USDA Forest Service Date of Report: August 18, 2006

FLICK CREEK FIRE

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: **Flick Creek** B. Fire Number: **WA-NCP-213**

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

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

G. District: **Chelan Ranger District & North Cascades National Park** H. Fire Incident Job Code: **PP1CLS**

I. Date Fire Started: **7-26-2006** J. Date Fire Contained: **Unknown-50% contained on 8/13/06***

K. Suppression Cost: **$ 2.08 Million (8/16/2006 ICS 209 Report Projection)**

* Containment: None predicted on 8/5/2006 ICS-209

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

1. Fireline waterbarred (miles) **0 miles (8/16/2006 ICS 209 Report)**
2. Fireline seeded (miles) **0 miles (8/16/2006 ICS 209 Report)**
3. Other (identify) **Spike camp, helispot**

M. Watershed Number: **1702000902 (Lake Chelan)**

N. NFS Acres Burned: **1010** Total Acres Burned**: 4,350 (8/14/2006 ICS-209 Projected 6000 acres)**
Ownership type: **National Forest system lands and National Park Service lands. Minor amount of private in-holdings along the lakeshore. Most of projected burn acres will be on the National Park lands.**

(3250 acres)NPS (90 acres)PVT

O. Vegetation Types: **: Low elevations: Ponderosa Pine and Douglas-fir Zones with bunchgrasses on southerly aspect with some overstory; Northerly aspects support closed canopy forests with pinegrass and other more mesic species. Elevations from about 4000-6000' support Subalpine Fir Zone conifers in closed canopy forests except on extremely rocky or southerly aspects. Elevations over 6000' are mostly parkland or meadows.**

P. Dominant Soils: **Relatively shallow soils with a surface layer of volcanic ash/pumice over coarse textured subsoils; soils 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**

Q. Geologic Types: **igneous units (Granodiorite) and metamorphic units (Gneiss): landforms are oversteepened glacial troughs developed from continental and alpine glaciation; with small debris fans occurring at the mouth of each tributary to the lake.**

R. Miles of Stream Channels by Class:

II- .9 miles **III- 2 miles** **IV- 8.25 miles**

S. Transportation System: Inside fire perimeter

Trails: **5.0** miles Roads: **0** miles

PART III - WATERSHED CONDITION

A. Soil Burn Severity* (acres): (low or unburned-86%) **2560** (moderate 10%) **1200** (high-4%) **540**

***Soil burn severity was delineated on an 8/11/06 reconnaissance flight and fire size (4300 acres) was taken from the 8/15/2006 ICS 209 Report. BARC mapping was used for the initial severity map. Expect that the low burn severity acres will increase in upper Fourmile Creek watershed as the fire is allowed to burn to the rocky ridgelines. See Burn Severity map in Appendix A.**

B. Water-Repellent Soil (acres): **none observed, however volcanic ash has non wettable characteristics when dry.**

C. Soil Erosion Hazard Rating (acres):

134 low **874 Moderate** **3342 high** ** (See Appendix A-Map)

**Most of the private land is located on alluvial fans or glacial terraces with slopes less than 20% and relatively low surface erosion rates. The upper watersheds are generally extremely steep with about 50% of the watersheds exceeding 60 percent slopes. These upper watersheds have high erosion rates or high runoff rates where little soil exists. Flick Creek and Fourmile Creek subwatersheds are administered by the National Park Service. Lands burned in the Fish Creek and Hunts Creek subwatersheds are administered by the Okanogan and Wenatchee National Forests.

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 recurring debris flows that deposit relatively coarse sediment directly into stream channels.

These shallow, rapid debris flows are a natural hydrologic process on the mountain slopes surrounding Lake Chelan. The burned area occurs predominately on glacial troughs that also served as melt water drainage during continental and alpine glaciation. Consequently, these drainages are very steep and rocky. Natural (pre-fire) landform sediment delivery and routing efficiency (90%) is considered very high but episodic. Runoff is routed rapidly into a series of parallel first-order channels that form a dense network of tributary streams. Runoff from these tributaries can be flashy. The major source of sediment delivery is in the form of debris flows from tributary streams or first order debris chutes into the main channels. This delivered sediment has contributed to and continues to contribute to the formation of debris cones and alluvial fans (characterized by sediment size and steep slope) at the mouth of subwatersheds. Over the centuries, a considerable amount of suspended and bedload sediment has been deposited into Lake Chelan. Due to the depth of the lake many subwatersheds deposit debris as steep debris cones. Most of the deposited material of these cones are under water. Alluvial fans and deltas are much less steep. Larger debris flow deposits, such as at Fourmile Creek and Flick Creek, tend to gradually heighten their debris cones by channel aggradation and overtopping which can cause new channels to form. The low gradient alluvial fans such as at Fish Creek, display depositional features indicative of channel migration across the fan. Structures on active cones and fans are at risk of being damaged or destroyed during a debris flow event.

Relatively large debris flows trigger pulses of episodic sediment delivery. Normally debris flows occur in response to dramatic changes in vegetation due to landscape level fires and/or from intense early summer thunder storms (see Part IV). Based upon local fire history, increased erosion rates induced by fire will substantially elevate the risk of debris flows for at least the next 5 years. Higher surface erosion rates will increase the rate of debris failures in the drainageways and ephemeral dissections. The Flick Creek Fire will increase the risk of debris flows, especially in Flick Creek and Fourmile Creek. Less extreme precipitation and snow-melt events can trigger debris failures. The figures listed above (D & E) reflect the contribution of delivered sediment from these debris flows over the design frequency (10 years).

