

D. Erosion Potential: 10.2 to 14.3 (ERMiT) and 4.61 to 10.3 (Disturbed WEPP) tons/acre

E. Sediment Potential: 6,460 to 9,060 (ERMiT) and 2,428 to 5,953 (Disturbed WEPP) cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 5

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

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

D. Design Storm Duration, (hours): 1

E. Design Storm Magnitude, (inches): 1.1

F. Design Flow, (cubic feet / second/ square mile): Pre Fire = 8.6; Post fire = 31.4

Watershed	Watershed Area (acres)	Percent Burned	Pre Fire Peak Q (cfs)	Post Fire Peak Q (cfs)	Pre-Fire (cfs/mi^2)	Post-Fire (cfs/mi^2)	Increase (cfs/mi^2)	% Increase
Twentymile Creek (HUC6)	27,042	91%	191	779	4.52	18.44	13.92	308%
Upper Beaver (HUC6)	40,101	51%	703	1,776	11.22	28.34	17.12	153%
Boulder Creek /Pebble(HUC6)	13,113	75%	141	579	6.88	28.26	21.38	311%
North Fork Boulder (HUC6)	38,708	85%	430	1,469	7.11	24.29	17.18	242%
Lightning Creek	6,506	74%	108	335	10.62	32.95	22.33	210%
Blue Buck	5,526	98%	95	482	11.00	55.82	44.82	407%
				Average =	8.6	31.4		

G. Estimated Reduction in Infiltration, (percent): 73%

Watershed	Watershed Area (acres)	Percent Burned	Pre Fire Volume (acre-ft)	Post Fire Volume (acre-ft)	Infiltration Reduction
Twentymile Creek (HUC6)	27,042	91%	191	779	76%
Upper Beaver (HUC6)	40,101	51%	703	1,776	62%
Boulder Creek (HUC6)	13,113	75%	141	579	77%
North Fork Boulder (HUC6)	38,708	85%	430	1,469	72%
Lightning Creek	6,506	74%	108	335	69%
Blue Buck	5,526	98%	95	482	82%
				Average Infiltration Reduction =	**73%**

H. Adjusted Design Flow, (cfs per square mile): 25.4 (post fire) - 8.6 (pre fire) = +16.8 increase

PART V - SUMMARY OF ANALYSIS

A. **Describe Critical Values/Resources and Threats:**
The Tripod Fire Complex and potentially impacted areas downstream exhibit many important characteristics that were considered in determining the proposed course of response. The summary below describes the conditions that warrant emergency rehabilitation actions.

1. ***Threats to Human Life, Property and Safety***---
Values at risk related to human development include homes and other buildings, farmlands, irrigation systems, bridges, campgrounds, a hatchery pond, roads, trails, and cultural sites (See Appendix B). Many of these developments are downstream of the burned area and are in the existing flood plains exposed to the risk of flood damage. About 700 tracts of land with homes or substantial improvements are identified in an Okanogan County data base to be within 300 feet of the streams inside or immediately adjacent to the burned area.

Threats to human life are primarily from falling trees, debris failures and flooding. Hazard trees are of particular concern along trails and roads and adjacent to dispersed campgrounds and future work sites inside the burn area. Both the public and BAER teams are at risk as they implement prescribed treatments. Exposure to debris slides along roads, trails, dispersed campgrounds, and trailheads will also elevate the risk

to people. An off site threat stream debris dams collapsing and causing subsequent flooding downstream. These dam collapses could occur without much warning. Due to the amount of the watersheds in high or moderate burn severity, peak stream flows are expected to increase over 300% for the design storm in this analysis. Infiltration of water into soil is lessened after severe fire and this will contribute to higher flows downstream. High bedload sediment loads are expected to cause some stream realignment that will also elevate the risk of flooding within active floodplains. This will increase the flooding threat for many of the 700 homes or structures downstream.

Forest Service facilities at risk include: Over 259 miles of system roads and over 70 miles of trail within the fire area; Cultural sites include trail and camp shelters. Mainline trails are in the Chewuch River, Beaver, Boulder, Twenty-mile, and Salmon Creeks. Trail head facilities are also in the same drainages. Dispersed campgrounds are located at numerous sites along the Chewuch River and Beaver, Boulder, Twenty-mile, Toats Coulee Creek and Salmon Creeks. And developed campgrounds include Camp Four, Chewuch, Falls Creek; Tiffany Springs, Wagon Camp, Irongate Camp, Fourteen Mile Camp and Thirty Mile Creek Campground.

Annual flooding along all the drainages including Beaver Creek, Twenty-mile Creek, Boulder Creek, Salmon Creek, Toats Coulee Creek and the Chewuch River is common. The annual peak flow is normally related to spring snowmelt (the largest flood over the past 140 years was during the normal spring time snow melt). Wintertime rain-on-snow events are not common and even when rain-on-snow events occur, that event is not likely to be the peak flow for that year. The greatest threat to peak flows following the Tripod fires, however, is from summer-time convective rain storms. High runoff from the severely and moderately burned areas is most pronounced because there is no vegetative cover after the fire to slow runoff, soil infiltration rates are slowed by the dry soil or soil hydrophobicity, which increases the rate of runoff and volume of runoff and sediment. Reduced vegetative cover and hydrophobicity may persist for up to five years in the highest severity burn areas.

Large wood debris inside the burned area may remain there or be carried out of the burned area during floods. This will further exaggerate the flooding effects and causing additional property damage and increasing the risk to human lives.

The highest risks for flooding are in Beaver Creek, Boulder Creek, Twenty-mile Creek and Windy Creek. Nearly two-thirds of Boulder Creek was burned with high or moderate burn severity. Slightly less than two-thirds of the Twenty-Mile watershed was burned with high to moderate fire severity. About one-third of the Upper Beaver Creek drainage was in the high or moderate burn severity class with farms and homes immediately below the burned area. These are large portions of the watershed in a condition which significantly increase flood flows. The loss of soil cover is predicted to increase peak flows in excess of 200% to 400% in these drainages. Floods of this magnitude will cause erosion and inundation of downstream properties and structures. Even though there are likely to be larger peak stream flows inside the burned area in the drainages that flow into the Chewuch River, these higher flows are expected to be moderated due to the size of the Chewuch.

Beaver Creek, although only 51% burned, is of particular concern for its threat to downstream values. Homes, farmland, irrigation intakes and other private facilities are present immediately below the burned area in this watershed—with very little unburned buffer. Also, due to downstream values at risk, Pelican, Clark, Boulder (Pebble) and Ramsey Creeks are high priorities for treatment. Increased flows and debris transport within all these drainages have the potential to impact downstream values.

Cultural resource sites are known to have been impacted and may require treatment to protect heritage values. The Forest Archeologist will be funded to complete appropriate surveys and assessments. In compliance with 36 CFR 800, tribal consultation concerning BAER activities will occur.

2. **Critical Cultural and Natural Resources (including Water Quality and Soil Productivity)**

The natural inherent soil productivity is low in the burned area with much of the productive capability tied to the volcanic ash surface soils. Residual and glacial till soils are derived from granitic bedrock units that have weathered into very coarse “sandy soils”. In the uplands, low soil moisture and soil infertility are often a limiting

factor for plant growth. Soil depths range from very shallow on ridgetops to moderately deep on hill slopes to deep in many valley bottoms. Along with continental weather characteristics (cool, short growing seasons), the overall site productivity is low for the fire area. Hence, this fire will not have a significant effect on inherent soil productivity.

The Tripod Fire Complex area has a history of frequent debris slides from steep slopes during high intensity storm events. Fires have also been a common historical disturbance. Natural large wildland fires in the upper elevations are infrequent, and fires are stand-replacing types often with high burn severity. In the lower elevations, forest stands historically had frequent but low intensity fires. However, due to higher than natural stand densities, even these stands had higher severity fires after 100 years of fire suppression. Vegetation recovery in high burn severity areas of the Tripod Complex will be slow, allowing accerated erosion to occur. The effects of high intensity storm events following wildfire are often worse because there is less protection on the soil and so these steep landscapes often suffer flooding and debris slides. These natural disturbance processes have undoubtedly maintained the relatively low productivity of the uplands, especially where the volcanic ash cover has been eroded.

