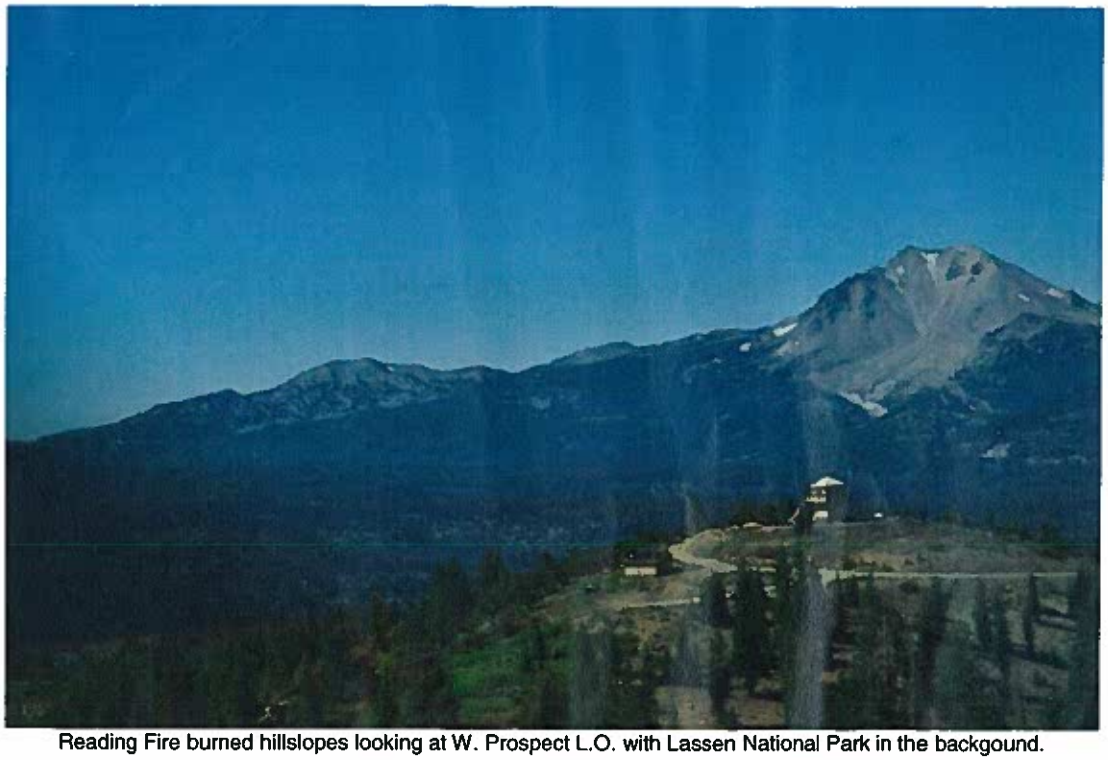
USDA-FOREST SERVICE

FS-2500-8 (7/08)
Date of Report: 9/5/12

READING FIRE BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST



Reading Fire burned hillslopes looking at W. Prospect L.O. with Lassen National Park in the backgound.

A. Type of Report

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

B. Type of Action

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

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

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

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Reading Fire

B. Fire Number: CA-LNP-G3H7

C. State: CA

D. County: Shasta

E. Region: 5

F. Forest: Lassen & LNP

G. District: Hat Creek

H. Fire Incident Job Code: P5G4HN

I. Date Fire Started: July 23, 2012

J. Date Fire Contained: August 22, 2012

K. Suppression Cost: $16 million

L. Fire Suppression Damages Repaired with Suppression Funds
1. Dozerline repaired / waterbarred: 21 miles
2. Hand line repaired: 7 miles
3. Hand line still needing repair (LNP): 19 miles

M. Watershed Number: 180200030601 Snag Lake, 180200030604 Upper Butte Creek, 180200030702 Lost Creek, 180200030703 Headwaters Hat Creek, 180200030706 Box Canyon-Hat Creek

N. Total Acres Burned: 28,079
NFS Acres(11,079) Other Federal (16,993) State ( ) Private (79)

O. Vegetation Types: Alder-willow shrubland in riparian areas, lodgepole pine on level gravels, mixed conifer forest with pine on lower slopes, mixed conifer forest with fir on middle slopes, red fir and mountain hemlock on upper slopes, montane chaparral on rocky shallow soils, dry grasslands in forest openings, and wet meadows and aspen in areas with a high water table.