PART IV - HYDROLOGIC DESIGN FACTORS

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

B. Design Chance of Success: **85** 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: **40** cubic feet/second/square mile

Footnotes
(*1) Design flow assumptions: (a) A short duration, high intensity, convective storm event is identified 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); (c) Selected a 10 yr Return Interval, 30 minute event--similar to those that have impacted other large burns near this area (Silica, Crum Canyon, Dinkleman, Tyee, Rex, Pot Peak, Deep Harbor, Deer Point, North 25 fires).

(*2) Estimated range in reduction in infiltration (item G) in the Flick Creek 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 (minimal, if any, classic hydrophobicity).

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats

1. Critical Natural/Cultural Resources (FSM 2523.2 including water quality)

The following summary describes the conditions that warrant emergency rehabilitation actions with regard to the Flick Creek Fire.

Site Productivity: The inherent soil productivity is low for the Flick Creek fire. Soils are derived from hard crystalline igneous and metamorphic bedrock units (granite 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. Glacial erosional and glacial fluvial processes have also had a major role in soil development on the landscape. Portions of some slopes may have glacial till deposits and surface soils include volcanic ash. Soil depths are relatively shallow with abundant rock outcroppings on troughwalls and moderately deep on glacial till deposits and alluvial fans (Appendix B).

Continental climatic conditions often limit available soil moisture. Soil moisture (except in valley bottoms) is often a limiting factor to plant growth on the rocky, often southern exposures that

predominate in the fire area.

Fire effects can also have a direct influence on the long and short-term accumulation of organic matter. About 2500 acres of the Flick Creek fire experienced low soil burn severity (Appendix A). Where the fire burned with a low fire severity no adverse effect on organic matter input in the short term or long term is expected. However, areas with high soil burn severity will likely reduce nutrient availability in the short and long term. The Flick Creek Fire likely had some effect in volatilization of nitrogen (N), phosphorus (P) and sulfur (S) in a portion of Flick Creek and Four-mile Creek. In the high and moderate soil burn severity areas the duff/litter layer was consumed, most of the foliage and fine twigs were removed from conifers, and larger downed woody debris was severely charred (Appendix A).

There are numerous snags in the burned area that will eventually fall. 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). However, if the natural fire return interval occurs, this downed wood would be exposed to at least three ground fires. Hence, large downed wood on these sites will likely be consumed or reduced by fire before becoming organic matter incorporated into the soil.

Invasive Plants: Another very unique threat to biodiversity and wilderness value from this fire is the presence of the Class A noxious weed common crupina (*Crupina vulgaris*) within the burned area. The only population of crupina in Washington State is here on the north shore of Lake Chelan (See Appendix B). State law requires the eradication of Class A noxious weeds. The Flick Creek fire burned part of this known infestation. This plant currently infests about 500 acres in and adjacent to the Flick Creek Fire area. After the 2001 Rex Creek Fire, burned populations were documented to increase in size and density as a result of the decreased canopy and ground cover. Also, there is much concern that additional open niches provided by the Flick Creek Fire will allow crupina to significantly expand from the Fish Creek – Moore Point area into the burned areas of Lake Chelan National Recreation Area.

In the short term, the fire will reduce overall vegetative cover, providing an opportunity to locate more crupina plants to speed and improve control of crupina in the burned areas. Over 1.25 million dollars have already been spent on the Okanogan and Wenatchee National forests to control Crupina. Due to the inaccessibility of this area, predicted control and monitoring treatments are expensive (Appendix C). Additionally, control of crupina and other weeds on adjacent burned private lands is critical to assure long term success on all lands in the area—hence the need for Wyden authority (Appendix C).

Class B noxious weeds are also present in the project area and include *Cytisus scoparius* (Scotch broom), *Centaurea diffusa* (diffuse knapweed), *Centaurea biebersteinii* (spotted knapweed). These species have been hand-pulled and grubbed in campsites associated with boat docks at Prince Creek and Moore Point. Scotch broom is now pulled as it is discovered on other National Forest System land. Class C weeds in the area include *Cirsium arvense* (Canada thistle) and *Convolvulus arvensis* (field bindweed). Weeds in the project area on the Washington State monitor list include *Verbascum thapsus (common mullein).* These species have been shown to have increases in population size, frequency and density after fire.

Many non-native, undesirable plant species not on noxious weed lists grow along trails in the area infested with crupina. These species include: *Taraxacum officinalis* (dandelion), *Tragopogon dubius* (yellow salsify), *Erodium cicutarium* (cranes bill), *Dactylis glomerata* (orchard grass), *Cirsium vulgare* (bull thistle), *Equisetum arvense* (horse-tail fern), and *Lactuca serriola* (prickly lettuce). Non-native annual grasses, primarily *Bromus tectorum* (cheatgrass), *Poa bulbosa* (bulbous bluegrass), and

*Festuca vulpia (*slender fescue) commonly grow with crupina.

Scotch broom, crupina and cheatgrass are fire adapted species and typically increase after fire. Both diffuse and spotted knapweeds also deal well with fire.

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 Flick Creek burned area, some drainages support small, domestic water supply systems servicing private homes along the lakeshore.

Water quality parameters most affected by the Flick Creek Fire are sediment loading, nutrient loading and stream water temperature. Stream sediment loading in fire-affected tributaries is expected to increase because of higher hillslope erosion rates for dry ravel and rilling which can increase debris slides and attendant debris flow activity. Ash, fine sediment and woody debris delivery and transport will increase during snowmelt runoff and the large rainstorm events. Periodic delivery of larger bed materials and woody debris is associated with the largest rainstorms. Debris slide/debris flows are discussed in more detail in the section on Life and Property. Increased erosion and routing of material to streams is expected for at least the next two to three years after the fire and then decline. The perennial and intermittent streams and ephemeral draws will continue to accumulate material. The amount of material present is directly proportional to the risk of failure and downstream delivery. Therefore, as time progresses and material aggrades, the risk of failure continues to increase until the debris is cleared.

