USDA Forest Service Date of Report: August 15, 2002

DEER POINT FIRE

DRAT 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: **Deer Point Fire****
Reburn of 1970 fires B. Fire Number: **P68198

C. State: **Washington** D. County: **Chelan**

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

G. District: **Chelan Ranger District**

H. Date Fire Started: **7-15-02** I. Date Fire Controlled: **Unknown**

J. Suppression Cost: **$ 15.6 Million (8/12/02 ICS 209 Report)****

** Projected Final Cost: $16 + Million

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

1. Fireline waterbarred (miles) **25 miles (9/10/01 ICS 209 Report)**
2. Fireline seeded (miles) **0 miles (9/10/01 ICS 209 Report)**
3. Other (identify) **Spike camps, base camps & safety zones (10 acres)****

** Deer Point Fire suppression-rehabilitation guidelines provided.

L. Watershed Number: **17-02-00-09-02 (Lake Chelan)**

M. NFS Acres Burned: 35,075 Total Acres Burned**: 40,665**

Ownership type: **Primarily National Forest system lands except for private in-holdings along the lakeshore and along the southern edge of the fire. Southern portion of fire also includes some BLM and DNR lands (8/12/02 ICS 209 Report).**

(549) State (837) BLM **(4081) PVT** (122) Lakes

N. Vegetation Types**: Low elevations (<2000 feet): Agricultural, Shrub-Steppe and open forest; Middle Elevations (2000-4500 feet): Mostly Douglas-fir series in early seral condition; Upper elevations (4500 + feet): Subalpine Fir Series series in early seral condition. Most of the fire area was burned in the fires of 1970.**

O. Dominant Soils: **Variable depths of volcanic ash/pumice over coarse textured subsoils. North facing slopes have deep ash/pumice soils (Andisols) while South facing slopes have thin-cobbly-ashy soils (Inceptisols). Soils on South facing slopes have more than 25% profile rock larger than 2 inches in diameter. Some deep coarse textured stony soils on debris fans and lateral glacial till deposits. Bedrock outcropping comprises more than 25 percent of soil units in headlands and on some south facing slopes**

P. Geologic Types: **igneous units (Granidiorite) and metamorphic units (Gneiss): landforms are oversteepened glacial troughs developed from continental and alpine glaciation**. **Debris fans at stream mouths extend out into Lake Chelan.**

Q. Miles of Stream Channels by Class:

I & II-2 miles **III-43 miles** **IV- >53 miles**

(small domestic water supplies present on at least 4 tributaries)

R. Transportation System:

Trails: _____ miles Roads: **86** miles

S. Unusual Fire Conditions: The Deer Point Fire is mostly a re-burn of areas burned in the 1970 Fires. Most of the 1970 fires were low to moderate burn intensities. Most of the standing dead timber in the Mitchell, Johnson, and Joe Creek watersheds were salvaged; with exception of the Gold and Poison Creek watersheds. Most of the burn intensity in the watersheds that were salvaged experienced low with some moderate burn intensity. The down large fuel loading in Gold and Poison Creek ranged from 50 to 100 tons/acre. Lodgepole pine reproduction grew up through this accumulation of large fuels. Lodgepole stand density ranged from 20-50 thousand stems per acre in the .5-3" diameter class with heights of 5-15'. Resulting burn intensity was mostly high in Gold and Poison Creek and soil surfaces were discolored with severe hydrophobic soil conditions. (See photo in Appendix D).

PART III - WATERSHED CONDITION

A. Fire Intensity* (acres): (low-62%) **25,633** (moderate 18%) **7,293** (high-10%) **4,105** (unburned 10%) **4,105**

***Burn intensity identified from 8/12/02 reconnaissance flight and GIS report. Expect burn area to significantly increase.**

B. Water-Repellent Soil (acres): **3,500 acres. The degree of hydrophobic conditions ranges from moderate to severe in high burn intensities. Hydrophobic soil conditions likely linked to excessive fuel loading (50-100 tons/acre coarse woody debris) and early seral organic matter accumulation.**

C. Soil Erosion Hazard Rating (acres):

3,500 (low) **8,500** (mod**) 27,000** (high) **

**Much of the private lands are located on alluvial fans that have slopes less than 20% with relatively low surface erosion rates. The upper watersheds are generally extremely steep with approximately 50% of the watersheds exceeding 60 percent slopes. These upper watersheds have high erosion rates. All subwatersheds are lands administered by the Okanogan and Wenatchee NFs.

D. Erosion Potential: **161** tons/acre

E. Sediment Potential**:** **41,280** cubic yards / square mile

Assumptions for Erosion and Sediment Potential: The erosion and sediment figures listed above reflect the contribution from reoccurring debris slides that deposit relatively fine to coarse sediment directly into stream channels. Shallow rapid slides are a natural hydrologic process in the watersheds within the Deer Point Fire. Sediment delivery from these slides has been and continues to be transported and deposited into Lake Chelan forming alluvial fans at the mouth of each subwatershed.

These types of slides trigger pulses of sediment delivery that are episodic in nature. Normally these slides occur in response to dramatic changes in vegetation due to landscape level fires or from intense early summer thunder storms and rain-on-snow events that occur in late fall and early winter (see Part IV). Based upon local fire history, fire induced watershed impairments will substantially elevate the risk of debris slides for at least the next 5 years. The Deer Point Fire will have a significant effect of increasing the frequency of debris slides. The figures listed above reflect the contribution of delivered sediment from these debris slides over the design frequency (10 years). These figures are considered conservative based upon recent fire induced debris slide occurrence.

The fire area occurs predominately on over-steepened slopes due to glacial or glacial fluvial erosion. Consequently drainages are very steep and rocky. Natural landform sediment delivery and routing efficiency (90%) is considered very high but episodic. Runoff is routed rapidly into a series of first order ephemeral channels that form a relatively dense network of tributary streams. Runoff from these tributaries can be flashy. The major source of sediment delivery is in the form of debris slides in these tributary streams. These slides deposit debris directly into the main channels of Camas Creek, Grade Creek, Poison Creek, Gold Creek, Mitchell Creek, Antilon Creek, and Joe Creek. This delivered sediment has and continues to form alluvial fans at the mouth of each sub watershed. Over the centuries, a considerable amount of suspended and bedload sediment has been deposited into Lake Chelan. Due to the depth of the lake this debris continues to be submerged and has not formed deltas.

PART IV - HYDROLOGIC DESIGN FACTORS

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

B. Design Chance of Success: **70** percent

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

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

E. Design Storm Magnitude: **0.6** inches

F. Design Flow: **<1.0 to 28.0 (*1)** cubic feet/second/square mile

G. Estimated Reduction in Infiltration: **5 to 40% (*2)** percent

H. Adjusted Design Flow: **45 to 273 (*3)** cubic feet/second/square mile

Footnotes

(*1) Design flow assumptions: (a) A short duration, high intensity, convective storm event has been identified as the storm type most likely to cause damage in the burned area. (b) Storm-related flow generated from surface runoff (no significant shallow sub-surface flow), with high likelihood of hail accumulations. (c) Selected a 10 yr RI, 30 minute event--similar to those that have impacted other burns in this area (Silica, Crum Canyon, Dinkleman, Tyee, North 25, Rex). (d) Design flow estimate (item F) could vary depending on the assumptions made regarding pre-fire (but not undisturbed) infiltration conditions in the area. However, this example assumes a negligible pre-fire reduction in infiltration.