P. Dominant soils: 62 soil map units: various loamy sands, sandy loams, and sands, mostly mod-deep to deep, and mostly soil hydrologic groups A and B. Specific dominant soils include [FS] Sheld, Yalanni, Xerorthents, Zynbar, and [NPS] Cenplat, Badgerflat, Sueredo, Badgerwash.

Q. Geologic Types: Bragdon (metasediments) and Baird formations (metavolcanics)

R. Miles of Stream Channels by Order or Class: 5 Miles Perennial, 3 Miles Intermittent, 14 Miles Ephemeral

S. Transportation System:

Trails: 2 miles Roads: 45 miles

PART III - WATERSHED CONDITION

A. Burn Severity by total and FS (acres):

Reading Fire (Aug 2012) - Soil Burn Severity by Ownership

Acres	Soil Burn Severity					
Ownership	**Unb/V.Low**	**Low**	**Mod**	**High**	**Total**	**Percent**
National Park	2,298	6,240	5,898	2,491	16,925	60.3%
	14%	37%	35%	15%		
National Forest	1,190	3,525	4,022	2,327	11,064	39.4%
	11%	32%	36%	21%		
Fruit Growers	10	39	16	9	74	0.3%
	13%	53%	22%	13%		
Total	**3,497**	**9,804**	**9,936**	**4,827**	**28,063**	
Percent	12%	35%	35%	17%		100%

B. Water-Repellent Soil by total and FS (acres): Water repellency is a primary element of the soils effects in this fire: severe repellency is widespread and mostly continuous throughout the fire area, occurring in all soil burn severity classes from the bottom of the surface-charred layer (generally 1-2 inches deep), and varying in thickness from ½ -2 inches in low SBS to 4-6 inches in high SBS. Repellency will be largely responsible for moderate soil burn severity expected to have a watershed runoff response similar to high. Repellency also occurred naturally in unburned areas, usually beginning at about 4 inches depth and 1-2 inches thick; repellency was greatly exacerbated by the fire in these coarse-sandy soils. Without repellency, these soils have rapid infiltration rates and surface runoff and erosion would normally be localized to shallow soil areas and/or steep slopes. It is estimated that about 80% of the fire area has water repellency elevated by the fire.

C. Soil Erosion Hazard Rating by total acres:

	Low	**Moderate**	**High**	**Very High**
Acres	13,951	11,165	2,744	79
Percent	50%	40%	10%	0.3%
	('water' removed from total acres)			

D. Erosion Potential:

Total fire area: 2 tons per acre for a 5 year runoff event, as determined using WEPP-ERMiT. Stated model accuracy is +/- 50%. With water repellency levels in this fire, +50% may be more representative for this area.

WEPP-ERMiT output: sediment production by watershed

ERMiT estimates	2-Year Event		5-Year Event		10-Year Event	
Watershed	tons/ac	tons	tons/ac	tons	tons/ac	tons
Lost Creek	0.2	196	1.5	2,274	2.8	4,464
Headwaters Hat Creek	0.1	1,829	1.8	22,539	3.4	41,014
Box Canyon-Hat Creek	0.4	4,357	2.1	23,964	3.6	41,232
Snag Lake	0.1	85	1.4	4,391	2.5	9,075
Upper Butte Creek	0.1	5	1.9	389	4.1	947
Grand Total	**0.2**	**6,472**	**1.8**	**53,557**	**3.3**	**96,733**

E. Sediment Potential:

ERMiT estimates (part 3D) try to account for hillslope re-deposition, and sediment production numbers are delivery to the bottom of the hillslope. Many modeled hillslopes in this fire do not have streams at the base of the slope; water percolates into the sandy soils and sediment is deposited on the gentle toe-slopes. Therefore it is roughly estimated that 20% of sediment estimates above would be delivered to the fluvial system.