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. Both nitrogen and phosphorus are lost from the system, especially in the high soil burn severity areas. 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 re-established. Elevated nutrient concentrations of runoff into Lake Chelan will be diluted to insignificance by the volume of the lake. Rapid development of vegetation in the burned area is critical to the re-establishment of the tight nutrient cycle in these forested watersheds. This alteration of nutrient cycling and re-establishment is a natural process associated with wildfire disturbance.

Water temperatures may increase significantly in the fire-affected stream reaches where the riparian canopy was burned. Experience suggests that riparian shrubs and herbaceous plants will rapidly re-sprout in those areas where root systems survived. This fire-influenced shift in temperature regime will persist until sufficient riparian canopy is re-established over the next two-three years to provide shade during the critical summer months.

*2. **Threats to Human Life, Safety and Property***

The values at risk include houses, docks, water intakes, trails, trail bridges, and campgrounds. The effect of the fire has increased the risk to both these values and human life—primarily in areas that are predisposed to mass failure events (e.g., recreation sites and private homes on debris cones and alluvial fans). Most of the private lands and all of the campgrounds are located on alluvial fans or debris cones. The subwatersheds of Flick Creek and Four-Mile Creek are administered by the National Park Service while Hunt's Creek and Fish Creek are administered by the Forest Service.

Due to the national, regional and local attraction of Lake Chelan, homeowners and recreationists will continue to use these facilities following the Flick Creek Fire. Even with temporary campground

closures to reduce the threat to recreationists, people will continue to use the alluvial fans and debris cones that are at risk to severe flooding and/or debris flows. The threat to these areas was present prior to the fire and the fire has now elevated that risk.

The predominant erosion processes are not surface erosion but rather mass failures that are typically shallow and rapid in nature. Log erosion barriers, straw wattles and helimulching are not appropriate hillslope treatments in the burned watersheds to reduce this risk because: (1) slopes are too steep and rocky for these treatments to be effective in trapping sediment or reducing concentrated flows and (2) these treatments are not effective in reducing mass failure processes. Channel treatments are also not appropriate for these high gradient perennial, intermittent and ephemeral stream systems.

As previously described, the upper watersheds are comprised of extremely steep, rocky glacial trough landforms which are at an elevated risk for debris failures in streams and tributary channels. Due to impaired watershed conditions, remaining snags will break and fall or become wind throw. Increased amounts of large woody material, in upper debris tracks and stream channels, will become incorporated in the debris slides for which the risk is likely to increase. Post fire debris accumulations increases the risk of debris failures in upper watershed channels which will pass additional soil, rock, and woody debris into lower stream reaches. This added debris will eventually be swept downstream onto the debris cones and alluvial fans at the stream outlets. Also, this added debris can form in-channel debris jams which can either breach and blowout during a flood surge, causing a surge of material to redeposit downstream, or divert flow across cones or fans, forming new channels.

These types of debris failure occurred on Lake Chelan following the 1970 fires (1972, 1974). A surge of flood debris washed out two dock facilities and a campground. Debris flows in 2006 along Lake Chelan came out of Canoe Creek (2001 Rex Creek Fire) and Big Creek (2004 Deep Harbor Fire). Fortunately no lives were lost, in part due to administrative closures of National Forest System lands in Lake Chelan. Unfortunately, four fatalities occurred in the adjoining drainage (Entiat Valley) following the same type of flood event after the 1970's fires.

The shelter at Flick Creek and the private residences and dock facilities at the mouth of Fourmile Creek, Flick Creek, and first order stream alluvial fans are at somewhat increased risk due to the fire. However, since the most damaging erosional processes are more deep-seated (rather than surface erosion driven) it is unlikely that available upland treatments would significantly reduce this risk. It is fortunate, however, that burn severities were generally low in the fire area. Flick Creek experienced the highest percentage of moderate (21%) and high severity (9%). There may be some treatments that private landowners can apply on their lands to reduce the likelihood of damage from flood/debris flow events. The Natural Resources Conservation Service has been contacted and is willing to work with homeowners on appropriate practices and participate in public meetings.

Floating woody debris in Lake Chelan poses a public safety hazard. Following the 1972 storm events, log booms were installed at the mouths of several drainages to function as a catchment to retain input of floating debris. Following the period of record peak flow of the Stehekin River in November 1995, public outcry resulted in the emergency expense of over $400,000 to collect and dispose of woody debris that had been flushed into the lake. Log booms were installed following the 2004 Deep Harbor Fire which later captured wood and campground remnants washed out of Big Creek during flood events in 2006. Log booms are effective in mitigating floatable debris effects to Lake Chelan. No booms are being proposed here since the fire severity is generally too low to justify this treatment.

3. *Wilderness Issues and Values*

Most burned area in the Flick Creek Fire is located within the Chelan-Sawtooth wilderness, the Stephen Mather Wilderness and/or North Cascades National Park (see Appendix A map). Many of the main drainages in the burned area have private land holdings at the mouth that are at significant risk from flood/debris events. Further, these drainages flow into Lake Chelan--noted for its excellent water quality. Issues related to the maintenance of wilderness values were evaluated during the BAER treatment development process. On Park Service Lands a Minimum Requirement Analysis (MRA) will be completed prior to implementation of any treatments within wilderness boundaries.

An EIS that addressed herbicide use to control noxious weeds in this area has been completed by the Forest Service. Additional Forest Service direction related to wilderness and BAER is found in FSM 2323 (specifically FSM 2323.43b) and in FSH 2509.13 section 26.6. Please see Appendix D for a summary of this direction.

