Norse Peak Fire 2017

USDA-FOREST SERVICE FS-2500-8 (7/00)

Date of Report: October 19, 2017

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

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

B. Type of Action

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

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

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

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Norse Peak and American Fires

B. Fire Number: WA-OWF-000365 (Norse Peak); WA-OWF-000351 (American)

C. State: Washington

D. County: Pierce and Yakima

E. Region: R6 Pacfic Northwest

F. Forest: Mt. Baker-Snoqualmie and Okanogan-Wenatchee

G. District: Snoqualmie and Naches

H. Fire Incident Job Code: P6K9KQ

I. Date Fire Started: August 11, 2017

J. Date Fire Contained: November 1, 2017 (Tentitive)

K. Suppression Cost*: $19,760,000 (Norse Peak); $800,000 (American)
*As of 10/5/2017

L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles): Blanket Creek Fire: 9 mi. dozer, 6 mi. handline;
2. Fireline seeded (miles): 0 Miles
3. Other (identify): None

M. Watershed Number: Hydrologic Unit Code 6 Watersheds (Table 1)

Table 1: HUC 6 Watersheds	
CODE	**Watershed Name**
170300020103	Crow Creek
170300020107	Lower American River
170300020108	Lower Bumping River
171100140306	Lower Greenwater River
171100140307	Silver Creek-White River
170300020106	Upper American River
171100140305	Upper Greenwater River
170300020102	Upper Little Naches River

N. Total Acres Burned: 55,920 acres

USFS Acres (55,920): Mt. Baker-Snoqualmie NF acres (23,235); Okanogan-Wenatchee NF acres (32,685) Norse Peak Wilderness acres (39,740); William O. Douglas Wilderness acres (3,813); USFS outside wilderness acres (12,367)

O. Vegetation Types:

Douglas-fir, Grand Fir, Mountain Hemlock, Pacfic Fir, Parkland, Subalpine Fir, and Western Hemlock.

P. Dominant Soils:

The soils within the Norse Peak Fire perimeter are dominated by a colluvium composed primarily of basaltic and andesitic parent materials, mixed with volcanic ash. These parent materials take the forms of lava flows, volcanic necks, and pyroclastic materials. Lava flows and volcanic necks form resistant features and outcrops, as they are generally fine-grained and competent, whereas pyroclastics have little resistance to weathering and tend to form unstable soils. The largest areas of contiguous soils are derived from ash and cinder deposits, generally from Mount Rainier eruptions. Soil surveys and general soil maps maintained by the Natural Resources Conservation Services (NRCS) web soil survey provided soil properties necessary for analysis. Dominant soils are Typic Vitricryands and Nimue loamy sand.

Q. Geologic Types:

The majority of the geology within the Norse Peak fire formed 5 to 23 million years ago (mya). Much of the lithology consists of volcanic rocks and deposits as well as lava and andesite flows. These areas are dominated by the Fifes Peak Formation (Tabor et al., 2006). A smaller portion of the fire contains Oligocene (23 to 33 mya) volcanic rocks dominated by the Ohanapecosh Formation (Fiske et al., 1963). Additional geology in the area consists of volcanic rocks of Huckleberry Mountain (Frizzell and others, 1984), tuffaceous rocks (Swanson, 1978), and sandstone (Swanson, 1978). A smaller portion of the fire area consists of nonglacial Quaternary alluvium and landslide deposits.

R. Miles of Stream Channels by Order or Class:

366.2 miles of streams (113.5 miles of perennial streams, 247.8 miles of intermittent streams, 0.8 miles of ephemeral streams, and 4.1 miles of man-made streams).

S. Transportation System

Trails: 87.3 miles

Roads: 29.1 miles of roads (3.2 miles of state highway, 0.6 miles Maintenance Level 4 Roads, 10.0 miles of Maintenance Level 3 Roads, and 15.3 miles of Maintenance Level 2 Roads)

PART III - WATERSHED CONDITION

A. Burn Severity (acres): Total Acres Burned: 55,920 acres

16,457 acres (29%) (Very Low/Unburned), 12,011 acres (21%) (Low), 18,801 acres (34%) (Moderate), and 8,651 acres (15%) (High)

B. Water-Repellent Soil (acres):

Estimated at 15,850 acres (32% of the fire area). Based on limited field reconnaissance, we determined that about 60% of the moderate and high soil burn severity (SBS) acres were water repellent, and about 20% of the low severity acres were water-repellent (changes beyond background levels). Natural water repellency is present.

C. Soil Erosion Hazard Rating (acres):

Due to the lack of soil survey data necessary to evaluate Erosion Hazard Rating, it could not be accurately estimated/summarized for the fire area. Broad trends were observed: rock-armored soils and soils on gentler topography likely have Slight to Moderate Erosion Hazard, while finer textured soils on steep slopes likely have Moderate to Severe Erosion Hazard.

D. Erosion Potential:

The following erosion rates (Table 2) for selected pour points of concern were calculated from post-fire erosion models for a five-year storm in GeoWEPP (see Soils Report).

Table 2: Erosion Rates calculated for Norse Peak Fire

Pour Point	Average Tons/Acre Pre-Fire	Average Tons/Acre Post-Fire	% Increase Post Fire
Camp Fife	0.1	0.85	88.2
Union Creek at SR 410	0.1	4.98	98.0
Ski Chalet	0.1	0.1	0.0
Pleasant Valley CG	0.1	2.17	95.4
Goat Creek at FSR 7176	0.1	5.03	98.0
Crow Creek CG	0.1	2.21	95.5
Greenwater River	0.1	2.66	96.2
28 Mile Creek outlet	0.1	0.21	52.4
Deep Creek at SR 410	0.1	2.62	96.2
Strawberry Creek	0.1	1.89	94.7
Minnehaha Creek at SR 410	0.1	0.63	84.1

E. Sediment Potential:

A small fraction of the tons per acre predicted in the erosion models will actually make it to a stream. This is shown in the sediment in tons per acre analysis. Much of the lower portions of the slopes are unburned and will act to catch debris before it enters the stream or reaches any locations considered to be values at risk.

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years):	3 Years
B. Design Chance of Success, (percent):	80%
C. Equivalent Design Recurrence Interval, (years):	5 year
D. Design Storm Duration, (hours):	24 hour
E. Design Storm Magnitude, (inches):	4.5 inches
F. Design Flow, (cubic feet / second/ square mile):	42.97 cfs/mi^2
G. Estimated Reduction in Infiltration, (percent):	35%
H. Adjusted Design Flow, (cfs per square mile):	119.4 cfs/mi^2

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:
Introduction/Background:
The Norse Peak Fire and American fire (henceforth referred to collectively as Norse Peak) were among thirteen starts that were ignited by lightning on August 10 and 11, 2017, in the vicinity of the William O. Douglas and Norse Peak Wilderness Areas on the Naches Ranger District of the Okanogan-Wenatchee National Forest. Over time, many of these small starts converged with each other and became the Norse Peak Fire with an official ignition date of August 11, 2017. The fires burned in steep rocky terrain, with limited and difficult access. Due to this, tactics were less suppression oriented as the fire burned through the wilderness area. Helicopters were used for water drops and coordinated with on the ground resources to aid in structure protection. No chemical fire retardant was used.