Even when vegetated, erosional processes are naturally high within the Tripod Complex. With or without vegetation cover these coarse-textured soils on steep rocky slopes continue to have very high erosion potentials. The primary erosional processes include shallow, rapid mass failures (debris slides) and surface erosional processes. Sediment loading in tributaries and debris chutes has been observed. The entrenched, over-steepened intermittent streams and gullies deliver debris efficiently to stream channels. Loss of vegetation in the moderate and high severity burn areas accelerates surface erosion, surface soil creep and debris slides.

In light of these natural hydrologic and disturbance processes, available land treatments will have mixed results. It is unlikely that seeding, fertilization or mulching would significantly reduce debris slide occurrence within these glacially oversteepened landscapes. However, these land treatments, if successfully applied in severely burned areas, may significantly reduce surface erosion and runoff potential, increase infiltration and slow the contribution to debris slides.

A significant risk to site productivity and biodiversity is invasive plants. Roads and trails are corridors for noxious weeds to expand in the area. Weed seed sources exist along roadways, trails staging areas-both adjacent to the fire area as well as at the Eight Mile Fire Camp. Invasive plant surveys and management are critical to help preserve the productivity and character of this area.

Decrease in Water Quality –

Water draining from the Tripod Fire Complex is critical for many uses including domestic and agricultural uses, aquatic habitat for the Threatened and Endangered species (spring Chinook salmon, steelhead, bull trout), and recreation use. Water quality parameters most affected by the Tripod Fire Complex will be water temperature and sedimentation. The fire significantly reduced the vegetation cover over extended reaches of the Twentymile, Boulder and Beaver stream systems as well as portions of Salmon Creek, Toats Coulee Creek, Bear Creek, Ramsey Creek and some low order streams draining into the Chewuch River. Sources of cooler water from adjacent springs or shallow ground water recharge through colluvial and alluvial deposits will help to buffer stream temperature increases. Riparian area shrubs are expected to rapidly recover over the next few years and provide some cover to help keep water temperatures relatively low. The fire killed trees provide some shade, but large tree recovery is not expected for another 50 to 100 years.

Stream sediment loads in the Twentymile, Boulder and Beaver Creek drainages are expected to dramatically increase from two sources. One is the occurrences of debris slides and surface erosion from the severe and moderately burned areas. Most of the delivered sediment will initially be fine volcanic ash and wood ash that will increase sediment levels. The bulk of the residual sediment delivery is expected to be very coarse sand, gravel, cobbles, and boulders during larger high intensity storms or peak runoff. The debris fans at the mouths of streams, especially portions of Beaver Creek, Boulder Creek and Twenty-Mile Creek are expected to enlarge. These fans encroach on the receiving stream and “nick points” are created in the receiving streams and rivers that will cause shifts in stream gradient and alignment. Sediment and large woody debris moving downstream into receiving waters may accumulate upstream of fans where the channel gradients are reduced.

Streams would eventually scour fan edges on the down stream portion of the fans and increase in-channel sediment. Bedload sediment composed of coarse sand and cobbles are expected to be flushed downstream during spring flows.

The other sediment source is from roads and trails throughout the severe and moderately burned areas. Roads in particular concentrate water, and roads with ditches intercept shallow ground water, as well as intercept surface water flow. The water and sediment are eventually routed to perennial and intermittent streams and ephemeral drainage ways. Sediment from natural and road sources are expected to accumulate in low gradient reaches and form alluvial fans or braided channels, such as in Boulder Creek. High peak flows in the spring or high intensity rain storms can generate runoff conditions that will carry large amounts of sediment downstream, causing damage to homes, farms, improvements and/or Threatened and Endangered Species habitat.

Anticipated increases in suspended and bedload sediment will also likely impact irrigation delivery systems (ditches, screens, pumps, etc.) plugging fish screens and causing additional wear on sprinklers and irrigation systems. Floatable woody debris will also move downstream during high flows. Small woody debris will also leave the burned area and become a maintenance issue for downstream irrigation diversions. Large woody debris is anticipated to remain generally inside the fire area. The wood accumulations are expected to provide for sediment storage in the burned area.

Invasives Plants

Invasive plants, such as diffuse and spotted knapweed and dalmation toadflax are fairly widespread in the lower elevation open areas within the fire with a few higher elevation patches. Orange hawkweed and sulfur cinquefoil are also known at a few sites. These invasive plants pose a significant threat to biodiversity-particularly in the severe and moderately burned areas.

B. Emergency Treatment Objectives:

The primary objective of emergency treatment is to establish conditions--on priority treatable areas within the burn--that protect human life, property and critical cultural/natural resources. Priority watersheds include Beaver Creek, N. Fork Salmon Creek, Boulder (Pebble) Creek and N. Fork Boulder Creek. The Twentymile drainage, although mostly burned is expected to be far enough north to provide for energy dissipation within its own braided channel or in the Chewuch floodplain before significantly threatening values at risk to the south. So, the Twentymile watershed and other drainages, most of which are only partly burned, are not expected to significantly threaten downstream values from the design storm. Treatments are also intended to support long-term, natural recovery by promoting soil-water infiltration, slowing accelerated surface runoff, thus reducing both erosion and downslope material delivery. This objective is met by increasing soil cover and thus decreasing rain drop impacts to the soil surface and dispersing overland flow to minimize water concentration on surface soils. The treatments will promote water infiltration; reduce surface runoff, water concentration and water velocities; retard the downslope delivery of sediment; and pass sediment, peak flows and woody debris through to the main stream channels. Reduction in sediment delivery downstream will reduce the risk to Threatened and Endangered fish habitat and irrigable lands and irrigation intakes. (Please see Appendix C for a discussion of proposed land treatments).

Invasive plants are a real concern in and around the burned area. Appropriate treatments are proposed to reduce or eliminate explosive increases in weed populations in the burned area and the attendant reduction in site productivity and biodiversity. Without treatment, these weeds will, due to the fire-caused reduction in plant cover, expand significantly—thus creating real problems in the future. Several noxious weed treatments are proposed to minimize the spread of noxious weeds into the burned area and maintain biodiversity. Treatments include direct treatment, Bioagent release, seeding and survey. Monitoring is also proposed to determine the effectiveness of noxious weed treatments.

Protection of roads and trails is another important objective of BAER work. In order to protect these facilities and reduce accelerated runoff from them, additional treatments are proposed to protect roads and trails.

Treatments are proposed to ensure that existing road and trail drainage structures are able to handle expected increases in flow. Other Road and trail treatments involve adding drainage structures, as needed to manage expected increased runoff. Proposed structural treatments to roads and trails will reduce accelerated road erosion and stream sedimentation potential and to protect road and trail infrastructure.

Protection of the cultural sites, the public and our personnel are also part of our charge. Treatments are proposed to assess and protect cultural sites that survived the fire. Additionally, as BAER implementation teams begin work, they will need to be protected from fire-caused hazards—primarily hazard trees. This will require hazard tree reduction along roads and work sites within the fire area.

A primary objective of BAER work is to be able to protect our publics through various treatments. One means of protection is to inform and warn our publics. As a result, public meetings, mailings and information packets will need to be used and are proposed as treatments. Also proposed are trail closure, signing and patrol. Finally, an early warning system is proposed that targets the severely burned drainages in the fire that post a serious risk to people.

C. Probability of Completing Treatment Prior to Damaging Storm or Event:

Land **70** % Channel **NA** % Roads/Trails **80** % Protection/Safety **90** %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	75	80	80
Channel	NA	NA	NA
Roads/Trails	90	90	90
Protection/Safety	90	90	90

E. Cost of No-Action (Including Loss): $56,223,411

F. Cost of Selected Alternative (Including Loss): $35,686,131

G. Skills Represented on Burned-Area Survey Team:

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

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H. Treatment Narrative:

The following treatments have been proposed to mitigate the threats to life, safety & property, and to reduce loss of critical cultural and natural resources (site productivity, biodiversity loss and degradation of water quality) as a result of the Tripod Complex Fires.

Land treatments to reduce erosion are the biggest portion of this request. Helimulching is the greatest proportion of the cost of land treatments. Several screens were used to apply this treatment where the benefit is the greatest. These screens included: High priority watersheds; highly erosive "flashy" landtypes; large proportions of High severity burning; and slopes under 60 percent without excessive surface rock. The high severity areas within priority watersheds that did not meet these criteria are proposed for seeding if not too steep and rocky.