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 5 - 10

B. Design Chance of Success, (percent): 85%

C. Equivalent Design Recurrence Interval, (years): 2

D. Design Storm Duration, (hours): 6

E. Design Storm Magnitude, (inches): 1.54

F. Design Flow, (cubic feet / second/ square mile): 2.37

G. Estimated Reduction in Infiltration, (percent): 80%

H. Adjusted Design Flow, (cfs per square mile): 3.19

PART V - SUMMARY OF ANALYSIS

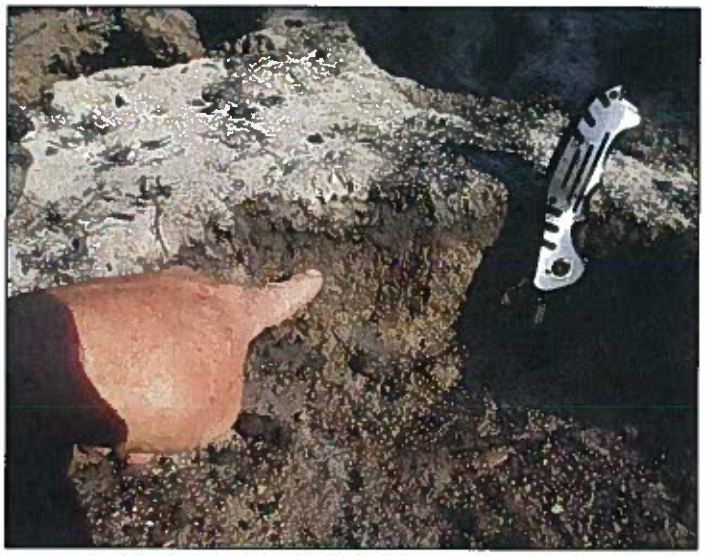
A. Describe Critical Values/Resources and Threats:

Background: The Reading Fire started on Monday, July 23, 2012 twenty-two miles southeast of Burney, California in Shasta County. The Reading Fire spread rapidly due to strong downslope winds from Lassen Peak burning into old decadent lodge-pole stands along Hat Creek. Initially it was a small lighting fire (150 acres) consuming ground fuel. But on August 6th strong downslope winds exploded the fire and in one day the fire grew to 1,000 acres consuming Lodge-pole Pine, Ponderosa Pine and Douglas fir. Approximately 65% burned at high and moderate soil burn severity (see soil burn severity map below). The rest of the fire was either low or very low soil burn severity. It is very important to

understand the difference between *fire intensity* or *burn severity* as discussed by fire behavior, fuels, or vegetation specialists, and *soil burn severity* as defined for watershed condition evaluation in BAER analyses. 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 analysis, we are not mapping 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.

General trends are lodgepole pine forested areas were moderate to high soil burn severity with 80 to 100 percent timber mortality. Open mixed conifer stands areas had moderate to low soil burn severities and with 30 to 70 percent mortality (see pics below).