As of October 10, 2017, the Norse Peak Fire size was stable at 55,920 acres, with expected containment on November 1 or by a season-ending weather event, whichever comes first. The nature of the fire resulted in a mosaic of soil burn severity (SBS), with the wilderness interior exhibiting the highest soil burn severity.

The SBS shows 49% burned at high and moderate soil burn severity. The rest of the fire was either low soil burn severity or unburned. It is very important to understand the difference between fire intensity and burn severity, and soil burn severity as defined for watershed condition evaluation in Burned Area Emergency Response analysis. Fire intensity or burn severity as defined by fire, fuels, or vegetation specialists may consider such parameters as flame height, rate of spread, fuel loading, thermal potential, canopy consumption, tree mortality, etc. For BAER analyses, mapping is not simply vegetation mortality or above-ground effects of the fire – soil burn severity considers additional surface and below-ground factors that relate to soil hydrologic function, runoff and erosion potential, and vegetative recovery. Areas of high soil burn severity are scattered throughout the fire area but tend to focus on the wilderness area north of Highway 410. Areas of high soil burn severity are at risk due to flooding and sedimentation affecting life and safety, invasive plants, trails, and roads.

Based on historic precipitation patterns, it can be expected that fall frontal storms have a high probability of occurring in the weeks following the Norse Peak Fire. The risk of flooding and erosional events will increase as a result of the fire, creating hazardous conditions within and downstream of the burned area. These hazardous conditions may be worsened in the case of a rain-on-snow event, where long-duration rainstorms falling on a shallow snowpack can produce very high peak flows.

The fire was divided into sub-watersheds with "pourpoints" established at the bottom of burned watersheds, or where values at risk were located. Watershed runoff response is referenced to these points.

Summary Of Watershed Response:

Erosion Response:

Generally, erosion will be highest in areas of moderate to severe soil burn severity (SBS) and slopes greater than 25%, excluding rock outcrops. These areas tend to be concentrated at higher elevations, on north-facing slopes, or on interior valley floors within designated wilderness. Field reconnaissance showed that most areas identified on the SBS map as having moderate soil burn severity already had significant surface cover reestablishing from needle fall (approaching 100% in many areas). Additionally, many soil areas have surface rock cover that shields the soil from raindrop impact and entrains/slows surface runoff, allowing it to infiltrate into the soil. Areas that burned at high severity generally lack needle cover because crowns were fully consumed. These areas of high severity burn where finer textured, low-rock content soils are present are the most susceptible to erosion. Due to snow on the ground and recent rainfall, it is expected that erosion rates on high severity burn areas and related deposition downslope will be substantially lower until spring, at which time erosion and deposition rates may peak as precipitation events add to snowmelt runoff.

Hydrologic Response:

Eight 6th Field watersheds overlap with the fire perimeter; percent area burned of these watersheds range from 2%-50%. Those watersheds that burned at a higher percentage (Crow Creek, Lower American River, Upper American River, Upper Greenwater River, and Silver Creek/White River) have the most "values at risk" identified that may be affected from post-fire flow. The following systems are expected to have the greatest change in flow and raise the most concern due to proximity to cabins, campgrounds, roads, etc: Greenwater River, Minniehaha Creek, Deep Creek, Goat Creek, Union Creek, Kettle Creek, American River and Crow Creek. Changes in flow responses are assumed due to the loss of vegetation and increased soil hydrophobicity as a result of the fire.

The responses are expected to be most evident during initial and larger storm events immediately after the fire. Thereafter, responses are expected to become less evident as vegetation is reestablished, providing ground cover, increasing surface roughness, and stabilizing and improving the infiltration capacity of the soils. The estimated vegetative recovery for watersheds affected by the fires are expected to be approximately 3 years, primarily due to the favorable growing conditions. Flood potential will decrease as vegetation reestablishes, providing ground cover, increasing surface roughness, and stabilizing and improving the infiltration capacity of the soils. Time for recovery of elevated peak flows to base flow will likely take longer than the vegetative recovery period in this region.

Although some implementation of for trails and roads treatments may not happen until spring 2018 due to inaccessibility (snow on the ground), there is still a need to stabilize these areas due to the estimated time it will take for vegetation to start recovering.

Flow response for selected pour points are summarized below (Table 3) and responses for 6th Field Watershed are also included (Table 4).

Table 3: Summary of Flow Response for selected pour points

Pour Point	Acres	Unburn Q2	Burned Q2	Times Increase
28 Mile Cr	4672	550.69	794.67	1.44
American River_Hells Crossing	44748.8	1886.72	4417.89	2.34
Camp Fife	320	127.74	219.11	1.72
Crow Creek Campground	26022.4	1404.09	3948.24	2.81
Deep Cr	2054.4	351.92	1231.60	3.50
Goat Creek Crossing	2835.2	419.46	1803.82	4.30
Greenwater Acclimation Pond	22656	1301.99	4772.26	3.67
Minnehaha Cr	1440	289.96	536.33	1.85
Pleasant Valley Campground	4051.2	509.52	1209.65	2.37

Ski Chalet	32	36.42	61.24	1.68
Ski Chalet#2	64	53.14	164.85	3.10
Strawberry Cr	979.2	234.99	484.32	2.06
Union Creek/Hwy 410	7372.8	706.14	2230.83	3.16

Table 4: Summary of Flow Response for HUC 6 watersheds

HUC 6th Watershed	Total Acres	Q2 Burned	Q2 Unburned	Q5 Unburn	Q10 Unburn
Crow Creek	26122.5	2454.95	1407.03	2227.77	2796.80
Lower American River	20754.1	1989.36	1241.23	1976.32	2496.63
Lower Bumping River	29426.4	1762.73	1501.39	2370.27	2966.10
Lower Greenwater River	32640.3	1876.94	1588.65	2501.69	3121.78
Silver Creek/White River	32599.4	2348.05	1587.56	2500.05	3119.85
Upper American River	30186.8	2360.82	1522.41	2401.96	3003.68
Upper Greenwater River	16081.2	1937.38	1080.13	1730.54	2201.32
Upper Little Naches River	28927.4	1961.89	1487.46	2349.25	2941.17

Geologic Response/Debris Flow Potential:

The Washington DNR Geological Survey provided a preliminary post-fire debris flow hazard assessment (Slaughter & Contreras, 2017). The assessment was based on geologic observations and modeling, which was interpreted and from which they presented recommendations. Areas of concern were Deep Creek (SR 410 MP 55.5), Alta Crystal Resort, Goat Creek recreation residences, four buildings at Crystal Mountain Resort, and recreation residences near Union Creek. Tenants have already been notified along Goat Creek at cabins 32, 33, 84, and 85. The Norse Peak Fire mostly burnt along ridge tops within the Norse Peak Wilderness. This left a large vegetated buffer distance between moderate or severe SBS and any structures, in which the potential debris flows and sediment may settle out prior to reaching these structures.

Response to Other Resources:

Hazard Trees:

There is a high risk to safety within the burn area from hazard trees. Expectation of high conifer mortility, especially in Hemlock, will leave the fire area at high risk from hazard trees especially along corridors of high concentrated use such as the Pacific Crest Trail, and dispersed camping areas within the wilderness.