The Twentymile watershed was not considered a priority watershed because the accelerated erosion, higher peak flows and subsequent debris failures would be absorbed by the large braided channel of the Chewuch River. The distance to downstream values at risk is about 8 miles and it is expected provide an adequate buffer to absorb the increased sediment and higher peak flows from the burned area within the Twentymile drainage.

Due to the large proportion of moderate severity, (also with the potential for accelerated erosion), additional treatment was appropriate. A significant percentage of the understory plants have survived in the moderately burned areas and since fertilization has been shown to be effective in our area the moderate severity burned areas in priority watersheds will be fertilized to provide additional plant cover (See App. C). Resource specialist reports are completed for the various resources assessed during the BAER process and are available upon request.

Overall Goal of Proposed BAER Treatments:

Complete a combination of comprehensive treatments, where feasible, to reduce concentrated runoff and effectively reduce the threat of severe flooding from the Tripod complex fire areas. These treatments are planned to reduce the threat to human life and safety and property damages to Federal, State, and private lands. These proposed treatments are also planned to reduce the negative effects to cultural sites, biodiversity, water quality and site productivity from fire-caused effects.

Land Treatments

Purpose: Reduce concentrated runoff and sheet erosion on sensitive hillslope soils by increasing soil cover from both applied mulch and fertilizer stimulation of surviving plants. Reduce the threat of debris torrents, severe channel scour, and flooding of Federal, State and private lands and into the Chewuch and Methow Rivers. Encourage natural vegetation recovery and discourage the rapid spread of invasive plants.

Treatment # L1: **Biocontrol Agent release:** Initially release *Larinus minutis* on knapweed at 6 sites to establish bioagents on 120 acres. A total of 12 releases will be made over a 3 year period to ensure effective control and maintain the populations at desirable levels. *Part VI dollars are for one year only.*

Treatment #L2 Invasives Survey (1 yr): Survey for early detection of invasives in areas where burned ground is adjacent to high risk roads, dozer lines, safety zones, drop points, and other high disturbance suppression activities. Other survey activities include revisiting 60 TES plant sites within the burned area to determine invasive presence and to survey for orange hawkweed in the burned area where there is a high risk for establishment. Length of treatment will be 3 years for surveying, covering abou150 acres/day or about 100 days over the 3 year period. *Part VI dollars are for one year only.*

Treatment #L3 Herbicide Weed Trt-1yr: treatments are limited to areas that have an Environment

Assessment for herbicide application. Approximately ½ of the total miles of road within the burned area can be treated with herbicide. A single successful treatment should reduce weed densities for at least 3 years, however, maintenance of these treatments will be needed to ensure the greatest control. There are approximately 500 acres of initial treatment being proposed with follow up maintenance on approximately 670 acres over 3 years. *Part VI dollars are for one year only.*

Treatment #L4 Manual Weed Treatment; 1 yr: Treat all other roads within the burned area with a high potential risk for spread into the burned area. Treatments would reduce seed production and dispersal into the burn. The initial treatment is about 120 acres and follow-up maintenance of this treatment will require revisiting these sites over a 3 year period to reduce seed production and transport. *Part VI dollars are for one year only.*

Treatment #L5 Seeding by hand after weed control: The treatment will fill in the niche once occupied by weeds and provide ongoing competition to germinating weeds seed. This treatment and subsequent maintenance over a 3 year period will be in areas not targeted for invasive competition seeding identified in either the Landscape or the Roads write-ups. *Part VI dollars are for one year only.*

Treatment #L6: - Heli-mulch for erosion: Mulch with straw in high severity burn areas with slopes less than 60% where abundant surface rock is absent and the potential hydrologic response for the LTA (subalpine-parkland or dry forest) is flashy. See "Treatment Narrative" (above) and Appendix C for treatment justification, Appendix D for specifications and Appendix E for a land treatment map.

Treatment #L7: - Aerially fertilize: Apply in moderate burn severity in the spring of 2007 to the areas with with slopes less than 60% where abundant rock is absent and the potential hydrologic response rating for the LTA (subalpine-parkland or dry forest) is flashy. This treatment would increase the vegetative growth of residual plant species on these sites and decrease the time needed for natives to become re-established on the site. See "Treatment Narrative" (above) and Appendix C for treatment justification, Appendix D for specifications and Appendix E for a land treatment map.

Treatment #L8: - Aerially seed: Seed (**Mix 1)** on low elevation, high severity burn areas on slopes less than 60% where abundant rock is absent and the potential hydrologic response rating for the LTA (subalpine-parkland or dry forest) is moderate. This treatment would provide vegetative cover on the sites with the least potential for fast vegetation recovery but without the highest risk for soil erosion. See Appendix C for treatment justification, Appendix D for specifications and Appendix E for a land treatment map

Treatment #L9: - Aerially seed: Seed (**Mix 4)** on high elevation, high severity burn areas on slopes less than 60% where abundant rock is absent and the potential hydrologic response rating for the LTA (subalpine-parkland or dry forest) is moderate. This treatment would provide vegetative cover on the sites with the least potential for fast vegetation recovery but without the highest risk for soil erosion. See Appendix C for treatment justification, Appendix D for specifications and Appendix E for a land treatment map.

The following 2 treatments were labeled PS5 and PS6 (respectively) in the initial. They were moved here as per WO recommendation.

Treatment #L10 – Cultural Resource assessment, survey and tribal consultation: *Identify and preserve and protect significant cultural sites and consult with the Colville and Yakama tribes.*

Treatment#L11 – Heritage site stabilization and monitoring: *Directional fall snags away from cultural sites and implementation monitoring (five to fifteen sites).*

Road and Trail Treatments

Purpose: Prevent concentrated runoff from the 259 miles of roads on National Forest System lands in the Tripod Complex Fire area. Prevent road washouts and delivery of sediment to sensitive high gradient streams with Bull trout, summer steelhead and spring Chinook salmon, west slope cutthroat trout, and downstream private water supplies. The treatments will meet the intent of the NW Forest Plan---road drainage

designed to minimize accelerated sedimentation and handle storm flood events while maintaining aquatic connectivity

Road Treatments

Purpose: Implement actions to: (1) minimize the potential for elevated or concentration of surface runoff, mass erosion, and sediment delivery from Forest Service roads within the Tripod Complex Fire, (2) insure public awareness of road-related and other hazards in the burned area and that road user safety features are in place. Upgrade road drainage structures to accommodate anticipated increased runoff conditions and construction of new drainage structures to improve existing facility drainage systems. For Hazard Trees associated with roads see the Protection/Safety Section.

Treatment #R1 - Manage road surface water on maintenance level 3-4 roads: Blade road surface, pull specific ditchline sections, remove outside berms and outslope where appropriate to improve road surface drainage. Remove rock and woody debris blocking ditchline.

Treatment #R2 - Manage road surface water on maintenance level 2 roads (Surface Repair): Blade road surface, pull specific ditchline sections, remove outside berms and outslope where appropriate to improve road surface drainage. Remove rock and woody debris blocking ditchline. Some Level 2 road segments will be bladed where necessary to control water to protect the road surface, road fill or road ditch. The bladed road sections are on open roads. The treatment is consistent with the Forest Road Mgt Plan. This treatment was slightly reworded from the initial to take out Level 1 roads.

Treatment #R3 - Drain Dips (maintenance level 1-2 rds): Construct drain dip to reduce potential for runoff concentration and accelerated surface erosion from anticipated fire effects. Dips will be outsloped.

Treatment #R4 - Drain Dips, Armored: Construct drain dip to reduce potential for runoff concentration and accelerated surface erosion from anticipated fire effects. Dips will be outsloped armored with Class 3 riprap.

Treatment #R5 - Ditch (Level 3-4 roads): Clean or reconstruct ditch

Treatment #R6 – Replace/Install Culvert (upgrade): Remove and replace damaged ditch relief or drainage CMP

Treatment #R7 - Armor Inlet/Outlet (new/exist CMP): Armor with Class 3 riprap to protect catch basin on inlet and to dissipate energy from the outlet.

Treatment #R8 - Clean Catch Basin: Remove excess material from catch basin to improve culvert capacity.