Mod-high soil burn severity in mixed lodgepole in Hat Creek



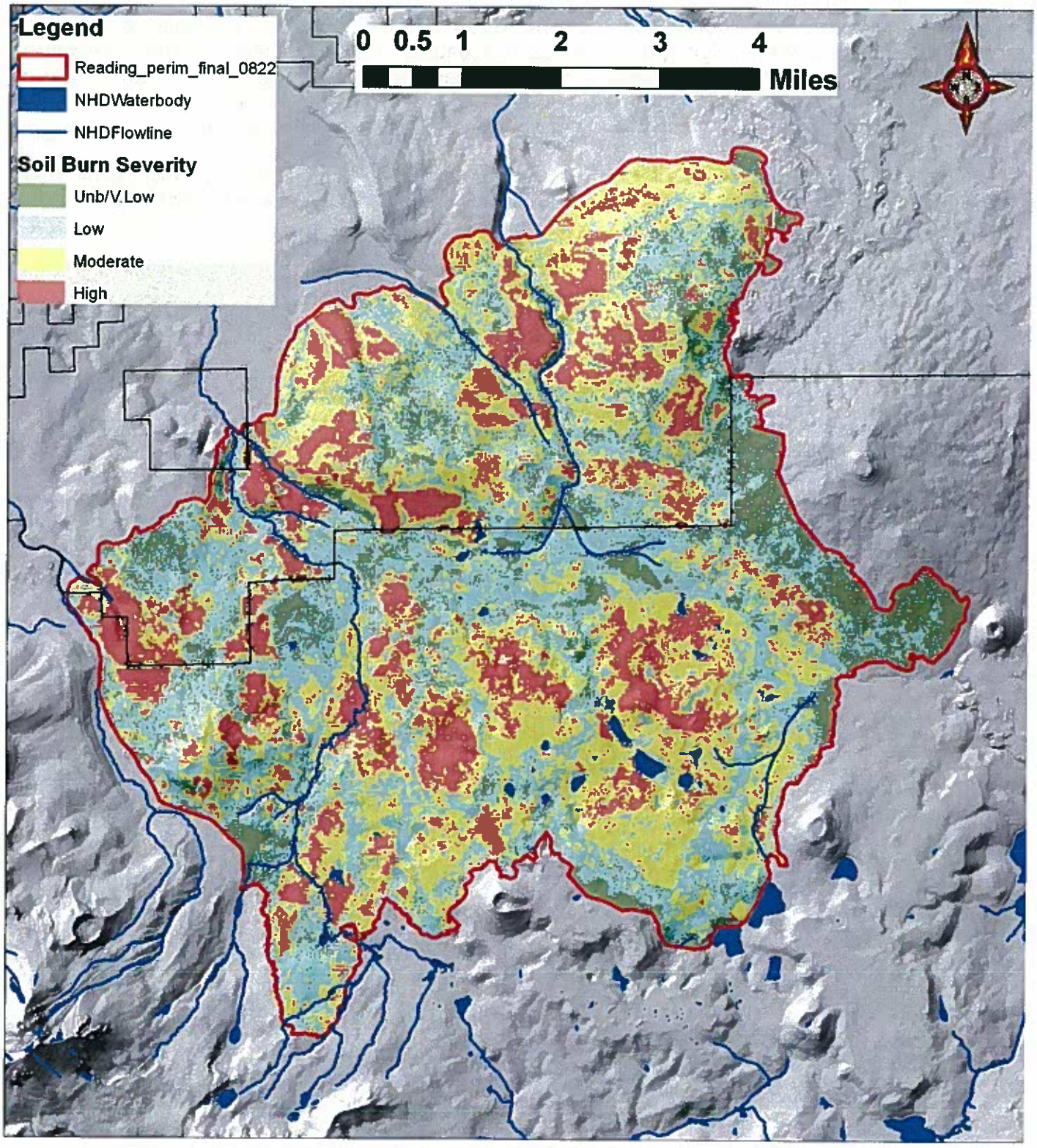
Mod- high soil burn severity char to 2" in mixed lodgepole

Low soil burn severity, P-Pine plantation along Badger Mtn.

Low soil burn severity with char on surface in Pine plantation

Looking at the soil burn severity map below shows multiple areas that have the majority of moderate and high soil burn severity. These areas are along Hat Creek and Boxrail Canyon with Hat Creek being at risk due to flooding and sedimentation affecting water quality and fish habitat.

Reading Fire Soil Burn Severity Map:



Values at Risk: (on a per watershed basis)

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

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: The steep nature of the burned environment creates potential hazards for flooding downstream along Hat Creek that could affect residents along its bank in Old Station. The burn has increased flooding potential by removing vegetative cover that reduces erosion and runoff (see hydrology report for details).

Risk Assessment – Threats to residents and campers along Hat Creek.

Probability of Damage or Loss: Unlikely. This determination is due to the lack hydrologic response from the burn by using a 2-year 6-hour storm modeling that shows moderate levels of flooding. Campsites are on the 100-year floodplain that are larger than anticipated flows.

Magnitude of Consequence: Moderate. This determination was made based on the potential outcome of campers or residents being flooded out or injured.

Risk Level: Low – Warning signs considered for threats to human life or safety.

Property: Based on the watershed response, the BAER Assessment team determined that residences and private property within and below the fire area are at increased risk of flooding as a result of the Reading Fire. Forest roads within the fire area will be repaired as a result of suppression activity which is critical to protect road-bed and associated infrastructure. But because of the expected increase in watershed response, the assessment team feels that significant damage would occur on roads throughout the fire perimeter due to undersized culverts and poor drainage (see hydrology report for details).