Wildlife:

The Mt. Baker-Snoqualmie National Forest and Okanogan-Wenatchee National Forest have four terrestrial Threatened and Endagered species. Two of these species, the Grizzley Bear and Grey Wolf, are not expected to be affected by the burn. Grizzley Bears are not expected to be found south of the I-90 corridor and the Grey Wolf is very mobile in following its prey base. However, the Nothern Spotted Owl and Marbeled murrelet habitat was affected. There are no treatments anticipated, nor are there treatments that can be implemented to improve nesting, foraging habitat for the northern spotted owl. Marbled murrelets (MAMU) would only potentially nest in old-growth (spotted owl nesting habitat is used as a surrogate for murrelet nesting habitat). The following table 5 is a preliminary indicator that the Norse Peak fire has had a low to moderate impact to owl/murrelet nesting; forage and roosting habitat may have a moderate impact.

Table 5: Spotted Owl Habitat by soil burn severity

Subwatershed	Owl	Activity Status	Soil Burn Severity
NACHES RANGER DISTRICT			
Crow Creek	SO816		Low

Lower American River	SO821		Moderate
Lower American River	SO874		Unburned / Very Low
Lower American River	SO892		Unburned / Very Low
Upper American River	SO897		Unburned / Very Low
SNOQUALMIE RANGER DISTRICT			
Lower Greenwater River	72201	CUR	Moderate
Silver Creek-White River	71303	CUR	Unburned / Very Low
Silver Creek-White River	72502	CUR	Unburned / Very Low
Silver Creek-White River	73701	CUR	Unburned / Very Low
Upper Greenwater River	74201	CUR	High
Upper Greenwater River	71711	CUR	Unburned / Very Low
Upper Greenwater River	71611	CUR	Unburned / Very Low
Upper Greenwater River	71416	HIST	Unburned / Very Low

Fisheries: Federally listed fish and designated critical habitat occur in all sub-watersheds of the Norse Peak and American Fires. Tributary areas affected by the burn are generally in the upper one third of those catchments within the Norse Peak Wilderness or William O. Douglas Wilderness. Steelhead and bull trout spawn and rear in many stream reaches that reside below where larger patches of high and moderate burn severities occur, including Greenwater River, Goat Creek, Crow Creek, and the American River. While Chinook salmon spawn and rear mostly in the mainstem of the White and Greenwater rivers, juvenile, sub-adults and eggs incubating in streambed gravels can be at risk by post-fire conditions in two ways: by ash and sediment accumulation, and where increases in flow negatively interact with existing infrastructure. Field assessment and professional experience concluded that although short-term effects could impact individuals, no treatments are needed to decrease the level of risk to them. However, treatments have been identified where increases in flow are likely to interact with roads and campgrounds in ways that would negatively impact multiple primary constituent elements of designated critical habitat, particularly water quality and quantity in spawning and rearing areas, as well as in migration corridors. Accelerated bank erosion and channel migration into roads and recreational sites with infrastructure such as toilets, kiosks and metal fire rings that could be washed into these critical habitats for steelhead and bull trout, could be minimized.

Botany:
Due to fire supression efforts there is a high risk of introduction and/or spread of invasive plant species. There are 13 known invasive species present in the fire area, risk of new infestations are high. There are no known threatened or endangred plant species within or affected by this fire area.

Cultural Resources:
The risks posed to archaeological sites is primarily the result of the loss of surface vegetation. Vegetation either directly obscures pre-contact sites from view of the public, or retains stable soil surfaces over buried sites. Exposure of artifacts can subject them to looting, which is often focused on the removal of formal stone tools. As the primary diagnostic elements of pre-contact sites, the information loss from the removal of these artifacts is permanent. In addition, vegetation loss can increase soil degradation through erosion resulting in loss of artifact provenience in stratified deposits, or damage to subsurface features. The increased risk of flooding and debris flows outside of the burn area can also subject sites along drainages to scouring and cut bank failure. Where sites have existed for centuries and longer, this level of damage may not be much different compared to post-depositional processes. However, modern changes to the environment, such as

the construction of roads, bridges, and culverts can change the properties of a drainage and risk redirecting water into courses not seen in the past.

Unlike pre-contact sites, the risk to historical sites in the flood plain is generally higher. Within the fire complex, the only known significant historical sites are buildings along the banks of prominent drainages. As younger cultural resources, historical buildings less than a hundred years old may have never been subjected to extreme environmental events. It is unknown what level of flooding or debris flows these features can withstand, or how they will be affected.

Values at risk that are not explicitly described are the traditional practices of the Muckleshoot Indian Tribe, and the Confederated Tribes and Bands of the Yakama Nation. The known risks associated with the lack of access cannot be detailed in this report, and there are particular risks that will remain uncommunicated to the Agency to protect the sanctity and secrecy of the practices involved. In the interest of providing some sense of the level of risk, it can be said that some places may require access by or on behalf of tribal leaders and elders into or through the burn area. A loss of access can affect the ability of tribal members to pass on traditional information or exercise important rites. The magnitude of such restrictions can be ranked as "major," but the probability is unknown. For this reason it is essential to maintain a steady line of communication to ensure that tribal needs are met where possible regarding the exercise of treaty rights and facilitation of traditional and spiritual practices.

Roads:
Engineering road properties will be affected by increased watershed response associated with moderate and high soil burn severity areas. Increased flows at main channels have the potential to overwhelm culverts that are undersized. Channelling of water along roads within the burn increases the potential for stream capture and damage to road base. Hazard trees along roads pose a threat to Forest visitors and employees accessing the burn. Loss of ingress and egress also poses a threat to public safety.

Trails:
The trails assessment involved walking approximately 18 miles of trails potentially affected by the fire, in order to assess sites in each burn class within the fire perimeter. Complete surveys were not feasible in the BAER assessment timeframe. In the six days of field assessment, trails were hiked on both the eastern and western portions of the Norse Peak Wilderness. Damage from hazard trees and burned roots affecting tread surface was evident on the Greenwater Trail, Norse Peak Trail, Pacific Crest Trail, Pleasant Valley Trail and the Union Creek Trail. These assessments were a small sample of the affected trails. The miles of trails that were assessed were representative of high, moderate and minor burn severity. The majority of the trail system within the Norse Peak fire assessment were impacted by fire and the anticipated trail tread effects are likely to be amplified during precipitation or snowmelt events within the watershed.

Values at Risk:

A BAER team began assessing the area for post-fire emergencies on October 5, 2017. In that time the team has identified the following values at risk and post-fire threats. **The full list of values at risk analyzed and risk determinations is included in Appendix 3. The values at risk discribed below are included within the report as these values were brought forward with proposed treatments later in the report.**
Interim reports may be submitted as additional assessments are completed.

The risk matrix below (Table 6), Exhibit 2 of Interim Directive No.: **2520-2010-1** was used to evaluate the Risk Level for each value identified during Assessment.

Table 6: Risk Matrix

Probability of Damage or Loss	**Magnitude of Consequences**		
	Major	Moderate	Minor
	RISK		
Very Likely	**Very High**	**Very High**	**Low**
Likely	**Very High**	**High**	**Low**
Possible	**High**	**Intermediate**	**Low**
Unlikely	**Intermediate**	**Low**	**Very Low**

Life:

Road

There are multiple road/stream crossings within and immediately downstream of the burn area. Post-fire flows are predicted to be from 1.44 to 4.30 times greater than pre-fire flows for a 5 year, 24 hour rainfall event. There is also a high risk due to hazard trees.