Treatment #R9 – Upgrade Major Drainage Structures: Remove and replace all eight major drainage structures that will fail to meet expected post fire flows.

Treatment #R10 - Road Closure Device: Construct earthen barriers to prevent traffic on Level 1 roads. The road closures will prevent vehicles from damaging existing road drainage structures. It is essentially a road closure treatment both for safety and to protect the drainage features installed on these roads.

Treatment #R11 - Stabilize Fill Slope: Spot placement of large rock to reduce the potential for fill slope erosion and accelerated sediment delivery to stream channel at selected sites.

Treatment #R12 - Obliterate: Obliterate non-system roads to provide for improved hydrologic function.

Treatment #R13 - Hydro-Seed: Seed all areas disturbed by construction activities to minimize erosion and protect from noxious weeds. **(Mix 3, 5, and 6)** on road ditches, slopes, and culvert sites. Mix 3 is for roads generally above 5,000 ft, e.g, forest roads 37 and 39 at these upper elevations. Mix 5 is for road ditches, slopes, and culvert sites below 5,000 feet. Most peripheral roads within the fire boundary fit the latter

description while most of the major forest roads and their spurs above 5000 ft. should be treated with Mix 3. Mix 6 is prescribed for road stabilization – roads that were opened for fire suppression and where there is concern for subsequent erosion. It is similar to Mix 5 but should be used where native plants are desired as components of future roadside vegetation. About 50% of the road miles would be treated to provide competition for invasive plants and to minimize erosion on roads within the Riparian Reserve. See Appendix D for description of the seed mixes

Treatment #R14 - Stabilize Roadbed: Spot rock w/aggregate to help reshape and stabilize road prism to improve surface drainage.

Treatment #R15 – BAER Implementation signage: *Replace/Install new carsonite vertical route markers (mtce level 1-2), horizontal route markers (mtce level 3-5), or destination sign (mtce level 3-5). This provides adequate signage to reference BAER Implementation treatments. This treatment was PS4 in the initial.*

Trail Treatments

Purpose:
Minimize the concentration of accelerated surface runoff and trail erosion from over 70 miles of Forest Service Trails in the burned area. These treatments will provide for BAER implementation access, reduce the risk to Forest Service personnel and the public associated with trail use, protect trail infrastructure and reduce water quality impacts from soil erosion off trails. For Hazard Trees see the Protection/Safety Section and the Hazard Tree Specialist report. As noted in Part V-A above, soils in the burned area are primarily derived from glacial till deposits and weathering of hard crystalline bedrock. This parent material weathers to coarse sandy loams and loamy sand soils. These soils often occur on over-steepened slopes (>60%) and are extremely susceptible to slope raveling following fire and rills and gullies during high intensity rain storms.

The fire has consumed much of the woody material and duff in the moderate and high intensity burn areas, which will result in hill slope raveling (soil, rock, and logs) that is expected to fill trail tread in many locations. In addition, in some trail sections, the trail shoulder has been supported by shrub and tree roots which were severely burned, resulting in anticipated sloughing of the shoulder. As a result of these fire-related impacts, trail drainage features have been rendered non-functional and the tread condition represents a hazard to both Forest personnel and the public. Soil erosion of the trail tread is expected where drainage features are destroyed. Water quality would be degraded by unchecked soil erosion from untreated trails.

Treatment #T1- Improve Trail Drainage: Install drain dips on 71 miles of trail to reduce the potential for runoff concentration and accelerated surface erosion from anticipated fire effects. Dips vary from rolling outslope dips to waterbars constructed from peeled and anchored native wood material. This treatment will occur on trail segments within moderate and high intensity burn where the potential for post-fire increases in surface runoff is high.

Treatment #T2 – Log out Trails: A number of fire-killed trees are falling and blocking trail access. Trail log out will be necessary on 71 miles of trail in order to gain access to the sections of trail that need drainage (T1) and tread improvements (T2).

Protection/Safety Treatments:

Purpose: *The objective of these treatments is to ensure public trail users are not injured by hazard trees, damaged tread, or compromised trail structures (such as turnpikes) and trail infrastructure is maintained).*
Implement actions to minimize the risk to BAER personnel and the public from hazard trees. Provide road signage to efficiently implement BAER treatments along roads. Also included are actions to assess, stabilize and protect cultural sites.

Treatment #PS1 - Hazard Tree (Roads): Remove all hazard tree that could potentially fall on mtce level 2-5 roads. This includes hazard tree removal for all 259 miles of roads in the fire area.

Treatment #PS2 - Hazard Tree (BAER work sites): Remove all hazard tree that could potentially fall on workers at BAER treatment sites. This is estimated to include 150 sites within the fire area.

Treatment #PS3 – Hazard Tree (Trails): This treatment will occur primarily on trail segments within high severity burn where most all of the larger over story tree were killed, this treatment is needed in order to eliminate safety concerns associated with access for installation of other trail treatments.

Treatments PS4-6 were moved as per WO comments to their appropriate sections.

Treatment#PS7 – Public Safety and Awareness: Hold four public meetings in various communities around the fire and develop public information materials and mailings.

Treatment#PS8 - Trail Public Safety--1 Yr. patrol and signing: Provide additional trail patrols and administratively close and sign trails. This would require about 100 trail signs and provide one season of additional trail patrol. *Signs would be posted on trails that will remain closed. Two GS-5 employees with trail bikes or ATVs will patrol the trails to ensure compliance with the closures for 130 days during the 2007 field season.*

Treatment#PS9 – Early warning system: Implement a system that is jointly run by the National Weather Service and Okanogan County Sheriff's Department Emergency Management to warn downstream citizens of potential life-threatening flood events originating from high intensity rain storms over the burned area. *The plan for this treatment is to work with these two agencies to install rain gauges in the Boulder and Beaver Creek areas (southern part of fire) where the greatest human values at risk are located. The Okanogan and Wenatchee NFs is seeking signed agreements and commitments to insure maintenance and that reporting of warnings is done by the agencies. This will require a signed agreement and the Forest Service will not run or maintain the instruments.*

Other Treatments:

Treatment #O1 – Resource Protection Range Rider: Ensure areas of high and moderate fire severity receive no grazing in year 1 recovery. These areas were previously not accessed by livestock, but it is likely that cattle will now stray from unburned or low severity areas into these areas and inhibit BAER treatments.

Treatment #O2 – Fencing for resource protection: Keep livestock out of BAER treatment areas. Strategic fencing would allow for protection of BAER treatments and recovery.

I. **Monitoring Narrative:**

Implementation monitoring of all treatments will be completed as practices are applied and costs are included in the treatment costs. Effectiveness monitoring will be funded as noted below and reports and additional funding requests completed yearly.

Effectiveness monitoring of road treatments will occur and will be completed by Forest staff. Effectiveness monitoring is a post-treatment activity to: 1) determine whether road treatments were effective at preventing unacceptable loss to Forest Service capital improvements in roads and associated drainage structures; and 2) estimate vegetation canopy cover/density during three seasons of growth for hydroseeding roadside treatment. This monitoring will be established in FY06-07 and first sampled in FY07. This will follow the protocol developed by Rod Clausnitzer on the Okanogan & Wenatchee NFs. The monitoring protocol is available on request. Costs associated with this monitoring are $25,000 for FY06-07 with a total 3 year cost of $75,000.

Additional monitoring efforts will be directed by and coordinated through the PNW Research Station. The following proposal was made by Dave W. Peterson for submission in this BAER report. Effectiveness monitoring will be designed to assess treatment effectiveness with regard to the following BAER objectives and their associated treatments:

1. Reduce splash erosion and increase soil water infiltration rates in moderate and high severity burn areas by increasing organic soil cover (treatments L6-L9).
2. Reduce the negative impacts of roads and trails on erosion and sedimentation (treatments R1-R14).
3. Maintain water quality and protect downstream human structures (L6-L9, R1-R14, T1-T2).
4. Protect biodiversity by checking the spread of invasive plants (land treatments L1-L5, R13, and managing habitat conditions for threatened and endangered species (e.g., bull trout, steelhead)

Monitoring will focus on five primary response areas, including:

1. Vegetation (native vegetation, seeded species, invasive weeds)
2. Soils (soil cover, infiltration rates, sediment delivery, landslides)
3. Water (stream discharge rates, water temperature, sediment transport, chemistry)
4. Aquatic biota (invertebrate productivity and diversity, T&E fish populations)

These response areas will be associated with one or more of the following monitoring units:

1. Upland terrestrial monitoring plots (~ 4 plots/mile^2) for vegetation and soil properties. Plots are surveyed once per year.
2. Roadside monitoring plots (~ 1 plot/mile) for weeds and sediment. Plots are surveyed twice per year, in spring and fall.
3. Stream sediment monitoring units (10 per land treatment) for sediment delivery and transport. Plots are surveyed twice per year (spring and fall), with additional surveys following large rainfall events.
4. Stream water monitoring units for monitoring discharge and water temperature. Discharge and water quality are monitored continuously.
5. Stream biota monitoring plots for monitoring invertebrates and fish. Streams are monitored six times per year.