(*2) Estimated range in reduction in infiltration (item G) in the Deer Point Fire is as follows: Low intensity (5%), moderate intensity (15%) and high intensity (40%). Estimated reduction of infiltration for this fire is due primarily to non-wettable conditions from dry, volcanic ash soils and hydrophobic conditions.

(*3) Adjusted Design Flow (item H) for the burned area varies widely based on location. Potential adjusted design flow for a small tributary in the fire interior (high intensity) is 273 csm. The latter flow represents an approximation of a potential short-term flow from an intermittent channel typical of the area--given degraded infiltration conditions. The fire area has had a history of events triggering floods one to three years following wildfires.

PART V - SUMMARY OF ANALYSIS

A. Describe Watershed Emergency:

The following summary describes the conditions that warrant emergency rehabilitation actions. Please refer to Appendices C & D and the analysis file for details on the rationale for each of the proposed treatments.

1. ***Loss of Site Productivity*** –

The inherent soil productivity is low for most of the area within the Deer Point Fire although some of the lands in orchard near the lower, southern border are highly productive. Soils are derived from hard crystalline igneous and metamorphic bedrock units (granitic and gneiss). These rock units typically weather into very

coarse "sandy soils" with a low nutrient capitol. A layer of volcanic ash forms the surface of most soils as well as varying thickness of pumice in some locations. The areas with significant accumulations of volcanic ash are the most productive sites in the fire area (eg. toe slopes, valley bottoms, and North facing slopes). Continental climatic conditions often limit available soil moisture. Soil moisture (except in valley bottoms) is often a limiting factor on the southern exposures that predominate in the fire area.

Fire effects can directly influence the long and short-term accumulation of organic matter. Most of the Deer Point Fire experienced low intensity burns. This level of burn intensity is not expected to have an adverse effect on organic matter input in the short term or long term (Everett and others, 1996). However, the areas with high burn intensity within the Deer Point fire will have a significant adverse on nutrient availability in the short and long term.

The Deer Point Fire likely had a profound effect in volatilization of residual nutrient capitol of nitrogen (N), phosphorus (P) and sulfur (S) in portions of Poison and Gold Creek watersheds. These areas had high and moderate intensity burns due to excessive fuel loading from the 1970 fires. The Deer Point fire basically burned hot enough to totally consume the duff/litter layer, foliage, woody material less than 6 inches, and severely charred larger down woody debris. Mineral soils were super heated creating discoloration. This level of burn intensity could severely reduce the nutrient capitol of these soils (Hungerford and others, 1990—p. 32; Baird, 1998). Furthermore, since little of the fine coniferous canopy remains (twigs, cones, and needles), there will be a long-term reduction in nutrient and organic matter input on these sites. This loss of future input of fine coniferous litter combined with the loss of the soil litter/duff layer will have a severe impact on the natural soils nutrient capital (Page-Dumroese and Harvey, 1990).

In some areas there are numerous snags still standing in much of the Deer fire area that will in time fall to the forest floor. The decomposition rate of this large downed woody debris is expected to exceed 100 years before becoming incorporated into soil wood as a part of the nutrient capital (Edmonds, 1990-p. 119). Hence, this standing dead material will likely elevate burn intensity for the next cycle of fires. Hence, continuing to affect the nutrient capital of soils within the Deer Point fire.

Another very unique threat to site productivity and forest values in the lower elevations is the presence of several noxious weeds within the burned area. The primary species of concern include diffuse knapweed (*Centauria diffusa*), dalmation toadflax (*Linaria dalmatica*) and Hoary Cress (*Cardaria draba*). There is grave concern that the additional open niches provided by the fire will allow these plants to significantly expand their range within the burned area; both on National Forest System Lands and lands in other ownership. The Natural Resources Conservation Service and the Forest Service will be working with private landowners to address this issue. Weed management on private lands is critical to protect the integrity of weed treatments on National Forest System lands. The proposed multi-year regimen of weed management is critical to help preserve the site productivity and character of this area.

2. ***Loss of Water Quality***

Water quality in the Lake Chelan sub-basin is critical for many uses including municipal/domestic supply, agricultural uses, aquatic habitat, recreation and aesthetics. Lake Chelan is a major recreation destination of national significance. In the Deer Point fire area, several drainages support small, domestic water supply systems servicing private lands along the lakeshore. Tributaries in the burned area also contain important populations of rainbow and westslope cutthroat trout. Implementation of the Lake Chelan Water Quality Management Plan is an on-going, cooperative effort (Beck, and others, 1991).

Water quality parameters most affected by this fire are sediment loading, nutrient loading and water temperature. Stream sediment loading in fire-affected tributaries is expected to increase as a result of increased surface erosion (via accelerated dry raveling and rill erosion) and as a result of increased debris slide activity.

Ash, fine sediment and woody debris delivery and transport will increase during snowmelt runoff and in response to storm events. Episodic delivery of larger bed materials and woody debris will be associated with the event driven debris slide-debris torrents discussed in more detail in the section on Life and Property. Increased sediment loading is expected to persist for at least the next two to three years after the fire and then decline.

Research has documented that wildfire exerts pronounced effects on the nutrient status of ecosystems (Tiedemann and others, 1978). Nutrient loss via volatilization and solution is described in the section on site productivity. For example, both nitrogen and phosphorus have been drastically reduced from the system. However, these losses begin to be offset by other processes such as N input from precipitation. Elevated nutrient concentrations in stream flow will persist for a relatively short period of time until the chemical retention capacity of the burned area is reestablished. The rapid development of native plant (and seeded grass cover) in the burned area is critical to the re-establishment of the tight nutrient cycle in these forested watersheds. This nutrient cycling alteration and re-establishment is a natural process associated with the wildfire disturbance.

Water temperatures may increase significantly in many of the fire-affected stream reaches as a result of riparian canopy loss. Even in areas identified as having been subject to low intensity burn, denser riparian vegetation burned at a higher intensity. However, experience suggests that riparian shrubs and herbaceous plants will rapidly re-sprout in those areas as long as root systems have not been damaged. This fire-influenced shift in temperature regime will persist until sufficient riparian canopy is re-established to provide shade during the critical summer months. The planting of woody vegetation in selected riparian areas that burned at moderate-high intensities would accelerate canopy recovery.

Wildfire influences all of the above water quality parameters. At issue, are the identification and treatment of those areas that may have burned at a greater than normal intensity due to human-caused influences (e.g., elevated fuel loading from past fire suppression activities) and concern for human developments that are now part of the system (e.g., private homes on alluvial fans, recreation sites). The proposed Deer Point BAER treatments have targeted both of these issues.