Risk Assessment – Threats to travelers on Forest Roads from flooding and hazard trees.

Probability of Damage or Loss: Likely - High flows post fire are likely to affect stream crossings, high amount of hazard trees along roads within the burn area.

Magnitude of Consequence: Major - Possible for users to access higher ground.

Risk Level: Very High – Area closure, gates to control access and closure signs

Recreation residences below fire area

There are recreation residences below the burn area, some specifically the Goat Creek watershed area where there are some of these residences within the floodplain.

Risk Assessment – Threats to residents within structures

Probablity of Damage or Loss: Possible to Likely – risk from flooding greatly increased and some residences are located within the flood plain.
Magnitude of Consequence: Moderate to Major – possible injury

Risk Level: Intermediate to Very High – no feasible hillslope treatments (too steep), channel treatments would not be effective for the predicted flows – coordinate with NRCS so that they can address specific landowner needs.

Campgrounds/Trail Heads near stream channel

There are three campgrounds on the Naches District within, or downstream of the burn area that are at increased risk of flooding and debris flows. These campgronds/trailheads are Union Creek Trailhead, Pleasant Valley Campground, and Long Valley Campground.

Risk Assessment – Threats to Forest users

Probablity of Damage or Loss: Likely – risk from flooding/loss of water control

Magnitude of Consequence: Moderate – possible injury

Risk Level: High – area closure and closure signs

Forest users on trails

FS trails exist throughout the burn area and there is a risk to users from increased runoff and hazard trees.

Risk Assessment – Threats to Forest users

Probablity of Damage or Loss: Very Likely – High use area near the greater Puget Sound metropolitan area.

Magnitude of Consequence: Major - High/Moderate SBS increased watershed response. High amount of hazard trees that could fall on forest users

Risk Level: High – Trail/Area closure

Property:

Forest Service roads

FS roads exist on the lower slopes of the watersheds affected by the burn area. Most of these roads are artaries giving acess to the Norse Peak Wilderness.

Risk Assessment – Threats to Forest Roads

Probablity of Damage or Loss: Likely – multiple crossings and parallel sections in the floodplain

Magnitude of Consequence: Moderate – water could channel down road with possible wash outs and there is a potential for crossings to be damaged or destroyed.

Risk Level: High to Very High– Install rolling dips, drainage structures and implement Storm Inspection and Response.

Recreation residences below burn area

There are recreation residence tracts below the fire area on both forests below the burn area.

Risk Assessment – Threats to private property (recreation residences and infrastructure)

Probablity of Damage or Loss: Possible to Likely – risk from flooding greatly increased

Magnitude of Consequence: Moderate-Major – possible innundation of structures and damage to outbuildings. Some structures within the Goat Creek Watershed are directly in the floodplain.

Risk Level: Intermediate to Very High – no feasible hillslope treatments (too steep), channel treatments would not be effective for the predicted flows – coordinate with NRCS so that they can address specific landowner needs.

Trails

FS trails exist throughout the burn area and there is a risk to the trail tread from increased runoff and hazard trees.

Risk Assessment – Increased flood and erosion risk as well as tread damage from falling hazard trees.

Probablity of Damage or Loss: Likely - severity of burn (high and moderate SBS) as well as directly below the higher severity areas.

Magnitude of Consequence: Moderate - wash out of trail and sections of trail would have to be reestablished.

Risk Level: High – Trail stabilization where there is the potential to damage the train tread or washout ephemeral stream crossings

Forest Campground and Picnic area facilities

Some fo the infrastructure associated with three FS campgrounds or trailheads (Union Creek TH, Pleasant Valley CG, and Long Valley CG) is at risk from increased post-fire flooding and debris flows.

Risk Assessment – Threats to Forest facilities

Probablity of Damage or Loss: Likely - severity of burn in watershed above campground and proximity to drainage.

Magnitude of Consequence: Moderate – loss of property

Risk Level: High –divert runoff around immovable structures using Jersey Bariers

Natural Resources:

Increase in Noxious Weed Populations:

An emergency exists with respect to vegetative recovery as a result of the threat of post-fire weed introduction and spread. The unknowing introduction and dispersal of invasive weeds into areas disturbed by fire suppression and rehabilitation has the potential to establish large and persistent weed populations. In addition, the burn area has documented weed infestations that are likely to expand under post-fire conditions (e.g. decreased competition for light/water, increased nutrients and increased soil temperatures). These weed populations could affect the structure and habitat function of native plant communities within the burn area. It is expected that most native vegetation would recover if weed invasions are minimized.

Probability of Damage or Loss: Likely. This determination is due to the high potential for vegetation type conversion by invasive species, most especially along the dozerline, roadsides and trails.

Magnitude of Consequence: Major. This determination is due to the high potential for invasive plant species to cause negative environmental and economic impacts in the burned area, particularly within the wilderness area.

Risk Level: Very High. The BAER team recommends early detection and rapid response weed surveys to locate and treat high priority infestations.

Water Quality/Hazardous Materials

Carrol Pass Campground burned in the fire. There were five vault toilets that burned during the fire that could overflow during rain events or during snow melt.

Risk Assessment – Threats to Water Quality, Forest Users (If area is open), and Sensitive Cultural Site

Probablity of Damage or Loss: Very Likely - high soil burn, in flood path/risk from over land flow

Magnitude of Consequence: Major – If effluent was to over top would get into local creek and very likely to contaminate local spring which is a sensitive cultural site.

Risk Level: Very High – Containment of haz mat is proposed by capping the exposed tank until the forest could get to the area to pump the septic pits.

Endangered aquatic species (Chinook Salmon, Steelhead, Bull Trout)

Risk Assessment – Probability of effects on habitat

Probability of Damage or Loss : Likely - Impact from high flows, increased sediment, and ash

Magnitude of Consequence: Moderate – Possible loss of redds and loss of juvinials and sub-adults

Risk Level: High – Interagency coordination with US FWS and NMFS, three bank armoring projects are proposed to help reduce sediment into critical habitat.

Cultural Resources:

Historic Homestead

Risk Assessment – Probability of looting of the sites.

Probability of Damage or Loss : Likely – some sites are in high SBS where most vegetation has burned leaving the sites exposed and easily spotted by looters.

Magnitude of Consequence: Moderate - potential for damage to site integrety if looted

Risk Level: High – Area closure would serve to protect sites until vegetation grows in to shield the sites so they are no longer visable.

B. Emergency Treatment Objectives:

1. **Roads** - To stabilize the transportation roads system and prevent further damage to system roads, associated infrastructure and prevent watershed degradation from loss of road tread resulting from:
   a. Erosion and other effects of storm water runoff as a result of fire damage on adjacent lands.
   b. Public Safety Hazards as a result of facilities or structures damaged or destroyed.

2. **Trails** – Storm proof trails to reduce the potential for watershed degradation, impacts to Federally listed fisheries, and close portions of them to the public, as warranted, until properly stabilized.

3. **Invasive Plants**- Reduce the potential for impaired vegetative recovery and introduction/spread of noxious weeds by conducting detection surveys/rapid response eradication efforts where feasible.