II. Monitoring Budget

Line Item	Unit	Unit Cost	# of Units	BAER $
GIS support for site selection	Year	$5,000	1	$ 5,000
Terrestrial monitoring plots (includes site selection)	Section	$300	150	$ 45,000
Stream sediment monitoring plots (includes initial installation of equipment)	Stream	$1,000	32	$ 32,000
Stream water monitoring plots (includes equipment installation)	Stream	$4,000	24	$ 96,000
Stream biota monitoring	Reach	$6,000	10	$ 60,000
Weather stations	Stream	$2,500	6	$ 15,000
Remote sensing of landslide occurrence, vegetation cover	Year	$20,000	1	$ 20,000
Data management, analysis, reporting	Year	$20,000	1	$ 20,000
Total first year costs				$ 293,000

Part VI

9/20/2006 13:31			NFS Lands				Other Lands		All
Tripod Complex Fire		Unit	# of	WFSU	Other		Fed	Non Fed	Total
Line Items	Units	Cost	Units	SULT $	$		$	$	$
Changes made on 9/20 are italicized and shaded									
A. Land Treatments									
#L1 Biocontrol Agent Release-1yr.	ea	1250	4	$5,000					$5,000
#L2 Invasives Survey (1 yr)	Ac	$5	3630	$18,150	$0		$0	$0	$18,150
#L3 Herbicide Weed Trt-1yr; 1yr.	Ac	$200	585	$117,000	$0		$0	$0	$117,000
#L4 Manual Weed Treat.; 1 yr	Ac	$500	107	$53,500					$53,500
#L5 Seeding by hand after weed control-1yr.	Ac	$100	90	$9,000	$0		$0	$0	$9,000
#L6 Helimulch for erosion- High Severity	Ac	$1,300	13767	$17,897,100					$17,897,100
#L7 Aerially Fertilize Mod Severity	Ac	$105	12694	$1,332,870					$1,332,870
#L8 Aerially Seed High Sev. not mulched-lo elev	Ac	$150	396	$59,400					$59,400
#L9 Aerially Seed High Sev. not mulched-hi elev	ac	$65	6402	$416,130					$416,130
#L10 Cultural Resource Assess & Consult	ea	$64,500	1	$64,500					$64,500
#L11 Heritage Site Stabil. & Monitor	ea	$19,400	1	$19,400					$19,400
Subtotal Land Treatments				$20,205,105	$0		$0	$0	$19,992,050
Insert new items above this line!									
B. Channel Treatments									
NONE PROPOSED									
Insert new items above this line!									
Subtotal Channel Treat.				$0	$0		$0	$0	$0
C. Roads and Trails									
#R1 Road Surface Water Mgt (Blading)	mi	$2,000	83	$166,000	$0		$0	$0	$166,000
#R2 Surface water mgt (Surfacing)	mi	$4,500	158	$711,000	$0				$711,000
#R3 Install Outslope Dips (non-armored)	mi	$4,000	158	$632,000					$632,000
#R4 Install flood relief dips (armored)	mi	$4,000	83	$332,000	$0				$332,000
#R5 Clean/Reconstruct Ditches; Lev. 3-4	mi	$4,500	158	$711,000					$711,000
#R6 Replace/Install Culverts	mi	$2,000	158	$316,000	$0				$316,000
#R7 Harden Drainage Features	mi	$3,600	158	$568,800					$568,800
#R8 Clean Catch Basins	mi	$2,000	158	$316,000					$316,000
#R9 Upgrade Major Drainage Structures	ea	$200,000	8	$1,600,000					$1,600,000
#R10 Road Closure Device	mi	$1,300	80	$104,000					$104,000
#R11 Stabalize Fill Slope	mi	$2,000	122	$244,000					$244,000
#R12 Imp. Hydrologic Function (obliterate)	mi	$8,000	18	$144,000					$144,000
#R13 Roadside Seeding (Hydromulch)	mi	$3,040	130	$395,200					$395,200
#R14 Stabalize Roadbed	mi	$2,200	122	$268,400					$268,400
#R15 BAER Implementation Signage	ea	$200	50	$10,000					$10,000
#T1 Trail Opening for Infrastructure protection	mi	$300	70	$21,000					$21,000
#T2 Trail Erosion Control (water mgt structures)	ea	$50	3952	$197,600					$197,600
Insert new items above this line!									
Subtotal Road & Trails				$6,737,000	$0		$0	$0	$6,737,000
D. Protection/Safety				$0	$0		$0	$0	$0
#PS1 Hazard Tree Reduction (Roads)	mi	$1,350	259	$349,650					$349,650
#PS2 Hazard Tree Red. (BAER Sites)	ea	$1,800	150	$270,000					$270,000
#PS3 Hazard Tree Reduction (Trails)	mi	$300	70	$21,000					$21,000
PS4 moved to R15; PS5-6 to L10 & L11									
#PS7 Public Safety and Awareness--Info Meetings	ea	$5,000	4	$20,000					$20,000
#PS8 Trail Public Safety--1 Yr. patrol and signing	ea	$60,000	1	$60,000					$60,000
#PS9 Early Warning System	ea	$125,000	1	$125,000					$125,000
Insert new items above this line!									
				$0	$0		$0	$0	$0
Subtotal Protection/Safety				$845,650	$0		$0	$0	$845,650
#O1 Resource Protection Range Rider	ea	25500	1	$25,500					$25,500
#O2 Fencing for Resource Protection	mi	2200	2.5	$5,500					$5,500
Subtotal Other				$31,000	$0		$0	$0	$31,000