Concern has been expressed regarding the proposed application of fertilizer on high and moderate intensity burned areas in order to improve establishment and growth of seeded species and enhance the cover of surviving native plants. The issue involves the potential for water quality impacts in Lake Chelan. Please refer to the discussion of fertilization and water quality in Appendix D for details.

3. ***Threats to Human Life and Property***

The values at risk include houses, roads, orchards, campgrounds, trails, and cultural sites. Due to the national attraction of Lake Chelan, homeowners and recreationists will continue to use these facilities following the Deer Point Fire. Even with temporary campground closures to reduce the threat to recreationists, people will continue to use the alluvial fans that are at risk of severe flooding. Some of the private lands and most of the campgrounds are located on alluvial fans. The upper watersheds are administered by the Okanogan and Wenatchee NFs.

As previously described, the upper watersheds are comprised of extremely steep conditions that are at severe risk for debris slides. Due to impaired watershed conditions, a tremendous amount of wind throw is expected in some areas. Increased amounts of large woody material, in upper debris tracks and stream channels, will become incorporated in the debris slides which is likely to substantially increase the scouring energy of each slide. Hence post fire debris slides are expected to accelerate the rate of scour in upper watershed channels that will deliver additional debris into lower stream reaches. This additional debris can trigger debris jams that can cause a surge of flood material onto the fans or can cause streams to divert and form new channels on the fans.

These types of flood events occurred on Lake Chelan following the 1970 fires. A surge of flood debris washed out two dock facilities and a campground. A recreationist narrowly escaped this flood event. Unfortunately, four (4) fatalities occurred in the adjoining drainage (Entiat Valley) following the same type of flood event. The campground and dock facilities at Mitchell Creek are all in jeopardy from debris flows and hence pose a serious pose a serious hazard to recreationists. The campgrounds are accessible by boat on Lake Chelan. The campgrounds and dock facilities are at serious risk of being destroyed by flood debris. The Mitchell Creek Campground and Dock was destroyed by debris flows after the 1970 fires and private boats were also destroyed or damaged

The Gold Creek and Antilon Creek alluvial fans pose the greatest threat to homeowner safety and property values. Other areas that pose a risk are the old flood plains of upper Johnson and Joe Creek. Channels within these flood plains have been reworked and houses have been built over the old channel. Both channels have subterranean flows with some areas of surface flow. (Refer to hazard assessment in analysis files).

The Natural Resources Conservation Service is working with the private landowners on the Camas, Poison, Gold and Antilon Creek to identify treatments to divert anticipated storm and debris flows away from dwellings. Channel treatments are not appropriate for these perennial stream systems. Hence, the only BAER treatments that will have some level of success at reducing the threat to life and property are upland aerial seeding and fertilization and log terracing. Upland seeding will help provide some ground cover and reduce surface erosion and concentrated runoff beginning in the summer of 2003.

Floating woody debris in the Lake poses a public safety hazard. Following the 1972 storm events, log booms were installed at the mouths of several drainages to control input of floating debris. Following the period of record peak flow in November 1995, public outcry resulted in the emergency expense of approximately $400,000 to collect and dispose of woody debris that had been flushed into the lake. Three log booms were installed in the 2001 Rex Creek Fires BAER project. If booms are need for the Deer Point fire, one or more of these booms could be moved and installed.

B. Emergency Treatment Objectives:

The application of the BAER treatments should assist natural recovery and minimize both on-site and downstream damage to values at risk. The non-structural land treatments proposed for upland erosion control (seeding, fertilizing) are designed to help maintain site productivity, protect water quality and minimize risks to life and property by accelerating ground cover. The non-structural land treatments proposed for weed control are designed to help maintain site productivity and ecosystem function by inhibiting weed establishment and spread. This is done by using a cultural practice (grass seeding) to provide competition for weeds and by manual weed control. Proposed structural treatments (e.g., log terraces, road drainage) are intended to reduce post-fire increases in accelerated erosion and sedimentation and to reduce threat to life and property.

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

Land **90 %** Channel/Riparian NA % Trails **70 %** Other **80** %

D. Probability of Treatment Success

<----Years after treatment----->

1	3	5

Land	70%	70%	70%
Channel	%	%	%
Roads/Trails	90%	90%	90%
Other	70**%**	**70%**	**70%**

E. Cost of No Action (Including Loss): **$7,855,000**

F. Cost of Selected Alternative (Including Loss): **$3,600,000**

G. Skills Represented on Burned-Area Survey Team:

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

The BAER survey team also included resource specialists from the NRCS (Gary Mitchell & Joe Lange), Farm Service Agency (Michel Ruud), Bureau of Land Management (Dana Peterson & Jim Rees), Washington State University County extension (Tom Brannon), Chelan County Weed Board (Terry Nowka), U.S. Fish and Wildlife Service (Jeff Krupka)

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

Phone: **(509) 662-4231** Electronic Address: **cedavis@fs.fed.us**

H. Treatment Narrative:

Overall Goal of Proposed BAER Treatments: To complete a combination of comprehensive treatments to reduce sediment delivery, protect water quality of fire-affected tributaries and Lake Chelan and to minimize the threat to life and property from post-fire events. In addition, the treatment will reduce noxious weed effects to site productivity in the area and enhance natural vegetative recovery.

Land Treatments

Purpose - Upland Treatments: Implement actions to: 1) reduce the post-fire potential for concentrated runoff and erosion on sensitive hill slope soils; 2) reduce the potential for debris slides and the subsequent threat of debris torrents and flooding of downstream private lands and recreation facilities; and 3) encourage recovery of natural vegetation. The noxious weed populations of concern (toadflax, Hoary Cress, knapweed) are found within the Fire area. The Okanogan and Wenatchee NFs along with other agencies and private landowners have already spent thousands of dollars to keep these weeds in check. In order to be successful, three years of treatment will be necessary which should also include herbicide use. Interim BAER reports will be submitted for 2002 – 2004.

Treatment #L1 Erosion Barriers: Install log or waddle erosion barriers on sensitive, high intensity burn areas in Gold and Poison Creek (1000 acres). These sites have slopes less than 60% with no surface rock or bedrock exposed. Install log terracing in strategic areas--where the potential to disperse concentrated runoff is greatest in order to minimize down slope sediment delivery to sensitive stream reaches.

Treatment #L2 Aerial Upland Seeding—wheat: Aerial seed high and moderate intensity burn areas in Gold and Poison Creek drainages (3,800 acres). This treatment is only proposed in at risk drainages where it is expected to be successful and where private lands are at risk from concentrated flows and/or debris slides. Seeding treatment

will rely on soft white winter wheat. This plant should offer high establishment success and yet be ephemeral in nature (Appendix B & C).

Treatment #L3 Aerial Upland Fertilization: Aerial fertilize sensitive moderate and high intensity burn areas (3000 acres) in Gold and Poison Creek drainages. Fertilization is proposed in order to increase herbage and root mass in the seeded wheat and the surviving native plants. Treatment will not be applied within 100 yards of main stream channels. Areas proposed for fertilization have low weed infestation levels. Areas selected for treatment have excessive soil discoloration indicating intense heating with likely total loss of nutrient capitol, refer to fertilization rationale (Appendix D).