4. **Area Closure** - Provide for public safety.

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

Land **50** % Channel **10** % Roads/Trails **10** % Protection/Safety **50** %

As this fire was contained so late and this assessment is being completed in mid-October, the majority of the fire area is currently under snow. However, it will take approxamately 3 years for vegetative recoevery to occur in the affected watersheds and there is still a risk from the fire to life, property, and critical natural and cultrual resources. It is proposed currently to complete the road and trail treatments not currently feasible due to snow next spring after snow melt.

D. Probability of Treatment Success (Table 7)

	Table 7: Years after Treatment		
	1	3	5
Land	80	90	100
Channel	70	80	90
Roads / Trails	70	80	80
Protection / Safety	90	90	100

E. Cost of No-Action (Including Loss): $4,808,460 Potential lost market value plus assessment costs (see Cost-Risk Assessments in the BAER assessment record or the value, cost risk assessment tool summary in Appendix 2 for more information). This does not include a monetary value on loss or harm to human life.

F. Cost of Selected Alternative (Including Loss): $5,454,018 Potential lost market value plus assessment costs plus treatment costs (see Cost-Risk Assessments in the BAER assessment record or the value, cost risk assessment tool summary in Appendix 2 for more information). This does not include a monetary value on loss or harm to human life.

G. Skills Represented on Burned-Area Survey Team:

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

Christopher Stewart, Team Lead
Marc Stamer, Co-Team Lead
Hilda Kwan, Hydrology
Andrew Montgomery, Hydrology (Trainee)
Eric Nicita, Soil Scientist
Noel Ludwig, Soil Scientist (Trainee)
Melissa Waid, Soil Scientist (Trainee)
Stephen Slaughter, Geology
Trevor Contreras, Geology
Kyle Noble, Public Affairs
Jackie Pope, Public Affairs

Katie VinZant, Botany
Brian McNeil, Recreation/Trails
Sonny Paz, Wildlife
Richard Vacirica, Fisheries
Mary Coughlin, Recreation/Trails
Karen Chang, Fisheries
Santino Pascua, Engineering/Roads
Paul Alford, Archaeology
David Keenum, GIS
Jess Clark, Soils GIS
Lance Smiskin, Fire Escort

Team Leaders: Christopher Stewart

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H. Treatment Narrative:

Hillslope Treatments:

Hazardous Materials Stabilization:
Corral Pass campground burned during the fire. As a result 5 vault toilets burned leaving open pits that are at least 2/3 to ¾ full after the busy summer recreation season. These sites are a risk to water quality and public health as they are currently open and could over fill with enough rainfall or during snow melt. If this were to happen it has the potential to contaminate a sensitive cultural site, high elevation spring important for traditional practices. The road to this site already has snow on it and there are many downed trees making this area only accessable from the air. This treatment would fly personnel and equipment in to cap these sites and stabilize the hazardous materials and prevent people or wildlfie from falling in until a more permanent plan can be carried out.

Table 8: Life and Safety Treatments – Hazardous Material Stabilization

Item	Unit	Unit Cost	# of Units	Cost
Helicopter	Day	$4,000	2	$8,000
Fuel Truck	Day	$500/Day	1	$500
Supplies	Each	$1,000	1	$1,000
2 GS 5 Forestry Techs - Labor	Day	$330/Day	2	$660
1 GS 5 Forestry Techs - Monitoring	Day	$165/Day	2	$330
Total Request				$10,490

Noxious Weed Early Detection and Rapid Response:
Weed detection surveys and rapid response eradication treatments are to determine whether ground disturbing activities related to the Norse Peak and American Incidents and the fires themselves have resulted in new or the expansion of existing noxious weed infestations. With 9 miles of dozerline, 8 miles of handline, 32 miles of road and 87 miles of trails in the burn areas it is expected that new and expanding weed infestations will proliferate in and along these vectors if left unchecked. Surveys and rapid response eradication treatments will begin in 2018 during the

flowering periods of weed species. Estimated costs are based on the assumption that two visits would be necessary because of the differences in flowering times. Completion of surveys in dozerlines, roads, staging areas and known invasive plant populations would be the first priority. The second survey priorities would be along handlines, trails and dip/drop points. Surveys of the general habitats in the burned area would be the lowest priority. Detailed weed detection survey guidelines are can be found in the Noxious Weed Early Detection and Rapid Response Report.

$30,000 have been authorized for BAER funding across the two forests.

Table 8: Weed Early Detection and Rapid Response Costs				
Item	Unit	Unit Cost	# of Units	Cost
1 GS-12 Forest Ecologist	Days	$400/Day	2	$ 800
1 GS-11 Botanist	Days	$350/Day	8	$2,800
1 GS-7 Bio Tech Weeds	Days	$230/Day	55	$12,650
3 GS-5 Bio Tech Weeds	Days	$200/Day	55	$33,000
Supplies	Each	$3,000	1	$ 3,000
Vehicle gas mileage	Miles	$0.55/mile	3,000	$ 1,650
Vehicle FOR	Month	$350/Month	4	$ 1,400
Total Cost				$52,500

Channel Treatments:

Bank Armoring: Three sites within or downstream of the Norse Peak Fire were found to have threats in relation to increase in flows and associated velocities on accelerated bank erosion. This stream channel response is likely to damage Pleasant Valley Campground, and Forest System Roads 1902 and 7031. Flows from Kettle Creek will run directly into American River and Pleasant Valley Campground. Changes are expected increase from 510 cubic feet per second (cfs) to 1210 cfs at Kettle Creek. Flow changes in Crow Creek, adjacent to road 1902, is expected to increase from 1404 cfs to 3948 cfs. An increase from 1302 cfs to 4772 cfs is expected for Greenwater River along road 7031. These discrete sites also directly overlap with federally listed threatened fish and their designated critical habitat. Accelerated loss of stream banks and damage to developed sites from expected flows and loss of water control will degrade habitat with high potential to result in the loss of spawning and rearing and contribute to further tributary production declines of these populations. The minimal treatments required to remedy these issues are:

Bank Armoring – Modify the current vertical erosive stream bank conditions to log/ root wad bank revetment lateral control structures. Regrade stream bank height as necessary to ensure additional sheer stress in the near bank region is further dissipated. Utilize excavated stream bank and flood plain soil to backfill buried portion of structure. Stabilize the zone of constructed bank and wood structures with approved grass and forb seeding.

Treatments on these sites would occur below the burn areas of high and moderate severity burn in headwater channels and side slopes >50%. The log/root wad bank revetment structures shall be designed to reform the margin of the stream banks and provide lateral control against accelerated channel scour and migration into Pleasant Valley Campground, Forest Roads 1902 and Forest Road 7031 increased flow velocities.