Risk Assessment - Private Property and campsites along Hat Creek.

Probability of Damage or Loss: Unlikely. This determination is due to the predicted change in watershed response because of moderate and high burn severity hillslopes above homes and campsites. Flooding and debris flows are unlikely for homes along Hat Creek.

Magnitude of Consequence: Moderate. This determination was made based on the change in watershed response.

Risk Level: Low - No treatments should be considered for threats to life and property.

Risk Assessment – Forest Service roads.

Probability of Damage or Loss: Likely. This determination is based on the expectation that increased erosion and sediment will occur and could plug drainage structures along roads.

Magnitude of Consequence: Moderate. This determination was made based on the amount of damage that would occur if culverts were temporarily plugged.

Risk Level: High.

Risk Assessment – Pacific Crest Trail.

Probability of Damage or Loss: Likely. This determination is based on the expectation that increased erosion and sediment will occur and run down the trail-tread destroying the trail.

Magnitude of Consequence: Moderate. This determination was made based on the amount of damage that would occur from trail-tread erosion destroying sections of the trail.

Risk Level: High.

Water Quality, Quantity, and Fisheries: The most noticeable effects of post fire effects on water quality would be increased sediment and ash from the burned area into drainages and water-bodies in and downstream of the fire area. During storm events this will increase turbidity and contribute to pool filling. Due to the moderate and high burn severity, water quality and quantity is expected to be significantly affected as a result of the Reading Fire within the Hat Creek watershed (see Hydrology Specialist Report). Hat Creek is a residential water source for numerous homes which has 60% of watershed burned hot (moderate and high soil burn severity) above. Hat Creek and Lost Creek are both fisheries for native residential trout and spawning gravels could be impacted by increased sedimentation. Aquatic plants and animals also could be affected by turbidity and sediments in habitat reduction (see hydrology and fisheries report).

Risk Assessment – Water quality of Hat Creek.

Probability of Damage or Loss: Likely. This determination is due to the change in watershed response and predicted increased turbidity affecting the drinking water for domestic water sources along Hat Creek.

Magnitude of Consequence: Moderate. This determination is due to the change in watershed response.

Risk Level: High.

Risk Assessment – Fisheries of Hat and Lost creeks.

Probability of Damage or Loss: Possible. This determination is due to the change in watershed response and increased bed-load turbidity affecting the fish habitat in Hat and Lost Creek.

Magnitude of Consequence: Moderate. This determination is due to the change in sediments in the water and spawning gravel enbeddiness that could occur.

Risk Level: Intermediate.

Risk Assessment – General aquatics.

Probability of Damage or Loss: Likely. This determination is due to the change in watershed response and increased bed-load turbidity and enbeddiness affecting the benthic macroinvertabrates in Hat and Lost Creek.

Magnitude of Consequence: Minor. This determination is due to the change in sediments in the water and gravel enbeddiness that could occur.

Risk Level: Low.

Risk Assessment – Cascade Frogs.

Probability of Damage or Loss: Possible. This determination is due to increased bed-load turbidity affecting the Cascade frog habitat in Hat and Lost Creek.

Magnitude of Consequence: Moderate. Due to the change in sediments water and gravel enbeddiness could occur.

Risk Level: Intermediate.

Threatened, Endangered, and Sensitive Plants: The potential values at risk for sensitive plants are the stability and viability of sensitive plant populations. Four sensitive plants are known to occur within the Reading Fire area and one federally listed Threatened species occurs immediately outside the fire boundary. All are likely to survive the fire; the annual species had completed its life cycle by the time of the fire, and the other four are long-lived perennials with well developed root systems. One roots in cliff crack systems. All of the species are adapted to a periodic disturbance regime resulting from either flooding or fire. Weed introduction and spread into occurrences of sensitive plants as a result of fire suppression activities or fire effects could reduce the quality of the habitat from high quality to lower quality. A dense infestation of a noxious weed such as oxeye daisy or yellow starthistle could greatly reduce or eliminate occurrences of a federally listed species. Such an invasion is likely given the close proximity of noxious weed populations and severe ground disturbance near the sensitive plants.