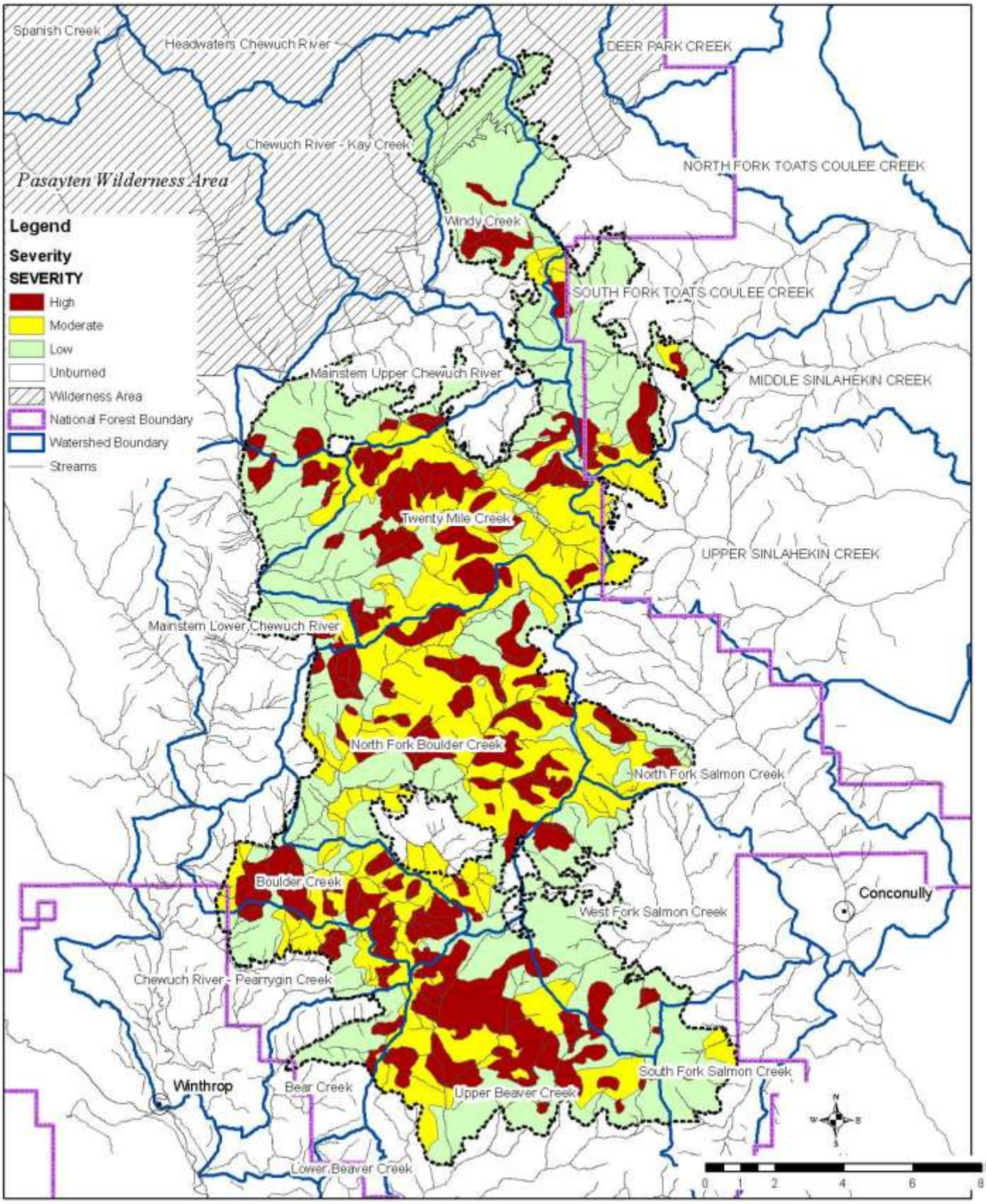
E. BAER Assessment (not part of WFSU)				**$0**	**$150,000**		**$0**	**$0**	**$150,000**
					$0		**$0**	**$0**	**$0**
Subtotal Evaluation				**$0**	**$150,000**		**$0**	**$0**	**$150,000**
F. Monitoring				**$0**	**$0**		**$0**	**$0**	**$0**
Monitoring-PNW Research Land Treament Effort)				**$293,000**	**$0**		**$0**	**$0**	**$293,000**
Monitoring (Road and Hydroseed treatments)				**$25,000**					**$25,000**
Subtotal Monitoring				**$318,000**	**$0**		**$0**	**$0**	**$318,000**
G. Totals				**$27,839,800**	**$150,000**		**$0**	**$0**	**$28,073,700**

PART VII - APPROVALS

1. \s\ *James L. Boynton* 9/14/2006
   Forest Supervisor (signature) Date

2. _____ _____
   Regional Forester (signature) Date

Appendix A
Tripod Complex Burn Severity



Appendix B.-- Values at Risk

The values at risk from the burned area include the area from the burned area down the major drainages to either the Chewuch River or the Methow River to where Beaver Creek enters the Methow. There is an inherent risk to the downstream structures and resources every year from flooding or low flow. A low rating indicates the BAER team does not believe there will be an increase in that risk to those values at risk.

Values at Risk	**Number**	**Value each**	**Total Value**	**Risk from Fire**
Homes w/in 300' of drainages	700	$215,000	$149,000,000	Low to High
Chewuch R. Fish Screens	3	350,000	1,050,000	Low
Chewuch R. Irr. diversions	3	175,000	525,000	Low
Chewuch R. Irr. ditches	3	100,000	300,000	Low
Chewuch R. Fish Acclamation Pond	1	1,000,000	1,000,000	Low
* fish habitat for T&E species	85 miles		10,000,000	High
Biodiversity Loss (Weeds)			5,000,000	High
Roads	259 Miles	68,000	17,605,000	High
Road Bridges	8 Bridges	830,000	6,650,000	Mod
Trails	70 Miles	20,000	1,400,000	High
Heritage/Cultural Properties	25 each	100,000	2,500,000	High
RVD's of use for area****	15,000 RVD	175	2,625,000	High
Range Water Developments	3 each	1600	4800	Mod
Beaver Creek Irrigation Improvements/equipment			2,225,000***	High
Okanogan Irrigation District Improvements			2,500,000	Low
Whitestone Irrigation District Improvements			2,000,000	Low
Total			$186,779,800	

*10 miles of the stream are in good to excellent condition;

**Risk from fire is: the likelihood that changes in soil and water conditions as a result of the fire would affect the down stream values at risk;

***Phone conversation 9/5/06 with Mike Fort, President of the Beaver Creek Water Users Association;

****These values will remain the same for any types of treatment including no treatment.

Appendix C
Land Treatment Justification
(mulching, seeding and fertilization)

Use of heli-mulch for erosion abatement after fire:

Use of mulch for surface erosion reduction has been shown to be effective (Robichaud, 2000). Aerial mulch application using helicopters (Heli-mulch) would be used to reduce concentrated runoff and sheet erosion on sensitive hillslope soils by increasing soil cover with inert straw material. Rain impact on the soil surface and subsequent erosion would also be reduced. This treatment would reduce the threat of debris torrents, severe channel scour, and flooding of Federal, State and private lands. Additionally, it would encourage natural vegetation recovery with creation of "safe" sites for native seed dispersal and seedling establishment on burned soils.

Use of fertilizer for erosion abatement after fire:

Art Tiedeman (research range ecologist), and Glenn Klock (research soil scientist-retired) addressed the effects of fertilization on seedling establishment and vegetation development on soils and sites essentially identical to the fire area. Although they conceded that their measurement methodology was not sensitive enough to statistically validate the fertilizers efficacy, they and both Phil McColley (forest soil scientist-retired) and Darlene Zabowski (research soil scientist) were adamant that fertilizer use improved vegetation establishment and vigor. They all suggested that fertilizer was the most effective treatment.

Recent research by Robichaud, Lillybridge, and Wagenbrenner (2006) summarizes fertilizer effects in fire recovery in north central Washington. After the 1998 North 25 Fire in the Wenatchee National Forest, eight study sites were established on steep, severely burned hillslopes to examine the effectiveness of postfire seeding and fertilizing treatments in increasing cover. In the first year, the seeded winter wheat provided 4.5% canopy cover, about a fourth of the total canopy cover, on the seeded plots; however, the total canopy cover on the seeded plots did not differ from the unseeded plots. In the fourth year of the study, the mean canopy cover in the fertilization treatment plots was 74%, and this was significantly greater (95% level) than the 55% mean canopy cover in the unfertilized plots. In this study, fertilizer was the only factor that effectively increased residual plant canopy cover of seeded and/or residual species. The seeding rate was not studied but is a variable of interest in such analyses. Increasing initial seeding rates could lead to measurable differences. Recent monitoring work on the Pot Peak fire fertilization treatments also support fertilization. Field crews reported that there was a obvious difference in size of shrubs in the fertilized area when compared to unfertilized—to the extent that their sampling system was not appropriate any longer due to the height of the shrubs on the fertilized sites.

The 60 lbs N/ac prescription being proposed for the Tripod Fire Complex is the result of the recent research work done after the 1970, 1998 and 2004 fires where fertilizer containing 50-100 lbs of N was recommended. The Dinkelman Fire used a 50 lbs N prescription. Water quality concerns are important here but are being mitigated by avoiding perennial drainages with fertilizer applications. Fertilizer would be 75% Ammonium Nitrate and 25% Ammonium Sulfate (or appropriate substitute).

Use of seeding (cereal grain and grass) for erosion abatement after fire:

In designing seeding prescriptions for the Tripod Wildfire Complex several factors were considered important criteria. These include: treatment objectives, native status, availability of seed, persistence, invasiveness, life cycle (annual vs. perennial), livestock palatability, growth form (sod-forming vs. bunchgrass), drought resistance or environmental amplitude, disease resistance, and cost. It is important that seeded species be adapted to local site conditions and not interact with local plant populations in a dysgenic fashion. Therefore, most of the seeding will be accomplished with a temporary cover crop of cereal grain – white winter wheat. Additional acreage will be seeded with a mix of perennial native grass species (or cultivars) and non-native grass species designed to provide a vigorous stand of vegetation that can resist invasive species infestation. These latter acreages include low elevation sites with a high risk of invasive species invasion or roadside rehab work throughout the fire area.