Table 10: Bank Armoring				
Item	Unit	Unit Cost	# of Units	Cost
GS-11 Engineer (Contract Oversight)	Day	$406/Day	20	$8,120
GS-9 Engineer	Day	$310/Day	25	$7,750

~~GS-11 Hydrologist~~	~~Day~~	~~$402/Day~~	~~25~~	~~$10,050~~
~~2 GS-11 Fisheries Biologist~~	~~Day~~	~~$402/Day~~	~~60~~	~~$24,120~~
~~GS-11 Botanist~~	~~Day~~	~~$402/Day~~	~~8~~	~~$3,216~~
~~GS-11 Archeologist~~	~~Day~~	~~$402/Day~~	~~5~~	~~$2,010~~
~~GS-12 Archeologist~~	~~Day~~	~~$465/Day~~	~~2~~	~~$930~~
~~4 GS-5 Fisheries Techs (Monitoring)~~	~~Day~~	~~$290/Day~~	~~20~~	~~$5,800~~
~~GS-11 Hydrologist (Treatment Monitoring)~~	~~Day~~	~~$402/Day~~	~~5~~	~~$2,010~~
~~GS-11 Fisheries Biologist (Treatment Monitoring)~~	~~Day~~	~~$402/Day~~	~~5~~	~~$2,010~~
~~GS-11 Botanist (Monitoring)~~	~~Day~~	~~$402/Day~~	~~5~~	~~$2,010~~
~~Construction Contract and Implementation~~	~~Each~~	~~$110,000~~	~~1~~	~~$110,000~~
~~Log Haul and Staging~~	~~Each~~	~~$30,000~~	~~1~~	~~$30,000~~
~~10% Overhead (Contracting)~~	~~Each~~	~~$14,000~~	~~1~~	~~$14,000~~
~~Total Cost~~				~~$225,248~~

Roads and Trail Treatments:

Road Treatments:

Culverts, bridges, roadside ditches, and other road drainage features are at risk from increased runoff and sediment from the burned areas. These processes can negatively affect the road prism, damaging the road, eroding land downslope of the road and routing flow and sediment directly to stream channels. Culverts associated with these roads are at risk of plugging from debris carried down channels from burned watersheds. Some culverts are undersized for the expected increases in peak flows and are at risk of failure from overtopping. Culvert failures may increase the magnitude of flood, sediment and erosion hazards in downstream communities and private lands and increase scouring of stream channels on NFS lands.

There is one culvert that is undersized on FSR 7176 where it crosses Goat Creek. This If this culvert plugged, there is a high likelihood a section of FSR 7176 would be lost and recreation residences along Goat Creek could be damaged from flooding and sediment deposition as a result of loss of water control. To provide for crew/contractor safety, hazard trees will have to felled along system roads where treatments are prescribed for implementation.

Approximately 30 miles of Forest Service roads are proposed for treatment (See Appendix 1, Treatment Map) for locations.

Storm inspection and response would occur during (if safe) or after storm events to ensure treatments continue to function. Focused work would be clearing culvert approaches to prevent plugging and opening overside drains to make roads are draining properly during rain events.

Table 11: Road Treatments

Item	Unit	Unit Cost	# of Units	Cost
Contract Preparation (GS-11 COR w/ per diem)	Days	$550	25	$13,750
Install Rolling Dips w/Aggregate Material	Each	$400	4	$1,600
Install Armored Dips	Each	$3,000	6	$18,000
Clean Drainage Structures (ditches and culverts)	Miles	$250	5.4	$2,835
Create Ditch on FS 7150	Feet	$2	100	$200
Remove Culvert on FS 7176	Each	$10,000	1	$10,000
Outslope FS 7250	Hours	$150	5	$750
Armor Road Edge on FS 7150	CY	$36	120	$4,320
Riprap Machine	CY	$36	50	$1,800
Danger Tree Mitigation for Work Areas	Each	$96	55	$5,280
Road Logout	Miles	$375	5.47	$2,051
Purchase Area Closure Signs	Each	$350	8	$2,800
Install Area Closure Signs	Each	$80	8	$640
Purchase Falling Debris Signs	Each	$36	86	$3,096

Install Falling Debris Signs	Each	$80	43	$3,440
Install Closure and Debris Sign Posts	Each	$67	51	$3,417
Purchase and Install Medium Duty Gates	Each	$6400	2	$12,800
Repair Gate	Each	$250	1	$250
Resource Specialists (GS-11)	Days	$400	13	$5,200
Contractor Mobilization (10% of project costs)	Each	$14,000	1	$14,000
Storm Inspection and Response				
GS-11	Hours	$50	60	$3,000
GS-9	Hours	$40	60	$2,400
Vehicle	Each	$1,440	1	$1,440
GS-11 Contract Admin, COR	Hours	$50	120	$6,000
Total Cost				**$119,069**

Trail Treatments:

Trail Storm Proofing: Prior to the first damaging rain events and within the first year following the fire, storm proofing is recommended to minimize erosion of the trail tread. Storm proofing treatments, implemented with hand-tools, would include out-sloping, de-berming, water-bars, and other suitable treatments outlined in the BAER Treatments Catalog to protect the trails from accelerated post fire flows and soil erosion. Trails within moderate and high SBS and directly below moderate and high SBS would be treated. Trail work would also include removal of foot bridges along stream intersections where there is high potential for plugging or loss of infrastructure. Repairs are recommended for approximately 37 miles of trail.

Harzard tree removal would occur along trails where crews would be working or sites used while spiking out. Cost estimate is based on 1.5 miles of work per day. Trails would be prioritized base on use and feasibility of access after the first winter. See Appendix 1 – Treatment Map for trails proposed for treatment in the burn area.

Table 12: Trail Treatments through moderate and high soil burn severity

Item	Unit	Unit Cost	# of Units	Cost
GS 9 Recreation Program Manager	Day	$250/Day	20	$5,000
GS 5 Trail Crew Leader	Day	$167/Day	30	$10,020
20 GS 4 Trail Crew	Day	$140/Day	30	$75,600
GS 12 Heritage Coordination	Day	$465/Day	5	$2,325
GS 7 Heritage Monitoring	Day	$182/Day	30	$5,460
C-Falling Team	Day	$500/Day	15	$30,000
Warning Signs	Unit	$50	4	$200
Per Diem	Day	$54/Day	30	$32,400
Misc. Supplies	Unit	$500	1	$500
Mileage and Transportation	Mile	$0.50/Mile	4000	$2,000
Total Cost				**$166,200**

Life and Safety Treatment:

Area Closure

As a result of the burn, there is imminent threat to public safety from hazard trees and the potential for flood events and debris flows. Implementing an area closure is critical to provide for public safety. Closures were determined by a coordinated effort with recreation, engineering and fire personnel. Implementation of the closure will require the installation of gates, repair of existing gates and installation of signs. One location will require using 4" rock available from an adjacent borrow pit to build a riprap barrier across a road into the tree line to keep the public from driving around a gate. Prior to closing the system roads, the contractors will be required to sweep the closure area (complex network of roads) to make sure members of the public will not be locked behind gates. If proposed barriers are not effective, an interim request would submitted for additional barriers. Closing public access off with a well discerned boundary will protect archeological sites now exposed in plain view. After spring green up, the Forest will conduct a

review of the burn area and watershed recovery to determine the need for continued closure.