B. Emergency Treatment Objectives:

The application of the BAER treatments assists natural recovery and minimizes on-site damage to values at risk. The non-structural land treatments proposed for weed control helps to maintain site productivity and ecosystem function by inhibiting weed establishment and spread. This is done by Integrated Weed Management that includes manual and chemical control methods on the National Forest to further reduce Crupina in the burned areas in the infested portion of Fish Creek. An invasive plant monitoring treatment will be applied to survey for any new populations on NPS and FS lands. Monitoring will also be used to assess the effectiveness of weed treatments on lands where weeds are controlled.

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

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

D. **Probability of Treatment Success**

	<----Years after treatment----->		
	1	3	5
Land	80%	75%	75%
Channel	NA	NA	NA
Roads/Trails	90%	90%	90%
Other(Cultural)	90%	95%	95%

E. Cost of No Action (Including Loss): **$1,993,750**

F. Cost of Selected Alternative (Including Loss): **$1,201,370**

G. Skills Represented on Burned-Area Survey Team:*

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

**The BAER Assessment team included resource specialists from both the National Park Service and the Forest Service.*

Team Leader: **\s\ Terry Lillybridge**

Phone: **(509) 664-9233** Electronic Address: **tlillybridge@fs.fed.us**

H. Treatment Narrative:

Overall Goal of Proposed BAER Treatments: To complete a combination of treatments to reduce weed populations (thereby enhancing native plant recovery), provide for cultural site protection and for safety and access for BAER implementation teams and the public.

Land Treatments

Purpose – Noxious Weed Control and Monitoring Treatments: To reduce the post-fire potential for significant Invasive Plant population increases in the burned area and hence to encourage recovery of natural vegetation. The entire known population of the Class A noxious weed Common crupina (*Crupina vulgaris*) in the state of Washington is within and adjacent to the Flick Creek Fire area (Appendix B map). The Okanogan and Wenatchee NFs and their cooperators have already spent over one million dollars to keep this weed from spreading to other areas. It is expected that common crupina and other invasive plants will increase in the fire area. Treatments are intended to maintain ecosystem health by reducing weed populations and preventing spread-- thereby encouraging natural vegetation recovery. In order to be successful, new populations need to be located quickly and prevented from spreading. Three years of effectiveness monitoring and maintenance of treatments will be necessary. It is also critical to provide weed treatment on private lands using Wyden authority (Appendix C) so that federal lands are not re-infested from untreated private lands. All weed monitoring and treatments are especially costly due to the inaccessibility of the area (Appendix C).

Treatment #L1-Manual or Chemical Control of Invasive Plants: Early spring control of known and newly discovered populations of Common Crupina and other Invasive plants by hand pulling or chemical treatment (where appropriate and allowable). If there is an environmental document in place that covers this, it might be good to reference it.

Treatment # L2-Survey~~Monitoring~~: Invasive Plant populationsns~~ns and treatments~~. This treatment provides for fall and spring surveys ~~3 years of monitoring~~ of invasive plant ~~nt control treatments and~~ populations.

Treatment #L3: Invasive Plant Control-Private. Use Wyden authority to fund Invasive plant control on nearby private lands. These treatments are needed to keep weeds from re-infesting federal lands from untreated private lands. Spring and fall treatments would occur for 1 year. It is likely that these treatments will require maintenance for the full three years. Completion of private land treatment is based on getting approval to use federal funds via a Wyden Amendment agreement. Without private land treatment, the treatments on National Forest System lands will be compromised.

Comment [F1]: Survey and monitoring should be separated. We monitor the effectiveness of treatments and can retreat up to three years based on what we find. We survey to determine where and how much to treat during the first year after fire containment.

Treatment #L4: Cadastral Survey of Private land boundaries. This is needed since actual boundary lines are unclear on the private lands adjacent to both the NPS lands and National Forest System Lands and it is important that treatments are done on the proper lands. This will also help the private landowner to know where they can apply treatments. Four parcels need to be surveyed adjacent to NPS and 2 adjacent to FS.

Treatment: Provide Trail Access for Noxious Weed Treatment Work: See Treatment #S1 and S2 under Safety and Access Treatments (below).

Safety & Access Treatments (BAER Employee and Public)

Purpose: Implement actions to allow for BAER implementation treatments along the Lakeshore Trail

and to provide for safety of our publics and the BAER implementation teams. These treatments are intended to provide access to complete various BAER treatments and monitoring along the lakeshore trail and to reduce the risk to personnel. (Incidentally, this will also reduce the risk to the public associated with trail use).

The Fourmile Creek trail bridge replacement is necessary for work in the spring since the flow in Fourmile Creek during that season makes crossing impossible without a bridge. The logistics of using a boat to bypass the stream is also both impractical and a safety issue.

Most of the trails in the Lake Chelan Recreation Area on the North Cascades National Park have not experienced a landscape scale fire since their construction. The fire has removed some of the woody material and duff in burn area, which will result in hillslope raveling (soil, rock, and logs) that is expected to fill trail tread in some locations. In addition, in some trail sections, the trail shoulder has been supported by shrub and tree roots which were 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 federal personnel and the public. Finally, tree mortality and fall across the trail will require logging out of the trails several times each year. Most trees fall in winter and spring.

Two information meetings are planned (Stehekin and Chelan). These will include our publics, NPS, USFS, NRCS and Chelan County Sheriff's personnel. Signing is also planned to help educate and inform the public.

Treatment #S1--Improve Trail Drainage, Tread and Logout: Install drain dips, improve tread and logout on 5.0 miles of trail to provide access for BAER treatments and to reduce the potential for runoff concentration and accelerated surface erosion from anticipated fire effects. Trail work will follow established park or National Forest trail standards (Covers the 3 years for BAER treatment and maintenance).

Treatment #S2–Footbridge Replacement: The Fourmile Creek Bridge has been burned and requires replacement to provide access for BAER treatments.