Risk Assessment – TES Plants

Probability of Damage or Loss: Likely. All of these species are resilient to disturbance but with strong competition due to invasive weeds habitat extent and quality will be greatly reduced.

Magnitude of Consequence: Moderate. All of these species are resilient to fire and will repopulate the area by reseeding or resprouting but are likely to be excluded by a number of noxious weeds known to occur in the vicinity and likely to be spread into the rare plants' habitat. None of the known occurrences of sensitive plant species were directly affected by fire suppression activity but suppression activities associated with this fire have a high potential to spread invasive weeds.

Risk Level: High.

Ecosystem Health and Integrity: Ecosystem integrity is at a high risk of being diminished due to the likely introduction and expansion of weeds. Noxious weeds reduce biodiversity, habitat quality, and ecosystem resiliency when they replace native species. In extreme cases, they act to change the structure and function of entire ecosystems. By exposing large areas of bare ground, the fire and suppression activities created conditions conducive to the spread of the noxious weeds known to be

within and adjacent to the fire area. Furthermore, suppression activities likely vectored noxious weed seed into or through the burned area. The heavy equipment washing station was not in operation for three days during the suppression effort. The equipment came from around the State and had potential to bring in a variety of noxious weeds. Additionally, machinery operated within or through areas known to contain yellow star-thistle, woolly mullein, bull thistle, and Klamath weed. Finally, straw that was not certified weed seed-free was used to repair drop points and other ground disturbance.

Risk Assessment – Native ecosystems

Probability of Damage or Loss: Likely. The fire and related suppression activities created large areas with soil conditions conducive to the establishment or spread of noxious weeds. Should dense populations of weeds become established, they can slow or prevent the recovery of native forest, shrubland, herbaceous, and riparian communities.

Magnitude of Consequence: Moderate. Vegetative communities with a significant component of noxious weeds provide degraded habitat for wildlife, are vulnerable to repeated disturbance, and can lose the ability to recover from such repeated disturbances.

Risk Level: High.

Risk Assessment – Native riparian vegetation.

Probability of Damage or Loss: Possible. This determination is due to increased bed-load turbidity bringing in invasive bull thistle due to adjacent hillslope erosion into Hat and Lost Creek.

Magnitude of Consequence: Moderate. Due to the change in erosion and flows, bull thistle could invade native riparian streambank vegetation.

Risk Level: Intermediate.

Risk Assessment – Water quality of Hat Creek due to increased levels of arsenic and selenium.

Probability of Damage or Loss: Unlikely. This determination is due to the slight change in pH from ash that increases pH levels making naturally occurring levels of arsenic and selenium to increase affecting the drinking water for domestic water sources along Hat Creek.

Magnitude of Consequence: Moderate. This determination is due to the change in watershed chemistry.

Risk Level: Low.

Threats to Ecosystem Stability: There is no emergency to ecosystem stability (geologic stability and soil productivity) due to the low debris flow potential and low production capacity of the soils (see geology and soils report).

No emergency exists for ecosystem stability as result of the Reading Fire.

Threats to Cultural Resources: Archival research and GIS analysis indicates that several cultural sites occur on Forest Service and Park Service lands within the Reading Fire perimeter. Post-fire assessment field work, conducted by the LNF heritage program staff, detected 2 sites (see archeology report).

Probability of Damage or Loss: Likely. Due to the high level of burning sites are exposed to erosion and vadalism.

Magnitude of Consequence: Moderate.

Risk Level: High.

Threats to Wildlife: There are no wildlife concerns for the Reading Fire due to no T&E species (see wildlife report).

No emergency exists for wildlife habitat as result of the Reading Fire.

B. Emergency Treatment Objectives: To allow safe passage of water to protect infrastructures and watersheds from accelerated sheet and rill erosion. To protect watersheds from the spread of noxious weeds and unfettered OHV access.