Table 13: Life and Safety Treatments – Road Hazard Signs and Gates				
Item	Unit	Unit Cost	# of Units	Cost
Gate Installation	Each	$6,400	2	$12,800
Gate Repair	Each	$250	1	$250
Purchase Area Closed Signs	Each	$350	8	$2,800
Purchase Falling Debris Signs	Each	$36	86	$3,096
Install Signs	Each	$72	51	$3,816
Install Posts	Each	$67	59	$3,953
Install Riprap Barrier	CY	$36	50	$1,800
Service Truck & Operator To Sweep Road	Hr	$79	32	$2,528
Total Request				$31,067

Developed Site Protection (Channel Deflectors):
Two developed sites have been identified at high risk for flooding that could cause damage to developed facilities (restrooms) at the Union Flats Trailhead, and Pleasant Valley campground, as well as a historical shade structure at the Pleasant Valley Campground . Jersey barriers would be installed and anchored in place adjacent to facilities to protect structures from impacts of sediment and high flow.

Table 14: Facility Protection				
Item	Unit	Unit Cost	# of Units	Cost
Jersey Barriers (20' sections)	Each	$600	46	$27,600
Total Request				$27,600
Note: Specialist time for contract administration is built into the Road treatment costs.				

Interagency Coordinator
Need to coordinate with NRCS for recreation resideces, County and WADOT regarding areas of concern along State Highway 410 (referenced in treatment map as coopertator coordination points).

Table 14: Life and Safety Treatments – Hazardous Material Stabilization				
Item	Unit	Unit Cost	# of Units	Cost
GS 12	Day	$465/day	20	$9,300
Total Request				$9,300

I. Monitoring Narrative:

Effectiveness monitoring is specifically designed to assess whether BAER treatments are effective on the ground after implementation. This monitoring is conducted by an on-the-ground review team consisting of emergency response specialist. This individual or team will primarily respond to areas after a major weather event, during the growing season, or after a period of unusual climate. This monitor will evaluate the effectiveness of:

- Reducing the threats to human life and property
- Preventing the deterioration of the National Forest Roads System
- Stabilization and prevention of the deterioration of sensitive archaeological sites

- Preventing loss of threatened and endangered species and their habitat

Table 14: Treatment Effectiveness Monitoring				
Item	**Unit**	**Time and Grade**	**# of Units**	**Cost**
Monitoring Area Closure	Each	2 days for 52 weeks for GS-7	1	$13,000
Monitoring Trail Treatments	Each	24 Days for GS-7	1	$6,000
Monitoring Road Treatments	Each	24 Days for GS-11	1	$9,720
Monitoring Streambank Armoring	Each	12 Days for GS-11	1	$4,800
Total Cost				**$30,520**

Part VI – Emergency Rehabilitation Treatments and Source of Funds by Land Ownership
Mt. Baker-Snoqualmie National Forest

			NFS Lands		
		Unit	# of		Other
Line Items	Units	Cost	Units	BAER $	$
A. Land Treatments					
Invasive Species	Each	16500	1	$16,500	$0
Haz Mat Stabilization	Each	10490	1	$10,490	$0
				$0	$0
Insert new items above this line!				$0	$0
Subtotal Land Treatments				$26,990	$0
B. Channel Treatments					
Streambank Armor	Each	45,050	0	$0	$0
				$0	$0
				$0	$0
Insert new items above this line!				$0	$0
Subtotal Channel Treat.				$0	$0
C. Road and Trails					
Road Stabilization	Each	81856	1	$81,856	$0
Trail Stabilization	Each	81332	1	$81,332	$0
				$0	$0
Insert new items above this line!				$0	$0
Subtotal Road & Trails				$163,188	$0
D. Protection/Safety					
Closure (Signs, Gates,	each	24975	1	$13,218	$0
Interagency Coordinat	each	9300	1	$9,300	$0
				$0	$0
Insert new items above this line!				$0	$0
Subtotal Structures				$22,518	$0
E. BAER Evaluation					
Assessment Team	report		1	$160,000	$0
				$0	$0
Insert new items above this line!				$0	$0
Subtotal Evaluation				$160,000	$0
F. Monitoring					
Treatment Effectiven	Each	15260	1	$15,260	$0
Insert new items above this line!				$0	$0
Subtotal Monitoring				$15,260	$0
G. Totals				**$227,956**	**$0**

Okanogan-Wenatchee National Forest

Line Items	Units	Unit Cost	# of Units	BAER $	Other $
A. Land Treatments					
Invasive Species	Each	13500	1	$13,500	$0
				$0	$0
				$0	$0
Insert new items above this line!				$0	$0
Subtotal Land Treatments				$13,500	$0
B. Channel Treatments					
Streambank Armor	Each	180,198	0	$0	$0
				$0	$0
				$0	$0
Insert new items above this line!				$0	$0
Subtotal Channel Treat.				$0	$0
C. Road and Trails					
Road Stabilization	Each	52473	1	$52,473	$0
Trail Stabilization	Each	84868	1	$84,868	$0
				$0	$0
Insert new items above this line!				$0	$0
Subtotal Road & Trails				$137,341	$0
D. Protection/Safety					
Closure (Signs, Gates,	each	15325	1	$18,089	$0
Interagency Coordinat	each	11200	1	$9,300	$0
				$0	$0
Insert new items above this line!				$0	$0
Subtotal Structures				$27,389	$0
E. BAER Evaluation					
Assessment Team	report		1	$160,000	$0
				$0	$0
Insert new items above this line!				$0	$0
Subtotal Evaluation				$160,000	$0
F. Monitoring					
Treatment Effectivene	Each	15260	1	$15,260	$0
Insert new items above this line!				$0	$0
Subtotal Monitoring				$15,260	$0
G. Totals				**$193,490**	**$0**

PART VII - APPROVALS

1. */s/ Jamie Kingsbury* — 10/20/2017
   Mt. Baker-Snoqualmie Forest Supervisor (signature) — Date

2. */s/ Alfred Watson* — 10/27/2017
   Okanogan-Wenatchee Forest Supervisor (signature) — Date