Treatment #S3–Trail and Campground Hazard Tree Abatement: As per new direction inventory for and remove high hazard trees along the Lakeshore Trail.

Treatment #S4–Hazard warning signs, public information meetings: Install hazard signs, produce information packages and hold public meetings to raise awareness of hazards for those visiting or living to the fire area.

Structural Treatments

NONE PLANNED.

Cultural Site Treatments

Purpose: To protect cultural sites from damage due to fire caused effects.

Treatment #C1–Remove Hazard Trees: Remove 32 trees that are both hazardous to the public and also threaten both a National Register Listed historic structure (Flick Creek Historic Shelter) and Field Site 292. Includes felling, bucking, piling and burning and cultural resource supervision of the process.

Treatment #C2–Soil/slope stabilization: Remove loose rock in the drainage above the Flick Creek Shelter and use woodstraw mulch on the burned area immediately above the shelter.

Treatment #C3–Trail Construction: Construct 50 feet of trail to direct foot traffic away from sensitive cultural site.

Monitoring

Implementation monitoring will be completed for all BAER treatments. Specifics of these activities will be outlined in the final BAER report. Cost estimates in Part VI for monitoring are preliminary. Implementation and effectiveness monitoring of Cultural Treatments are included as a line item in Part VI. Noxious Weed Monitoring is also included as a separate itemized treatment and the costs are displayed on Part VI. Implementation monitoring of other treatments will be done as treatments occur and the costs have been included as part of the treatment costs.

Comment [F2]: Again, I think we should separate treatment effectiveness monitoring from survey and list it under the monitoring section. Request funding for one year. Ask for more next year if you need it. Need to take monitoring out of L2 and list in monitoring section on Part VI.

BAER Evaluation

BAER Survey Cost: The estimated cost of BAER Assessment and preparation of the Initial Burned Area Report is listed in Part VI of the 2500-8. These have been added to the total for the NPS but not for the Forest Service. Application of the proposed treatments will require the development of an Implementation Plan. More specific information related to proposed treatments is in the BAER Survey analysis file.

BAER Cultural Resource Survey: Field inspection of all known cultural resource sites were conducted as part of the BAER assessment process. Additional assessments prior to and during implementation of BAER treatments will be required on Cultural Resource site FS-292 on Park Service lands.

NPS BAER Implementation Coordinator

The Park service typically designates and includes a line item to cover the costs of a BAER Implementation Coordinator. This is included as an NPS line item on the Part VI spreadsheet.

	PART VI--2500-8							
	8/18/06 1430			NFS Lands			NPS Lands	All
			Unit	# of	WFSU	# of	Fed	Total
Tmt #	Line Items	Units	Cost	Units	SULT $	units	$	$
	A. Land Treatments							
	1) Invasive Plant Treatments							
L1 1/	IWM of Invasive Plants **(NPS)**	Ac	$ 175	0	$0	225	$39,375	$39,375
L1 1/	IWM of Invasive Plants **(FS)**	Ac	$ 252	170	$42,840	0	$0	$42,840
L2 1/	Monitoring of Invasive Plants (3 yr) **(NPS)**	Ac	$ 65	0	$0	2700	$175,500	$175,500
L2 1/	Monitoring of Invasive Plants (3 yr) **(FS)**	Ac	$ 67	2040	$136,680		$0	$136,680
L3 2/	Private Land Control (Wyden)	Ac	$ 250	40	$10,000	40	$10,000	$20,000
L4	Cadastral Survey (times # of parcels)	ea	$ 6,500	2	$13,000	4	$26,000	$39,000
	Subtotal Land Treatments				$202,520		$250,875	$453,395
	B. Channel - Riparian Treatments							
	Subtotal Channel - Rip. Treat.				$0		$0	$0
	C. Safety & Access Treatments							
3/4	Provide Trail Access for BAER							
S1	Trail Drainage, Tread & Logout **(NPS)**	Mi	$12,000	0	$0	3	$36,000	$36,000
S1	Trail Drainage, Tread & Logout **(FS)**	Mi	$ 9,000	2	$18,000			$18,000
S2	Footbridge Replacement	ea	$10,850	0	$0	1	$10,850	$10,850
S3	Hazard Tree Abatement	ea	$ 7,990		$0	1	$7,990	$7,990
S4	Hazard Signs and Public Info	ea	$11,800		$0	1	$11,800	$11,800
S4	Hazard Signs and Public Info	ea	$ 4,000	1	$4,000			$4,000
	Subtotal Road & Trails				$18,000		$66,640	$88,640
	D. Cultural Site Protection							
C1	Remove Hazard Trees-site protect	ea	$ 645			32	$20,640	$20,640
C2	Slope stabilization(Woodstraw)	Ac	$ 5,670			1	$5,670	$5,670
C3	Trail Construction	Ft	$ 60			50	$3,000	$3,000
	Subtotal Structures				$0		$29,310	$29,310
	E. BAER Evaluation							
5/	**1) BAER Assessment Cost**				$15,035		$22,228	$22,228
6/	**2) BAER Cul Res Site Assess.**				$0		$5,460	$5,460
	G. BAER Monitoring (Cultural)				$0		$16,575	$16,575
	H. BAER NPS Implemetation Coord.						$35,075	$35,075
	I. Totals				**$220,520**		**$382,418**	**$650,683**

NOTE: TREATMENTS LISTED TWICE ARE TO REFLECT UNIT COST DIFFERENCES BETWEEN FS AND NPS.