Treatment #L4a- Control of Noxious Weeds on Roads: Early spring chemical treatment along the Grade Creek Road # 8200, East Fork of Joe Creek Road # 8045, Johnson Creek Road #8210 totaling (30 miles/150 ac.). Two applications, initial treatment ($900/mile; $200/ac.) in the fall of 2002 and follow up treatment ($450/mile; $100/ac.) in the spring of 2003. The treatment areas are covered by an existing NEPA decision.

Treatment #L4b- Control of Noxious Weeds on Roads: Seed competitive species to fill open niches created by weed removal and from fire kill of existing plants on 205 acres (Appendix B &C).

Treatment #L5 Aerial Upland Seeding—perennials and wheat: Aerial seed high and moderate burn intensities in the Antilon, Johnson, and Joe Creek Watersheds. This treatment is only proposed in drainages where soil productivity, water quality, and private land values are at risk (1400 acres). This area also has high risk for noxious weed establishment/spread. Noxious weeds are already present. Seed mix will consist primarily of competitive native perennial species with cereal grain as a cover crop in order to provide for both erosion control and competitive vegetation for noxious weed suppression. (Appendix B & C)

Treatment #L6- Aerial Seeding for Erosion Control and Noxious Weed competition: This treatment is only proposed in isolated areas of low intensity burn that have an elevated risk of soil loss and reduction of soil productivity along Lake Chelan (1200 acres). See Appendix B & C.

Road Treatments

Purpose: Implement actions to: (1) minimize the potential for elevated or concentration surface runoff, mass erosion, and sediment delivery from Forest Service roads within the Deer Point Fire, (2) insure that the public is aware of road-related and other hazards in the burned area and that road user safety features are in place.

Treatment #R1 – Install Armored Outsloped Dips: Construct rolling out sloped dips with aggregate surfacing to improve ditch relief and ability of road to better handle anticipated increases in surface runoff. Armor dip inlets and outlets, especially on exposed fills. Dip installation sites are: (1) locations where no drainage feature existed before (e.g., inadequate frequency of ditch relief) or (2) locations where existing dips (or waterbars) are inadequate to handle anticipated flows or (3) locations where an existing damaged or inadequate culvert can be replaced with a low maintenance rolling dip. Log, "Eco-Log" or straw bale structures will be installed within run-out area of dips to help further disperse surface runoff and minimize sediment delivery potential. (also called "grade-sags", "outsloped rolling dips", etc.)

Treatment #R2 – Install Outsloped Dips (non-armored): Same as R1 but without aggregate surfacing and fill armoring.

Treatment #R3 – Install Armored Flood Relief Dips: Construct large, armored rolling dips (surface armor & aggregate and fill slope armor) immediately downgrade of major stream/draw crossings to deflect flood flows off the roadway and back into the stream/draw bottom. These dips much larger than treatment #R1 are differentiated from #R1.

Treatment #R4 – Pull Existing Culverts: Remove existing culverts to re-establish more natural flow patterns and reduce the risk of pipe plugging, runoff concentration and accelerated sedimentation.

Treatment #R5 – Replace/Install Culverts – Remove and replace existing damaged culverts (primarily ditch relief). Install new ditch relief culverts to improve drainage frequency and minimize potential for runoff concentration, road washouts, and excessive sediment delivery.

Treatment #R6 – Harden Drainage Features: Clear blockages from existing culvert installations. Install rock headwall, collar and apron to improve efficiency of structure and to minimize scour and slough. Install rock, log terraces, straw bales or other materials below the outlet to disperse surface runoff from ephemeral systems.

Treatment #R7A – Minor Upgrade of Stream Crossings: Partial or complete removal of excess fill material at Little Gold, Gold, Poison, Grade Creek stream crossings. Also installation of an armored emergency overflow dip, additional armoring of the fill slopes and possible installation of a mid-fill slope relief CMP (conversion of the existing crossing to a "vented, debris torrent ford"), in order to improve potential for major crossings to withstand higher flows and debris torrent event(s), with reduced sedimentation potential. Little Gold will not require fill removal.

Treatment #R7B – Major Upgrade of Stream Crossings: Replace existing undersized culverts at Little Grade and Antilon Creek stream crossing with a larger drainage structure to improve ability of road crossing to handle anticipated increases in surface runoff (including sediment and woody debris) and to reduce the potential for plugging and accelerated sediment delivery. Little Grade Creek will require installation of an armored emergency overflow dip and armoring of the fill slopes to better pass flood flows carrying high sediment and debris loads. Antilon will not require flood relief dip.

Treatment #R8 - Stabilize Roadbed: Spot rock selected locations/road sections with native pit-run and/or crushed aggregate to help reshape and stabilize road prism to improve surface drainage and minimize accelerated sediment delivery. (e.g., surface road on either side of major stream crossings)

Treatment #R9 - Road Surface Water Management: Blade road surface, pull specific ditch line sections, remove outside berms and outslope where appropriate to improve road surface drainage. Inslope above switchbacks where appropriate to utilize run-out ditch and minimize surface runoff through curve. Inslope as directed to avoid runoff concentration on unstable fill slope sections. Remove rock and woody debris blocking ditch line.

Treatment #R10A – Miscellaneous Structure Work: Structure work generally associated with Grade Creek Road #8200 and includes: 1) Penstock treatment at four road crossings (pipe crushing; $800); 2) Install one deflector berm at Johnson Creek crossing by Antilon Snowpark ($500); 3) Install large rock cribwalls at seven fill slope sites ($43,000).

Treatment #R10B – Miscellaneous Structure Work - Non-BAER: Structural work associated with roads that includes: 1) Removal of four cattle guards ($6,000) and Removal of one gate ($750).

Treatment #R11 – Hazard/Closure Signing - Non-BAER: Purchase and install closure and burned area hazard notification signs to inform public of post-fire conditions and management actions taken to protect public safety. For Deer Point this also includes carsonite hazard markers at fill slope problem sites and milepost signing of the Grade Creek-Cooper Mountain loop.

Treatment #R12 – HazMat Removal at Little Gold Creek: This project involves removal of creosote contaminated soils and a contaminated section of old flume waterline at the Little Gold Creek crossing on the Grade Creek Road. This material distilled out of creosote soaked flume as a direct result of the fire. The site is located at (and suspended above) a perennial stream channel.

BAER Evaluation

BAER Survey Cost: The estimated cost of BAER Survey and preparation of the Initial Burned Area Report is listed in Part VI of the 2500-8. BAER survey cost also include the cost of a spot satellite image ($6500). Application of the proposed treatments will also require the development of an Implementation Plan. Specifics related to seed and seed selection for the noxious weed treatments are shown in Appendices B & C. More specific information related to proposed treatments is in the BAER Survey analysis file.