3. _____ — 11/2/2017
   Regional Forester (signature) — Date

Appendix 1: Maps and Figures

Figure 1: Norse Peak Soil Burn Severity Map

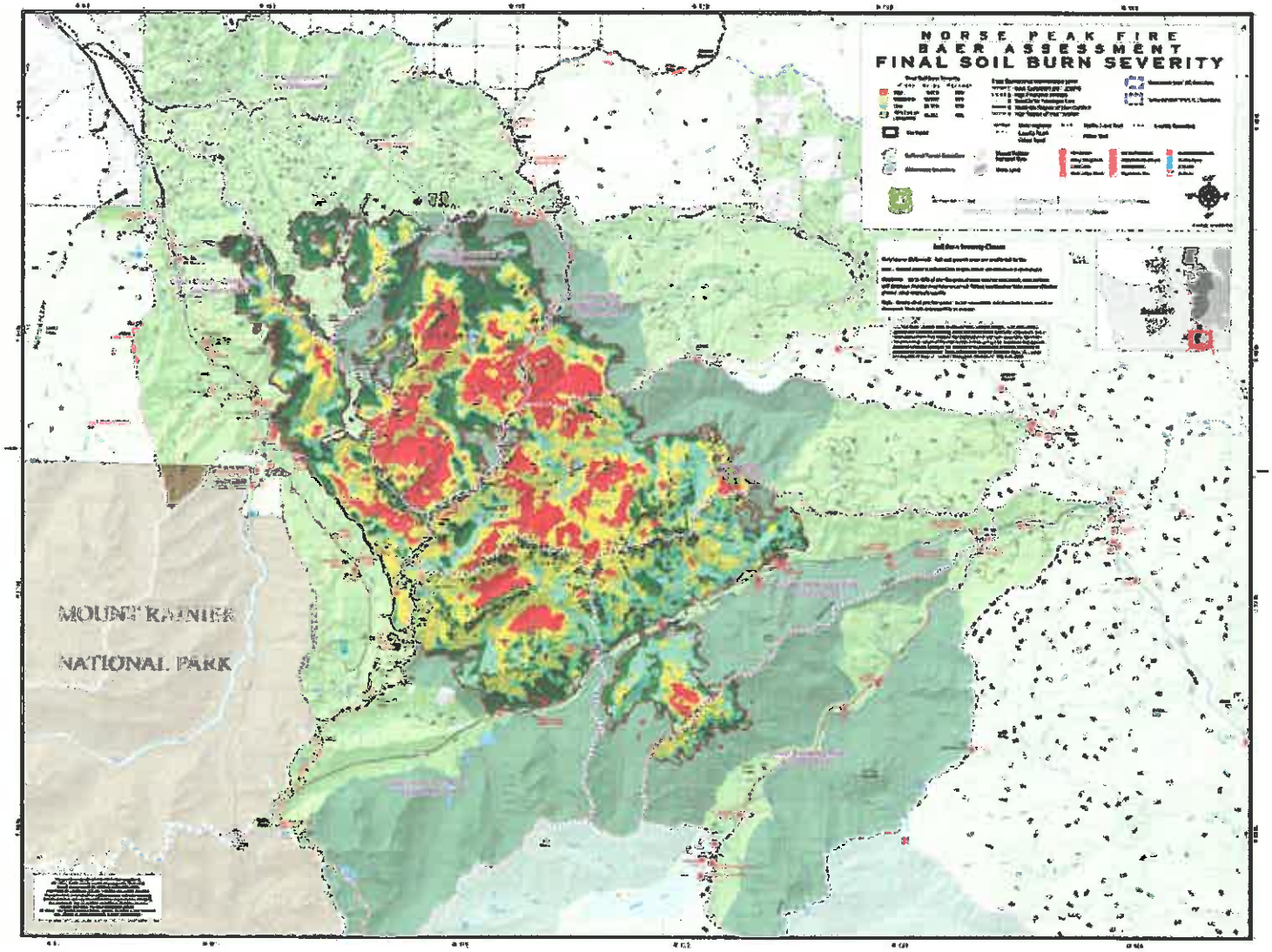
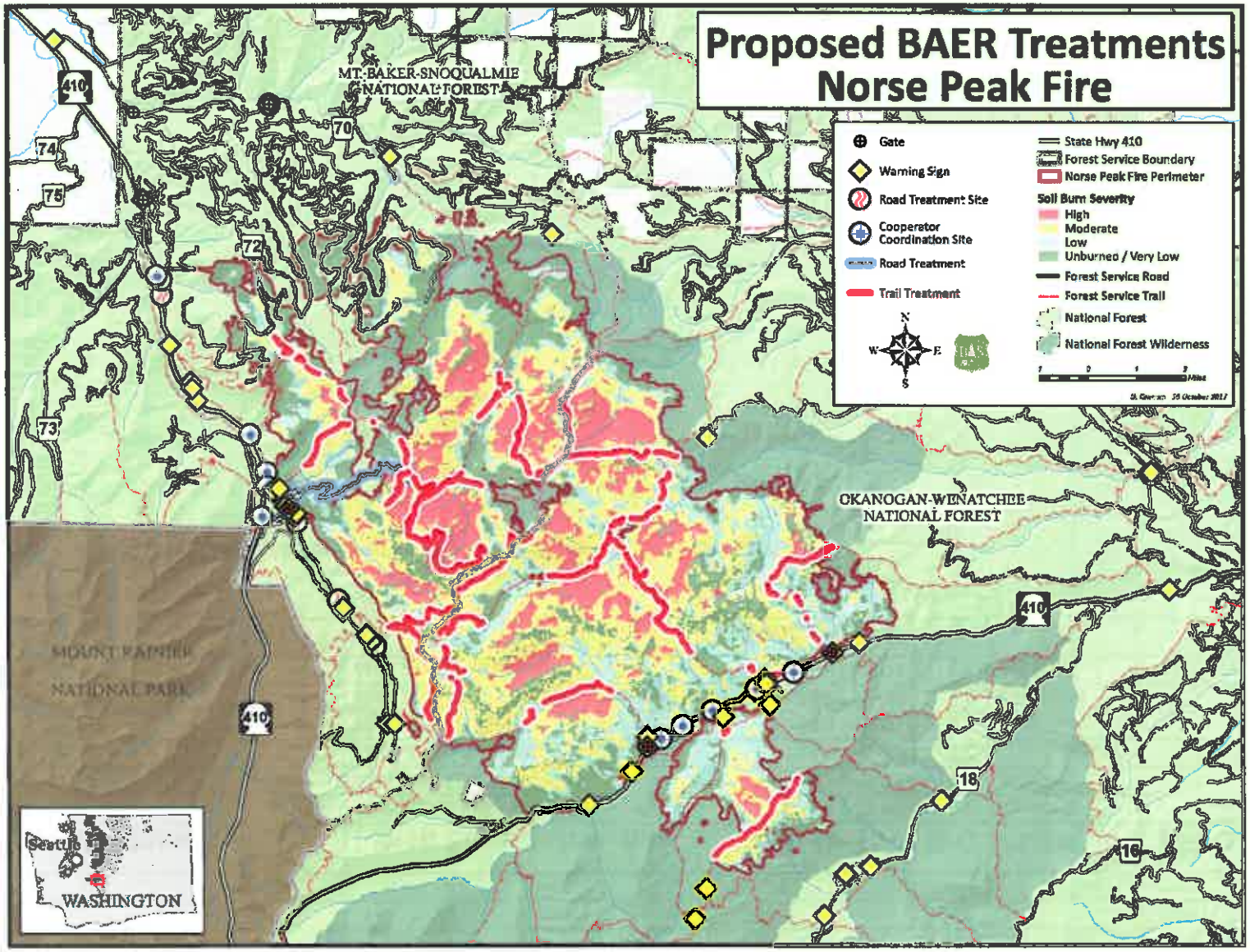


Figure 2: Norse Peak Proposed Treatments



Appendix 2: Norse Peak BAER Economic Summary

Norse Peak Fire	October 18, 2017				
BAER Economics Summary					
Excel Workbook	**Map Zone Tab Name**	**Total Cost**	**B/C**	**IMV**	**IMV Justification**
VARWorksheet_Norse.xlsm	Map Zone A-Roads	$116,260.00	9.0	Justified	
	Map Zone B-Trails	$181,460.00	1.7	Justified	
	Map Zone C-NoxWeeds	$55,300.00	0.0	$79,000.00	Yes
	Map Zone D-HazMat	$10,490.00	9.4	Justified	
	Map Zone E-ChannelTreatments	$225,248.00	1.8	Justified	
	Map Zone F-Closure	$56,800.00	1.6	Justified	
TOTAL		**$645,558.00**			

Appendix 3: Values at Risk identified within or downstream of the Norse Peak Fire. Attached.