1/ Refer to Appendix C for discussion of the proposed noxious weed control treatment. Most ground-based weed control costs are crew or logistics costs.
2/ Funding for this will require approval under the Wyden amendment
3/ Total cost of providing safe trail access for weed control work (Lakeshore Trail)
4/ Total cost of trail work estimated by NPS Resource personnel
5/ FS part not included in total; NPS part included in total
6/ Included in total

PART VII - APPROVALS

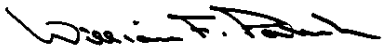
FLICK CREEK FIRE

Recommended by:

/s/ *James L. Boynton*

JAMES L. BOYNTON
Forest Supervisor Date: 8/22/06

Recommended by:



WILLIAM PALLECK
Park Superintendent Date: August 21, 2006

Recommended by:

Robert J Sheehan *8/20/2006*

ROBERT SHEEHAN
District Ranger Date:

Appendix A

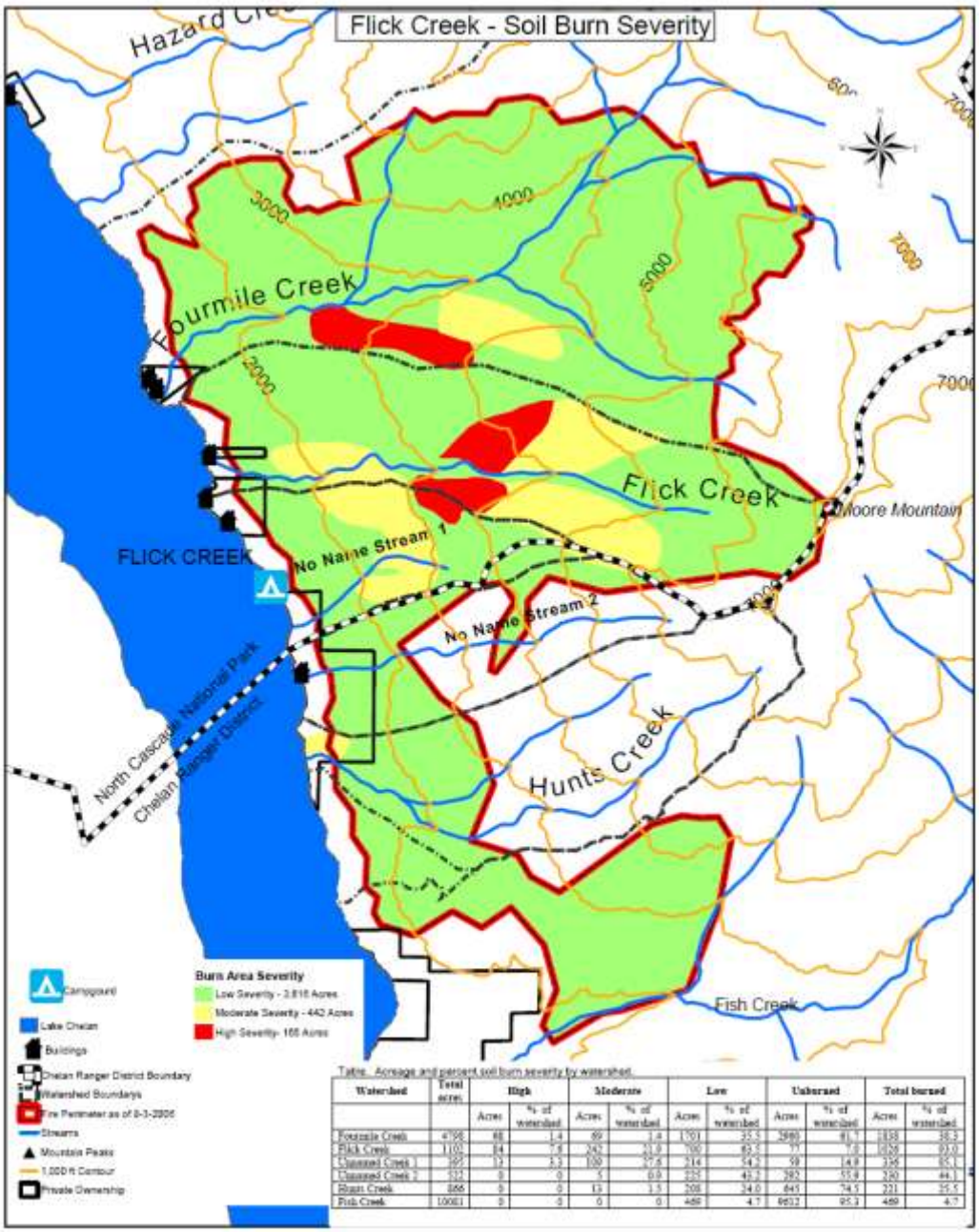


Table: Acreage and percent soil burn severity by watershed.

Watershed	Total acres	High		Moderate		Low		Unburned		Total burned	
		Acres	% of watershed	Acres	% of watershed	Acres	% of watershed	Acres	% of watershed	Acres	% of watershed
Fourmile Creek	4706	68	1.4	99	2.1	1701	35.5	2980	61.7	1858	38.3
Flick Creek	1100	64	5.8	343	31.0	700	63.1	11	1.0	1089	99.0
Unnamed Creek 1	167	12	7.3	109	67.5	314	54.3	59	14.8	108	85.1
Unnamed Creek 2	577	0	0	5	0.9	225	43.2	282	55.8	240	44.1
Rogers Creek	866	0	0	13	1.5	208	24.0	645	74.5	221	25.5
Fish Creek	10061	0	0	0	0	469	4.7	9612	95.3	469	4.7