BAER Cultural Resource Survey: Surveys by the Forest Archeologist will be required prior to the implementation of the BAER treatments.

BAER Flume Survey: An old flume constructed from creosote impregnated wood burned during the fire resulting in Hazardous materials concerns. A survey to evaluate this flume is required.

BAER Emergency Consultation: Required for a variety of potential T&E species effects in the fire area.

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

	8/15/02 1430 Draft			NFS Lands			Other Lands			All
			Unit	# of	WFSU	# of	Fed	# of	Non Fed	Total
Tmt #	Line Items	Units	Cost	Units	SULT $	units	$	Units	$	$
	A. Land Treatments									
	1) Upland Erosion									
L1	Erosion Barriers	Ac	$ 300	1000	$300,000		$0		$0	$300,000
L2	Aerial Upland Seeding	Ac	$ 26	3800	$98,800		$0		$0	$98,800
L3	Aerial Upland Fertilization	Ac	$ 70	3000	$210,000		$0		$0	$210,000
	2) Nox. Weed & Erosion									
L4a	Weed Control	Ac	$ 300	150	$45,000		$0		$0	$45,000
L4b	Hand Seeding Rds	Ac	$ 80	205	$16,400		$0		$0	$16,400
L5	Aerial Seeding-weed,erosion	Ac	$ 61	1181	$72,041	200	$12,200		$0	$84,241
L6	Aerial Seeding-weed,erosion	Ac	$ 61	1200	$73,200		$0	1200	$73,200	$146,400
L7	Private Land Seeding (Wyden)	Ac	$ 61	200	$12,200		$0		$0	$12,200
	Subtotal Land Treatments				$827,641		$12,200		$0	$913,041
	B. Road Treatments									
R1	Armored Dips	ea	$ 1,150	98	$112,700		$0		$0	$112,700
R2	Non-Armored Dips	ea	$ 575	292	$167,900					$167,900
R3	Flood Relief Dips	ea	$ 2,875	8	$23,000					$23,000
R4	Pull Existing Culverts	ea	$ 1,150	9	$10,350					$10,350
R5	Install Culverts	ea	$ 2,450	8	$19,600					$19,600
R6	Harden Drainage	ea	$ 230	142	$32,660					$32,660
R7A	Minor Upgrade Stream Xings	ea	$ 24,000	4	$96,000					$96,000
R7B	Major Upgrade Stream Xings	ea	$ 41,500	2	$83,000					$83,000
R8	Stabilize Roadbed	mi	$ 57	1560	$88,920					$88,920
R9	Surface Water Mgt		$ 1,035	36.8	$38,088					$38,088
R10A	BAER-Misc Struct.		$ 51,000	1	$51,000					$51,000
R10B	Other-Misc Struct.				$0					$0
R11	Hazard Signing				$0					$0
R12	Little Gold HazMat	ea	$ 29,000	1	$29,000					$29,000
	Subtotal Road Treatments.				$752,218		$0		$0	$752,218
	E. BAER Evaluation									
O1	**1) BAER Survey Cost**				$35,000		$1,000		$0	$36,000
O2 6/	**2) BAER Cul Res Survey**				$4,500		$0		$0	$4,500
	3) Flume Survey				$20,000					$20,000
	4) Emergency Consultation				$2,500					$2,500
	G. BAER Monitoring				$0		$0		$0	$0
	subtotal Evaluation				$62,000					
	H. Totals				**$1,641,859**		$13,200		$0	**$1,705,759**

PART VII - APPROVALS

DEER POINT FIRE

Recommended by:

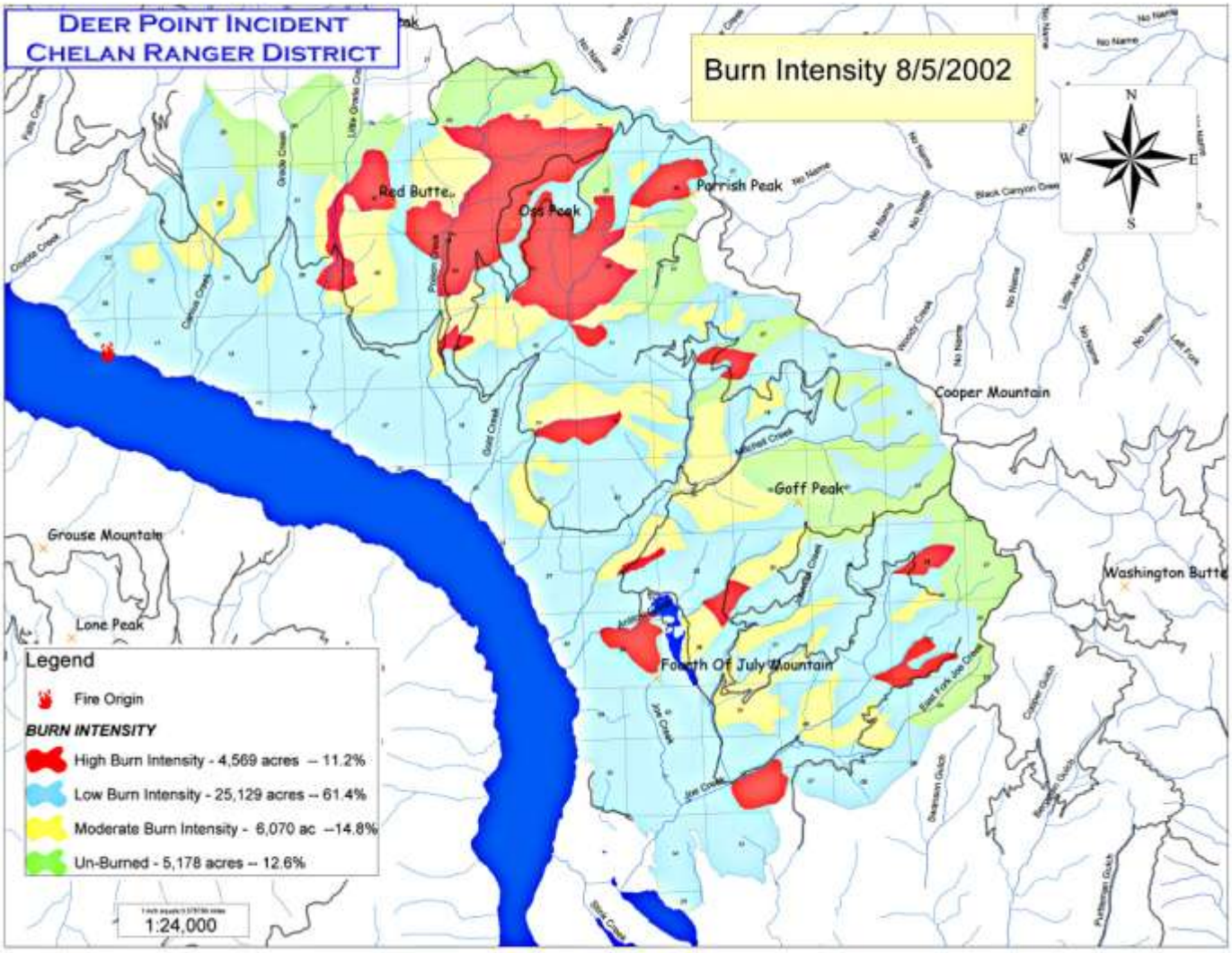
\s\ Sonny J. O'Neal

Sonny J. O'Neal
Forest Supervisor Date: August 15, 2002

Approved by:

/s/ Richard Sowa __8/21/02_____
Linda Goodman Date
Acting Regional Forester

Appendix A
Deer Point Fire
Burn Intensity



APPENDIX B
Seeding/Fertilizer Prescriptions
Deer Point Fire

8/15/02

The following seed mixs are recommended for the general situations outlined below. The pounds/acre is based on a desired broadcast rate of about 100 pure live seeds/square foot (PLS/SQ.FT) for small seeded plants. The cereal grain prescription requires many fewer seeds/sq. ft. due to the large size and higher success of grains. All seed must be "Prohibited and Restricted Noxious Weed Free for the State of Washington." All seeding rates should be determined on a pure live seed (PLS) basis. Certified "Blue Tag" seed is preferred. ACCEPT NO SEED WITH ANY NOXIOUS WEED CONTENT!

SEEDING PRESCRIPTIONS:

Note: For the seed mix, other species may be substituted in consultation with the Forest vegetation specialists.

Upland Perennial Seed Mix Specifications—Erosion and Competition for Noxious Weeds

- The seed mix listed below is for use to compete with weeds along roads and on firelines and safety zones.
-

Roads, (BAER cost); Firelines and Safety Zones (Fire Cost)

Species	**PLS Rate**	**Seeds/sq.ft.**	**Cost/lb**	**Total Cost/ac**	**Acres Treated**	**Total all BAER Cost/ac.**
Thickspike wheatgrass 'Schwendimar'	10 lbs/ac	36	$4.00/lb	$40.00		
big bluegrass 'Sherman'	1.5 lbs/ac	32	$5.50/lb	$8.25		
sheep fescue 'Covar'	2 lbs/ac	32	$3.50/lb	$7.00		
Soft White winter wheat 'Madsen'	16 lbs/ac	5	$.19/lb	$3.00		
Western Yarrow	.125 lbs/ac	7	$9.50/lb	$1.20		
Application Cost				$20		
Total	**29 lbs/ac**	**112 seeds/sq.ft.**		**$79.45/ac** Use $80	**205**	**$16,400**

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

Once grasses are established (spring 2003) the use of fertilizer is recommended for roads, firelines and safety zones.

- In the portions of the fire selected for erosion control seeding where weeds are also a concern (primarily the southeast portion of the fire [Johnson and Joe Creeks] and in the degraded area along Lake Chelan) use the following seed mix.

Species	**PLS Rate**	**Seeds/sq.ft.**	**Cost/lb**	**Total Cost/ac**	**Acres Treated**	**Total all BAER Cost/ac.**
Thickspike wheatgrass 'Schwendimar'	7 lbs/ac	25	$4.00/lb	$28.00		
big bluegrass 'Sherman'	1 lbs/ac	21	$5.50/lb	$5.5		
sheep fescue 'Covar'	1 lbs/ac	16	$3.50/lb	$3.5		
Soft White winter wheat 'Madsen'	16 lbs/ac	5	$.19/lb	$3.00		
Western Yarrow	.125 lbs/ac	7	$9.50/lb	$1.20		
Application Cost				$20		
Total	**25 lbs/ac**	**72 seeds/sq.ft.**		**$61.20/ac** **Use $61**	**2581**	**$157,441**

Note: Total acres for this mix includes—1181 acres in Joe, Johnson and Antilon drainages; 1200 acres along Lake Chelan; and 200 ac of private lands.

For the low intensity areas along Lake Chelan, an alternate seed mix that would be more favorable to wildlife is shown below. It is significantly more expensive due to the higher seed costs.

Species	**PLS Rate**	**Seeds/sq.ft.**	**Cost/lb**	**Total Cost/ac**	**Acres Treated**	**Total all Cost/ac.**
Thickspike wheatgrass 'Schwendimar'	3 lbs/ac	10	$4.00/lb	$12.00		
Bluebunch Wheatgrass 'Secar'	5	16	$12.00	$60.00		
Bluebunch Wheatgrass 'Whitmar'	3	9	$12.00	$36.00		
big bluegrass 'Sherman'	1.25 lbs/ac	26	$5.50/lb	$6.90		
Sandberg's Bluegrass	.75	16	$8.50	$6.40		
sheep fescue 'Covar'	2 lbs/ac	32	$3.50/lb	$7.00		
Soft White winter wheat 'Madsen'	16 lbs/ac	5	$.19/lb	$3.00		
Western Yarrow	.125 lbs/ac	7	$9.50/lb	$1.20		
Small burnet	.1 lbs/ac	.12	$2.50	.25		
Application Cost				$20		
Total	**31.25 lbs/ac**	**121 seeds/sq.ft.**		**$152.75/ac** **Use $153**		

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Upland Aerial Cereal Grain Seed Mix & Fertilization Specifications

Listed below is the seed and fertilizer prescription for the upland aerial erosion control treatments in Gold and Poison Creeks. The sowing of winter wheat and fertilization is proposed in order to increase vegetation cover and thereby better protect the soil resource from accelerated erosion. This proposed in order to reduce both sheet and rill erosion and sediment delivery..

Upland Seed and Seeding Specifications

Species	**Seeds/lb PLS**	**Rate (PLS) Lbs/ac**	**Seeds /sq.ft. PLS**	**Cost/lb**	**Total Cost/ac**	**Acres Treated**	**Total Cost**
Soft white Winter Wheat (Eltan or Bruehl)*	13,000	30	9	$.19/lb	$5.70	3800	$21,660
Application Cost (aerial or ground)					$20.00	3800	$76,000
Total		**30**	**9**	**$.19**	**$25.70 Use $26**	**3800**	**$98,800**

Other species may be substituted with consideration to availability, cost, persistence, native status and invasiveness.

Species Information

Species*	**Cultivar/Status**	**Attributes**
Soft White Winter Wheat Must be cold & snow mold tolerant	"Eltan" or "Bruehl"; Cold and Snow Mold Tolerant	Non-persistent; rapid upland soil stabilization

- ***FERTILIZER PRESCRIPTION (>3500'):*** **For Seeding High and Moderate Burn Intensity in Poison and Gold Creeks** *(and as needed for roads, firelines and safety zones)*

The fertilizer treatment recommended below is best applied in spring after seeded plants are established but other issues may require fertilization at the same time as seeding.