Experiences of the Dinkelman Fire of 1988 (53,000 acres) and the Chelan County Fires of 1994 (180,000 ac.) led to the prescription of soft white winter wheat alone. In both projects the wheat germinated better than the other species included in the mixes and did not persist over 3 years. Multiple species seeding has not always worked,

although it may attempt to meet an 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 or to establish a perennial stand of vegetation to compete with invasive species for growing space.

The greatest limitation to stand establishment is weather effects on germination. Wheat is a high energy seed which will germinate when other species will not. If the wheat doesn't make it then other species won't either. Also, wheat seed is much easier to apply because it broadcasts very well (as opposed to most grass seeds). Concerning the use of legumes for nitrogen, fall seeding seldom gets much establishment. Legumes do much better when seeded in spring. Seeding is a reasonably priced treatment for which the treatment success can be difficult to assure due to weather affects. In the Chelan County Fires of 1994, wheat germinated well, maintained itself for 2-3 years and then was gone. In the School fire of 2005, native perennials were seeded and results where deemed a real success (personal communication, Forest Service BAER team personnel—see photo below).

School Fire (2005) seeding success.

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Appendix D--Fertilizer, Seeding and Heli-mulching Specifications

Aerial Heli-mulch Specifications

Apply heli-mulch to high severity burn areas with slopes less than 60% where abundant surface rock is absent and the potential runoff rating for the LTA (Land Type Association: subalpine-parkland or dry forest) is flashy (high runoff potential).

Rate of application should be one ton/acre of certified or papered noxious weed-free straw. Straw must be certified as weed free by a state agency or be "papered"--come from state (or crop improvement association)-certified seed grain fields with inspection certificates listing weeds found. Acceptance of straw mulch material is subject to Forest Service approval. NAMA inspection may meet requirements for noxious weed-free straw.**

Listed below is the heli-mulch prescription for the upland aerial erosion control treatments.

HELI-MULCH PRESCRIPTION:

Activity	Straw Type	Bale type	Amount/ Acre	Cost/Ac.
Heli-mulch	Soft white Wheat, or Barley**(above)	60-1200# Rectangular	1 ton	$1300

Aerial Fertilization Specifications

Apply fertilizer in the spring of 2007 to the areas with moderate burn severity with slopes less than 60% where abundant rock is absent and the potential runoff rating for the LTA (subalpine-parkland or dry forest) is flashy (high runoff potential). Application rates are 60 lb/acre nitrogen. Surface water areas will be avoided.

This treatment would increase the vegetative growth of residual plant species on these sites and decrease the time needed for natives to become re-established and provide adequate cover on the site. The fertilization of moderate severity burned areas should better protect the soil resource from accelerated erosion.

FERTILIZER PRESCRIPTION*:

Fertilizer	Gross lbs/ac	N lbs/ac	Cost/Ac.
Ammonium Nitrate Sulfate	200	60	**$40**
Application Cost			**$65**
Total			**$105**

*Use 75% Ammonium Nitrate and 25% Ammonium Sulfate to get a 30-0-0-6 (N,P,K,S) mixture or suitable substitue as approved by Forest Service. Apply at the rate shown above as needed to get 60lbs of N per acre.

Aerial Upland Seed Mix Specifications

Listed below is the seed presciption for the upland aerial erosion control treatments.

The sowing of cereal grains and perennial grasses on high severity burned areas should increase total vegetation cover of the burned area and thereby better protect the soil resource from accelerated erosion. This should reduce both sheet and rill erosion and sediment delivery.

Activity	Cost/acre
Application Cost (aerial or ground)	$50

Seed and Seeding Specifications—Aerial Application for Land Treatment
Mix 1 and 4 are for aerial application. Mix 1 is for low elevation and mix 4 for high elevation.

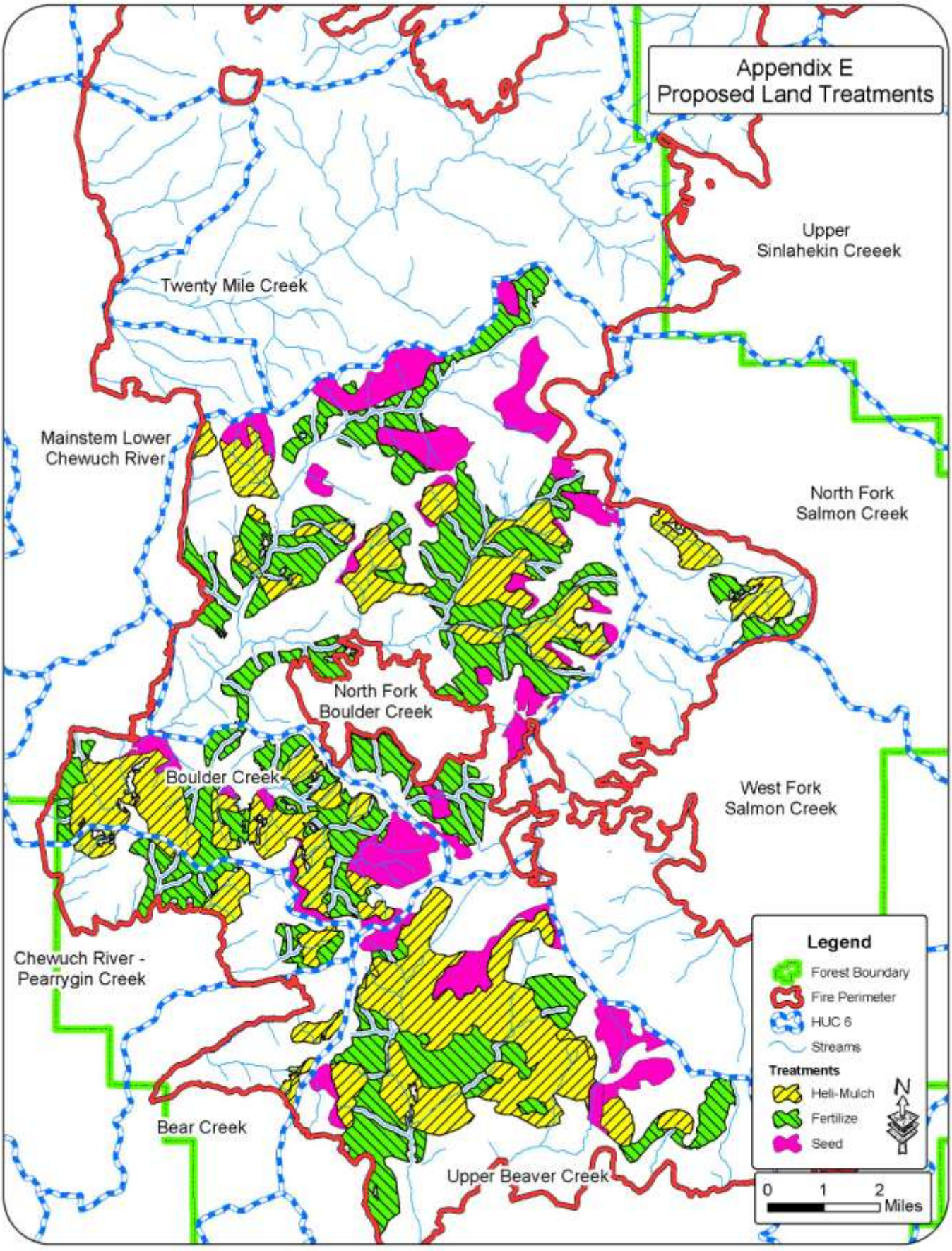
Mix	Species	Cost/lb	Seeds/lb	PLS (1 lb) Seeds/sq ft	PLS(Tot) lbs/ac	PLS (Tot) Seeds/sq ft	Cost/ac
1	Thickspike Wheatgrass *Elymus lanceolatus spp. lanceolatus*	$6.17	153,000	3.5	15	52.5	$92.55
1	Big Bluegrass (Sherman) *Poa secunda (Poa ampla)*	$6.98	1,046,960	24	1	24	$6.98
1	Prairie Junegrass *Koeleria macrantha*	$12.32	2,315,000	53	0.25	13.25	$3.08
1	Bluebunch wheatgrass *Agropyron spicatum*	$7.50	145,000 (Whitmar)	3.3	0	0	$0.00
1	Sheep Fescue (Covar) *Festuca ovina*	$3.20	530,320	12	1.5	18	$4.80
MIX 1	TOTAL				17.75	107.75	$107.41
4	Triticale	$0.44	14,000	0.32	0	0	$0.00
4	Soft white winter wheat (Eltan)	$0.23	12,000	0.3	60	18	$13.80
MIX 4	**TOTAL**						**$13.80**