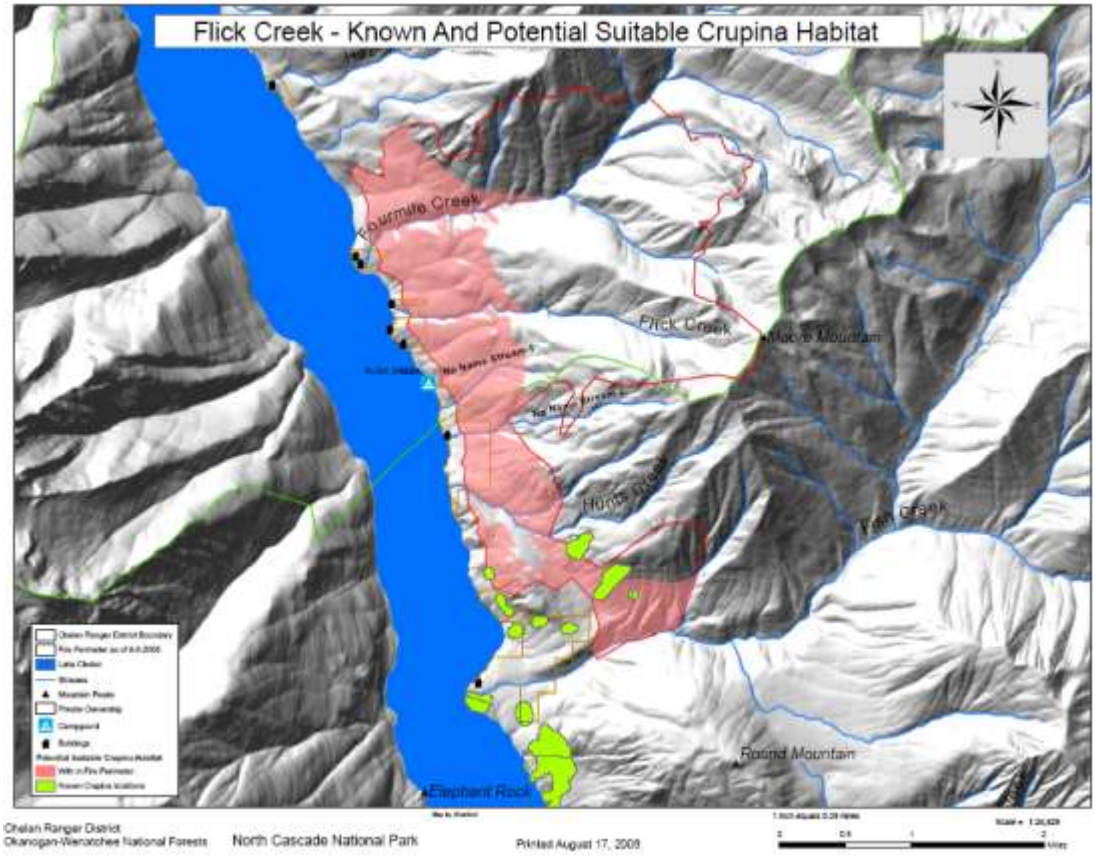
Chelan Ranger District
Okanogan-Wenatchee National Forests

North Cascade National Park

Printed August 17, 2006

Appendix B

Potential Habitat and Known Sites for Common Crupina



Appendix C.
8/18/06

Invasives treatment and monitoring
Rationale for cost estimates and Wyden Authority

Logistics
Costs for invasives treatment and monitoring are high due to the lack of roads in the burned area, the need to use boats to access the sites, and the need to set up spike camps for crews (travel time up the lake is too long for a daily commute – over 20 miles on the lake). All water used for spray operations must be packed up from the lake or staged using helicopters. The terrain is very steep and rocky, slowing survey and treatment efforts. Costs were estimated using real costs experienced by the Chelan Ranger District during its annual crupina control project and invasive treatment after the 2001 Rex Creek Fire.

Monitoring
Acres identified for monitoring were based on the acres in the burned area that are potential habitat for invasives, especially common crupina. Potential habitat was defined as areas under 3000 feet elevation and on south, east, and west slopes. The potential habitat model was developed using field experience with invasive plants on the north shore of Lake Chelan, after the Rex Creek Fire.

Federal Land Treatment
Treatment acres were predicted to be no more than twenty-five percent of the area monitored. It was assumed that new infestations would be relatively small in the first year after the fire. On Park Service land, estimated treatment acres are 225. On Forest Service land an estimated 170 acres will be treated.

Wyden Treatments and Benefits to NPS and FS
Since private parcels support both Crupina and other noxious weeds, it is imperative that weed populations on private parcels also be treated in order to maintain the integrity of weed management efforts on federal lands. Otherwise, federal lands will be re-infested from extant weed populations left unchecked on private parcels-so there is a direct benefit to federal lands from work on private lands. Land owner agreements will be pursued prior to implementation of private land treatments.

Acres for Wyden treatments were estimated based on acres of the private land parcels that were burned (either completely or partially). Estimated acres for Wyden treatments are the maximum expected. The Natural Resources Conservation Service has been contacted concerning availability of funds for private protection. They have no funds in their Emergency Watershed Protection funding to help fund private work. They will, however, provide information to landowners as requested.

Appendix D. Summary of Wilderness direction and BAER

From FSM 2323 (specifically FSM 2323.43b) and in FSH 2509.13 section 26.6:

FSM 2323.43b: This direction indicates that BAER treatments should only be implemented to prevent unnatural loss of the wilderness resource or to protect life, property and other resource values outside of wilderness; and that normally hand tools and equipment should be used to install treatments.

FSH 2509.13 (section 26.6):

1. Design treatments to be temporary, short-lived actions
2. Use native materials for structural measures
3. Normally, treatments should be accomplished with hand tools & equipment—if other methods are needed use minimum necessary; use chainsaws, motorized vehicles and aircraft only if other means infeasible or cause unacceptable delays (resulting in significant threat to downstream values)
4. Protect the genetics of endemic plants; choose short-lived ground cover that will not hybridize with locals, displace local native species or offer serious long-term competition to recovery of local plants.