Fertilizer	**Gross lbs/ac**	**N lbs/ac**	**Total Cost/Ac.**	**Acres Treated**	**Total Cost**
Ammonium Nitrate Sulfate	134	40	**$20/ac**	3000	$60,000
Application Cost			**$50**	3000	$150,000
TOTAL	134	40	**$70**	**3000**	**$210,000**

Use 75% Ammonium Nitrate and 25% Ammonium Sulfate to get a 30-0-0-6 (N,P,K,S) mixture. Apply at the rate shown above. Fertilization should occur in early spring once seeded grasses are established and after weeds have been treated. Fertilizer will be used in upland treatments only in Gold and Poison Creeks where elevations all exceed 3500'. Fertilization of road competition seeding is recommended at the above rates if over 3500'. For elevations below 3500' where fertilizer is necessary (firelines, safety zones and roads) use half the amount of fertilizer shown. (See Appendix D for fertilizer rationale). A 300' buffer from perennial streams must be maintained. Fertilizer

Cost/ton = approx. $268.

Appendix C
Rationale for Seeding Treatments
Deer Point Fire
8/15/02

Aerial Upland Seeding Criteria

There are many grass and herbaceous plants that could be used to provide soil protection. However, criteria used for seed selection to best meet both BAER objectives and land allocation concerns for the Deer Point Fire included:

- Native or relatively short-lived introduced species preferred (so natives would come back)
- Use persistent plants only when native; or where competition with weeds an overriding concern
- Rapid developing
- Good ground cover
- High energy seeds
- Non-weedy
- Known to have been successful elsewhere
- Available in sufficient quantities
- Adapted to the sites
- Low cost-when compared to other equally effective plants

Past restoration work has sometimes used long-lived exotic pasture grasses for rehabilitation seeding. Often this seeding was successful in providing soil cover to thereby reduce erosion--but the seeded species commonly persisted for many years longer than required for short-term erosion reduction and sometimes inhibited re-vegetation by native plants. For the Deer Point Fire, natives or short-lived ephemeral plants are preferred; non-native plants will be used only when short-lived or when it is deemed critical to provide competition due to the significant weed populations in the area.

Based upon the above criteria, Forest Service plant materials specialists met and consulted with a number of individuals from various agencies to help discuss seeding and fertilization options for the Deer Point fire (Meeting notes in the analysis file). Seed suppliers were also quizzed concerning their ideas related to the use of various potential plants species. Forest Service staff also used literature review and previous experience (particularly from the 1988 Dinkelman fire, 1994 Tyee Complex Fires, 1998 N25 Fire, 2000 Hash Rock Fires and 2001 Rex Creek Fire) to develop the seed and fertilizer recommendations for the Deer Point Fire. The process of prescription development involved several iterations with numerous points of review before the final recommendations were developed. The seed mix developed for fall upland erosion control seeding in Gold and Poison Creeks uses cereal grains to provide two to three years of coverage (an appropriate variety of annual soft white winter wheat).

Noxious Weed Competition Seeding Criteria

Noxious weeds are a major concern in the fire area—particularly diffuse knapweed and Dalmation toadflax. Noxious weeds inhibit natural stand development and reduce natural biological diversity. 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). Weeds may also inhibit re-establishment of native plants including trees. Both knapweed and toadflax are well established in the area and will increase as a result of the open stand conditions. Seeding the known and potential habitat nearby will help to reduce both weed re-establishment and invasion into new areas.

It is well documented that vegetated sites are more resistant to weed invasion than sites devoid of vegetal cover. Sheley and others (1999) note that establishing perennial grasses to fill open niches can minimize re-invasion by rangeland weeds. Plant competition, grazing and fertilization can favor desirable species. Thill and others

(1999) found that competitive grasses can suppress weeds and that the selection of grasses should be appropriate to the site. Larson and McInnes (1989) noted that certain grasses were particularly effective at inhibiting encroachment of diffuse knapweed including sheep fescue, thickspike wheatgrass and big bluegrass.

Much of the same logic and criteria for the upland erosion control seeding were used for selecting plant materials (kind and amount) for competing with weeds on the Deer Point Fire. However, some other criteria were important as well. It was felt that annual seeded species would be unacceptable due to the need for long-term competition with weeds. Also, fertilization was avoided due to the likelihood that weeds would be favored more than the seeded species. As a result, the prescription for aerial and ground-based seeding for weed competition used perennial grasses without any fertilization (fertilization could occur in future once seeding is viable). The higher seeding rate of about 100 seeds/sq. ft. was chosen to improve likelihood of success--especially given the small size of these seeds when compared to wheat. The seeding along roads and in Johnson and Joe Creeks uses an aggressive primarily perennial mix to better compete with weeds and the critical area seeding just above Lake Chelan uses a third seed mix that is better adapted to that site. Refer to Appendix B for seed specifications and rates.

Appendix D
Rationale for Fertilizer Treatment
Deer Point Fire
8/15/02

The Deer Point Fire likely had a profound effect in volatilization of residual nutrient capitol of nitrogen (N), phosphorus (P) and sulfur (S) in portions of Poison and Gold Creek watersheds. These areas had high and moderate intensity burns due to excessive fuel loading from the 1970 fires. These parts of the Deer Point fire burned hot enough to totally consume the duff/litter layer, foliage, woody material less than 6 inches, and severely charred larger down woody debris (See photo below). Mineral soils were super heated creating discoloration. This level of burn intensity could severely reduce the nutrient capitol of these soils (Hungerford and others, 1990—p. 32; Baird, 1998). Furthermore, since little of the fine coniferous canopy remains (twigs, cones, and needles), there will be a long-term reduction in nutrient and organic matter input on these sites. This loss of future input of fine coniferous litter combined with the loss of the soil litter/duff layer will have a severe impact on the natural soils nutrient capital (Page-Dumroese and Harvey, 1990).

After the 1994 Chelan County Fires--where over 180,000 acres burned--some research addressed wildfire effects to nutrient capitals in burned and unburned stands. Nutrient losses to burned soils were estimated at 44% for N and 11% for S (Baird, 1998). These numbers are considerably higher for N than the 5-10% estimated by Tiedemann and others (1978). The volatilization and loss of sulfur on these sites after fire apparently limits plant growth. Klock and others (1971) found that using fertilizer that contains S significantly improved orchardgrass productivity in greenhouse pot studies on various soils. Additionally, Baird (1998) found (using bioassays with lettuce) that soils from fertilized areas resulted in 70-80% increase (compared to controls) in lettuce yield one year after the fire. This suggests that fertilization with Nitrogen and Sulfur improved short-term plant productivity. Increased plant productivity means increased plant cover and root growth—critical elements in potentially reducing soil erosion. In the field, where harsher conditions prevail, the availability of moisture may limit this response.

Additionally, in areas that experienced high and moderate intensity burns, many to most of the native vegetation has been killed either through burning of the foliage and/or because of intensive heating of the surface soil horizons. Loss of this vegetation leaves the soil surface unprotected should a high intensity storm event occur. Seeding and fertilization help to establish vegetative cover where the resident plants have been destroyed by fire and consequently will be delayed in re-colonizing the site. Establishing vegetal cover helps to stabilize the soil surface and prevent accelerated soil erosion. Refer to Appendix B for the fertilizer prescription.