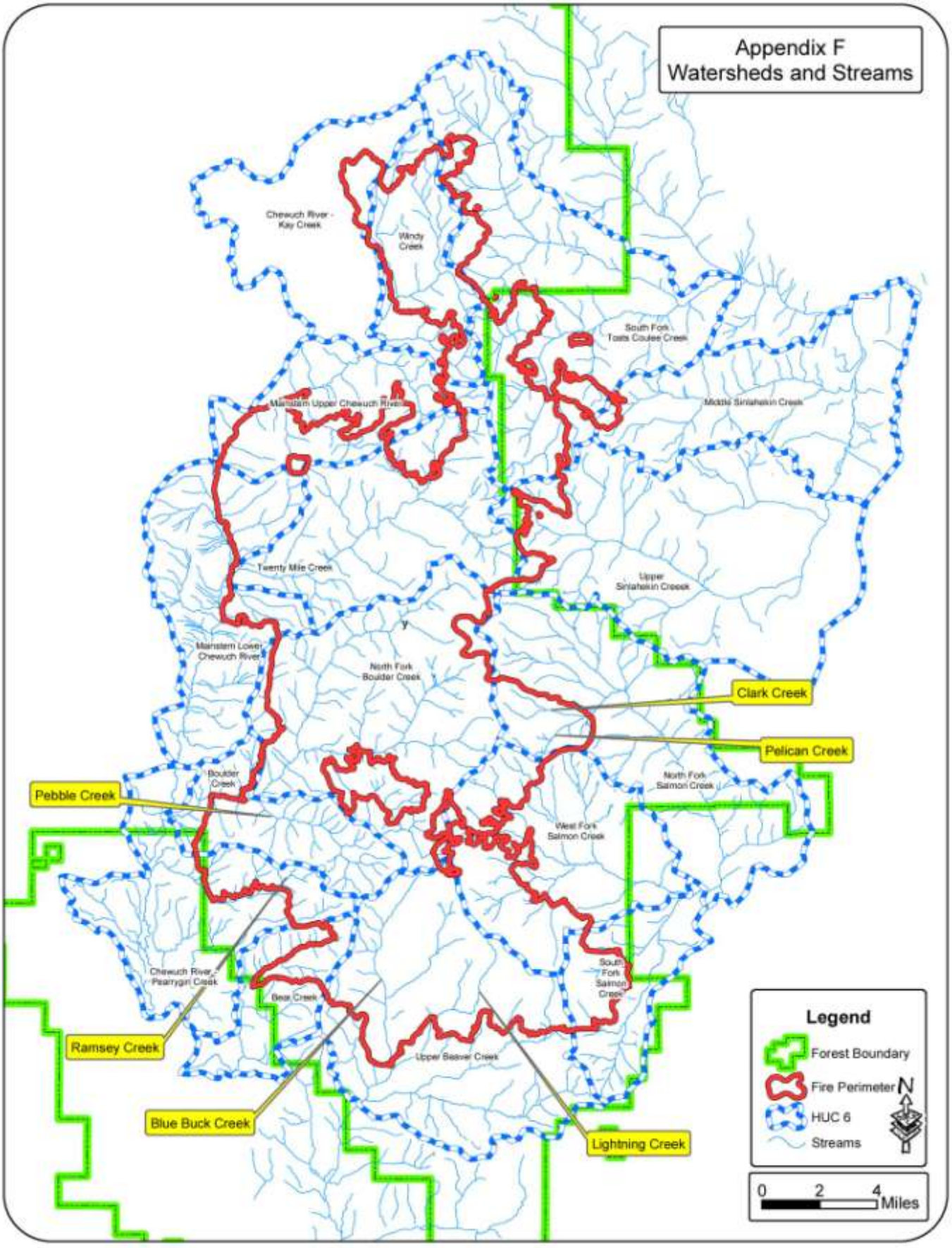
Roadside HydroSeed: Seed Mix Specifications

HydroSeeding is being recommended along roadsides to improve vegetation establishment on road cuts and fills.
Seed and Seeding Specifications—HydroSeed Application for Roadside Treatments

Mix	Species	X Cost/lb	Seeds/lb	PLS (1 lb) Seeds/sq ft	PLS(Tot) lbs/ac	PLS (Tot) Seeds/sq ft	Cost/ac
3	Slender wheatgrass (Adnac) *Elymus trachycaulus*	$1.71	159,000	3.7	6	22.2	$10.26
3	Mountain Brome (Bromar) *Bromus marginatus*	$2.05	64,080	1.5	16	24	$32.80
3	Hard Fescue (Durar) *Festuca trachyphylla*	$2.74	530,320	12	2	24	$5.48
3	Blue Wildrye *Elymus glaucus*	$5.38	134,000	3.1	8	24.8	$43.04

MIX 3	Total				32	95	$91.58
4	Triticale	$0.44	14,000	0.32	0	0	$0.00
5	Intermediate wheatgrass *Agropyron intermedium*	$3.35	80,080	1.8	0	0	$0.00
5	Streambank Wheatgrass (Sodar) *Elymus lanceolatus var. psammophilus*	$6.12	153,000	3.5	10	35	$61.20
5	Sheep Fescue (Covar) *Festuca ovina*	$3.20	530,320	12	2	24	$6.40
5	Big Bluegrass (Sherman) *Poa secunda (Poa ampla)*	$6.98	1,046,960	24	1	24	$6.98
5	Prairie Junegrass *Koeleria macrantha*	$12.32	2,315,000	53	0.25	13.25	$3.08
MIX 5	**Total**				**13.25**	**96.25**	**$77.66**
6	Slender wheatgrass (Primar) *Elymus trachycaulus*	$1.71	135,000 (Pryor)	3.1	10	31	$17.10
6	Streambank Wheatgrass (Sodar) *Elymus lanceolatus var. psammophilus*	$6.12	153,000	3.5	0	0	$0.00
6	Sheep Fescue (Covar) *Festuca ovina*	$3.20	530,320	12	2	24	$6.40
	Big Bluegrass (Sherman) *Poa secunda (Poa ampla)*	$6.98	1,046,960	24	1	24	$6.98
6	Prairie Junegrass *Koeleria macrantha*	$12.32	2,315,000	53	0.25	13.25	$3.08
MIX 6	**Total**				**13.25**	**92.25**	**$33.56**


Appendix E
Proposed Land Treatments
Upper
Sinlahekin Creeek
Twenty Mile Creek
Mainstem Lower
Chewuch River
North Fork
Salmon Creek
North Fork
Boulder Creek
Boulder Creek
West Fork
Salmon Creek
Chewuch River -
Pearrygin Creek
Bear Creek
Upper Beaver Creek
Legend
Forest Boundary
Fire Perimeter
HUC 6
Streams
Treatments
Heli-Mulch
Fertilize
Seed
N
0 1 2
Miles


Appendix F
Watersheds and Streams
Chewuch River - Kay Creek
Windy Creek
South Fork Tatis Coulee Creek
Mainstem Upper Chewuch River
Middle Sinlahekin Creek
Twenty Mile Creek
Upper Sinlahekin Creek
Mainstem Lower Chewuch River
North Fork Boulder Creek
Clark Creek
Pelican Creek
Boulder Creek
Pebble Creek
North Fork Salmon Creek
West Fork Salmon Creek
Chewuch River - Pearrygin Creek
South Fork Salmon Creek
Bear Creek
Ramsey Creek
Upper Beaver Creek
Blue Buck Creek
Lightning Creek
Legend
Forest Boundary
Fire Perimeter
HUC 6
Streams
N
0 2 4 Miles