Other portions of the FSM for wilderness (i.e. 2323.26b-Nonstructural Range Improvements; 2323.43a-Watershed Condition Improvement) provide other applicable direction including:

- Seed with indigenous or naturalized species
- Noxious farm weed control by grubbing or chemicals is appropriate when they threaten lands outside wilderness or are spreading within wilderness—as long as control efforts do not cause serious adverse impacts on wilderness values.
- Use fertilization only as an aid to revegetation
- Use non-motorized equipment to accomplish improvement objectives. Only imminent threat to important values downstream justifies use of motorized equipment.

References and Literature Cited

Agee, James K. 1993. Fire ecology of Pacific Northwest forests. Island Press, Wash. D.C. 493pp

Baird, Maryann. 1998. Wildfire Effects on Nutrient Capitals in Inland Coniferous Forests. University of Washington, Unpublished Masters Thesis

Beck, R.W. and Associates. 1991. Lake Chelan Water Quality Plan. Report for the Lake Chelan Water Quality Committee.

Page-Dumroese Deborah, A. Harvey, M. Jurgensen, R. Graham, Organic Matter function in the Western Montane Forest Soil System. Paper presented at Symposium on Management and Productivity of Western Montane Forest Soils, Boise, Idaho (4/10-12/1990).

Edmonds R.L., 1987 Decomposition rates and nutrient dynamics in small-diameter woody litter in four forest ecosystems in Washington, U.S.A., College of Forest Resources AR-10, University of Washington.

Edmonds R. L., 1990 Organic Matter Decomposition in Western United States. Paper presented at Symposium on Management and Productivity of Western Montane Forest Soils, Boise, Idaho (4/10-12/1990).

Everett, Richard. R. Schellhass, T. Anderson, J. Lehmkuhl, and A. Camp, 1996. Restoration of Ecosystem Integrity and Land Use Allocations Objectives in Altered Watersheds. Paper presented in American Water Resource Association.

Everett, Richard, D. Zabowski and P. McColley. 1990. Vegetative Restoration of Western-Montane Forest Soils. Paper presented at Symposium on Management and Productivity of Western Montane Forest Soils, Boise, Idaho (4/10-12/1990).

Hungerford, R.D., M.G. Harrington, W.H. Frandsen, K.C. Ryan and G.J. Niehoff. 1990 Influence of fire factors that affect site productivity. Paper presented at Symposium on Management and Productivity of Western Montane Forest Soils, Boise, Idaho (4/10-12/1990).

Klock, G. O. 1969. Use of a starter fertilizer for vegetation establishment. Northwest Science. 43: 38. [Abstract].

Klock, G. O. 1982. Stabilizing Ash-covered timberlands with erosion control seeding and fertilization. In: Proceeding, Conference, Mt. St. Helens: Effects on water resources; 1981 October 7-8; Jantzen Beach, OR. Pullman, WA: Washington State University Press;

Klock, G. O. and C. C. Grier. 1979. Effects of fire on the long-term maintenance of forest productivity. In: Gessel, S. P.; Kenady, R. M.; Atkinson, W. A., eds. Proceedings, forest fertilization conference; 1979 September 25-27; Union, WA. Contr. 40. Seattle, WA: University of Washington: 247-250.

Klock, G. O., A. R. Tiedemann, and W. Lopushinsky. 1975. Seeding recommendations for disturbed mountain slopes in north central Washington. USDA For. Serv. Res. Note PNW-244, 8 p. Pac. Northwest For. and Range Exp. Stn., Portland, OR.

Klock, G. O., J. M. Geist, and A. R. Tiedemann. 1971. Erosion control fertilization-from pot study to field testing. Sulfur Inst. J. 7(3):7-10.

Larson, L.L. and M.L. McInnes. 1989. Impact of grass seedings on establishment and density of diffuse knapweed and yellow starthistle. Northw. Sci. 63(4): 162-166.

Robichaud, P. R., J.L.Beyers and D.G. Neary. 2000. Evaluation the effectiveness of post fire rehabilitation treatments. Gen. Tech Rep. RNRS-GTR-63. Fort Collins: U.S. Department of Agriculture, Forest service, Rocky Mountain Research station. 85 p.

Sheley, R.L., S. Kedzie-Webb and B.D. Maxwell. 1999. Integrated weed management on rangeland. In: Biology and management of noxious rangeland weeds. Roger L. Sheley and Janet K. Petroff editors. Oregon State University Press.

Thill, D.C., C.T. Roche' and D.L. Zamora. 1999. Common Crupina. In: Biology and management of noxious rangeland weeds. Roger L. Sheley and Janet K. Petroff editors. Oregon State University Press.

Tiedemann, A. R. 1973. Stream chemistry following a forest fire and urea fertilization in north-central Washington. USDA For. Serv. Res. Note PNW-203, 20 p. Pac. Northwest For. and Range Exp. Stn., Portland, OR.

Tiedemann, A. R., J. D. Helvey, and T. D. Anderson. 1978. Stream chemistry and watershed nutrient economy following wildfire and fertilization in eastern Washington. Journal of Environmental Quality, Vol. 7, no. 4, October-December.

Tiedemann, A. R. and G. 0. Klock. 1976. Development of vegetation after fire, seeding and fertilization on the Entiat Experimental Forest. In: Proceedings, Annual Tall Timbers Fire Ecology Conference No. 15; 1974 October; Portland, OR. Tallahassee, FL: Tall Timbers Research Station: 171-192.

USDA Forest Service. 1990. Forest Service Manual Amendment; 2300-90-2 Wilderness.

USDA Forest Service. 1995. Burned-Area Emergency Rehabilitation Handbook, 2509.13. Forest Service

USDA Forest Service 2001. Unpublished Fire Regimes Okanogan and Wenatchee NFs. Tom Lueschen. Fire Behavior Analyst.