One unusual advantage of fires in this area are that a number of research projects have addressed the efficacy of seeding and fertilization as erosion control measures in north-central Washington (Klock, 1982; Klock and Grier, 1979; Klock and others, 1975; Klock, 1969; Klock and others, 1971, Tiedemann and Klock, 1973; Tiedemann and Klock, 1977; Everett and others, 1990; Baird, 1998; N25 Fire monitoring report, 2000). Further, some work done in north central Washington addressed the effect of fertilization on water quality and stream ecology (Tiedemann and others, 1978, Tiedemann, 1973; Tiedemann and Helvey, 1973). Review of this work, personal communication with a number of the authors and field observations on other fires led to the following conclusions:

- Erosion control seeding can be effective in providing rapid vegetal cover and thereby reduce soil loss;
- Fertilization should result in greater biomass and better root development of seeded and residual native plants;
- Fertilizer application should provide a readily available form of N but avoid phosphorus (a plant macronutrient with more significant water pollution concerns in Lake Chelan);
- Fertilizer should contain some sulfur to ameliorate the lack of that nutrient in the soils of this area;
- Fertilization should not result in detrimental increases in stream nutrients even when fertilization involves the whole watershed with twice the application rate for N than is being proposed for Rex Creek (Tiedemann and others, 1978). Direct application of fertilizer to streams and wet areas can be successfully avoided by use of buffer zones;

- A starter fertilizer is a critical component for seeding success (particularly in reference to fire line stabilization) (Klock, 1969).

Agee in his book on fire ecology concluded that evidence for fertilization was inconclusive and likely not worth the cost (Agee, 1993). However, Agee's conclusions are not in total agreement with other literature and research conducted in the Deer Point Fire vicinity. Personal communication with several of the listed authors (who spent many years conducting site specific research mostly in the Entiat area) and anecdotal information following the Dinkelman Fire (1988), the Tyee and Rat/Hatchery Complexes (1994) and the North 25Mile Fire (1998) suggested that fertilization was a critical step in vegetation re-establishment. For the Deer Point Fire, although 50 #/acre of actual N was considered, 40#/acre was prescribed in areas with higher precipitation (>3500').

Some work has been done in this area that addresses the kind, amount and potential effects of fertilization after wildfire. The 1970 Wenatchee fires received a lot of attention by Wenatchee Forestry Science Lab personnel and some work by local scientists prior to the fires is also germane. Art Tiedemann (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 very similar to the current fire area (Klock, 1969; Klock, 1982; Klock and others, 1975; Klock and others, 1971; Tiedemann, 1973; Tiedemann and others, 1978; Tiedemann and Klock, 1976). Although they conceded that their measurement methodology was not sensitive enough to statistically validate the fertilizer's efficacy, they and both Phil McColley (forest soil scientist-retired) and Darlene Zabowski (research soil scientist) were convinced that fertilizer use improved vegetation establishment and vigor. They all suggested that fertilizer was the most effective treatment--even more than seeding.

Additionally, BAER effectiveness monitoring for the 1998 North 25 Fire indicated that fertilizer treatment was the only treatment that resulted in significantly higher vegetation cover. It is expected that fertilization will substantially improve the vigor and growth of seeded and surviving native plants. In addition, upland fertilization will not exacerbate weed problems since the proposed treatment areas generally have low noxious weed population levels or will receive more intensive manual control work.

Fertilization – Water Quality Concerns:

Water quality in the Lake Chelan sub-basin is critical for many uses including municipal and domestic water supply, agricultural uses, aquatic habitat, recreation and aesthetics. Lake Chelan is a major recreation destination of national significance. In the Rex Creek fire area, several drainages support small, domestic water supply systems servicing private lands along the lakeshore. In addition to the valuable lake fishery, tributaries in the burned area contain important populations of rainbow and westslope cutthroat trout. Implementation of the Lake Chelan Water Quality Management Plan is an on-going, cooperative effort targeted at protecting water resources (WA DOE, 1989).

One of the major concerns in the Lake Chelan Water Quality Management Plan is human-caused acceleration of eutrophication. Water quality studies have shown that phosphorus is the principle nutrient limiting primary production in the Lake. The Plan calls for implementation of efforts to reduce human-caused phosphorus loading and requires a minimum level of monitoring to detect any changes in phosphorus levels with respect to established threshold levels of concern (WA DOE, 1989).

Concern has been expressed regarding the proposed application of fertilizer as part of the Deer Point Fire BAER prescription. BAER fertilizer applications on fires in the area since 1989 have ranged from 20 to 50 lbs of N per acre. The Deer Point Fire BAER prescription calls for aerial application of ammonium nitrate sulfate (30-0-0-6) on approximately 3800 acres to improve establishment of seeded species and enhance the cover of surviving native plants (2,500 acres high intensity + 1,900 moderate intensity). The proposed fertilization rate results in application of 40 lbs of actual N per acre (Refer to Appendix B for the fertilizer prescription). The prescription also calls for a small component of sulfur—a critical limiting nutrient for plant growth in these soils. The fertilizer compound being applied does not contain phosphorus. As with past BAER projects, the direct application of fertilizer to streams will be avoided via the use of buffer zones.

As discussed above, research in the area has documented that, relative to background conditions, wildfire exerts pronounced effects on the nutrient status of ecosystems (Tiedemann and others, 1978). Nitrogen is lost from the system via volatilization and in solution, with N inputs from precipitation helping to offset some of this loss. This research also indicated that water quality effects from post-fire fertilization for erosion control in response to the 1970 Entiat fires were

negligible (no exceedances of EPA drinking water quality criteria). Fertilizer application on burned areas in this research study involved a rate of over 50 lbs of actual N per acre applied using equipment less capable of observing stream buffers (fixed wing aircraft).

In this study, the lack of large increases in nitrogenous constituents in solution that could be attributed to fertilization was considered to be an indication of the relatively high degree of chemical retention capacity in the study watersheds, despite the disturbance of wildfire. The rapid development of native plant and seeded grass cover—and accelerated re-establishment of nutrient cycling---was considered to be primarily responsible for the observed nutrient retention capacity. More recent work evaluating productivity responses from the 1994 Tyee fires indicates that post-fire fertilization with N and S could increase soil productivity where other environmental factors do not limit growth (Baird, 1998).

Given research findings and field observations, the prescribed fertilizer composition (lacking phosphorus), moderate rate (40#N/acre), application technique (helicopter) and application constraints (stream buffers) are considered to pose a low risk of water quality degradation from fertilizer use in fire-affected tributaries. This low risk of adverse effects from fertilization is countered by the much greater potential benefit to be obtained in treated areas as a result of the rapid stimulation of vegetative growth. This stimulation will have the beneficial effect of promoting nutrient retention on-site (reduced loss via reduced soil erosion and accelerated uptake). Timeliness of vegetative establishment is a major factor in reducing erosion and nutrient losses, maintaining soil processes and maximizing nutrient cycling (Everett and others, 1990).

One of the few gently sloping areas in the Deer Point Fire. Notice the soil discoloration.

Appendix E
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