Risk determination is dependent on the design storm selected and downstream values at risk. By using an average storm (2-year event) emergency planning measures can be designed to mitigate and minumize anticipated risks. Using a 2-year design storm the values at risk can be evaluated to determine if an emergency exists. Emergency determination matrix displayed below shows if an emergency exists, probability of failure if untreated or treated, and treatment proposed to mitigate the emergency.

Reading Values @ Risk Emergency Determination Matrix

Value at Risk	Emergency U%(yes/no)T%			Reason	Treatment
Hat Creek pvt. homes	30	N	-	Flooding potential	Natural recovery
Fish habitat – Hat/Lost Ck.	40	N	-	Eroded fine sediments	Natural recovery
FS roads	75	Y	15	Undersized culverts	Upsize culverts, storm patrol, r-dips
Heritage sites	80	Y	45	Erosion & vandalism	Mulching, diversion structures
Ecosystem stability	40	N	-	Lack vegetative cover	Natural recovery
Native plant community	70	Y	30	Weed invasion	Detection survey
Botanical T&E	55	M	25	Firelines around mdw.	Detection survey
U% = untreated; T% = treated; Where Y = yes, M = maybe, and N = no					

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

Land **90** % Channel **-** % Roads/Trails **85** % Protection/Safety **90** %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	80%	85%	90%
Channel	-	-	-

Roads/Trails	95%	90%	85%
Protection/Safety	95%	90%	85%

E. Cost of No-Action (Including Loss): $1,376,600

F. Cost of Selected Alternative (Including Loss): $239,745

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader:Brad Rust

Email:brust@fs.fed.us Phone:530-226-2427 FAX:530-226-2485

H. Treatment Narrative for Forest Service:

(Describe the emergency treatments, where and how they will be applied, and what they are intended to do. This information helps to determine qualifying treatments for the appropriate funding authorities.)

Land Treatments: Invasive weed detection surveys, and hazard tree removal for project implementation are the selected treatments (see treatment map).

The proposed treatments on National Forest System lands can help to reduce the impacts of the fire, but treatments will not completely mitigate the effects of the fire. The treatments listed below are those that are considered to be the most effective on National Forest System lands given the local setting including topography and access.

Natural Recovery: Vegetation in the mixed conifer and fir forests will recover slowly. Even in areas of moderate soil burn severity, the canopy was mostly killed and the seed source removed. Stands with an element of Jeffrey, sugar, western, or ponderosa pine will likely recover more quickly, since at least a few mature trees are likely to have survived to produce seed into newly exposed mineral soil. Meadows dominated by grasses and forbs will recover within a year, because for the most part soil temperatures were not hot enough to kill root systems. The montane chaparral shrubs were mostly killed by the fire, but fire stimulates manzanita seeds stored in the soil to germinate. In riparian areas along Hat and Lost creeks, sedges and grasses were resprouting within 10 days of the fire, and most riparian shrubs are also likely to resprout.

Invasive Plants: Treatment Description. 1) Conduct detection surveys along dozer lines, some handline segments, drop points, spike camps, drafting sites, and dozed roadsides in 2013: once in early July to detect cheatgrass, yellow starthistle, medusahead rye, Klamathweed, and oxeye daisy, and once in early September to detect reed canary grass, knapweeds, bull thistle, and woolly mullein. Hand pull or dig all noxious weeds found, or use herbicide where appropriate.

Bag and properly dispose of seed heads. Map and document findings. 2) Conduct detection surveys and treatments in burned areas with known noxious weed occurrences in 2013. 3) Conduct maintenance surveys and treatments in 2014 and 2015.

Treatment Cost. 1) EDRR surveys and treatments of known weed infestations, 21 miles of dozer line, 7 miles of hand line, and 10 acres of identified miscellaneous sites (staging areas, drop points, drafting sites, sling sites, spike camps, helispots) totaling approximately 100 acres: $41,000.

Assessment of areas burned or disturbed by the fire or related activities (approx. 100 acres, surveyed twice each year). Costs estimates are for one year of assessment only.

Expense	Estimated 2013 Cost per Day	# 8hr days	Total
GS-11 Botanist (coordination & planning, documentation)	$350	25	$8,750.00
GS-9 Crew leader (planning & implementation)	$300	25	$7,500.00
GS-5 Seasonal crew members (two for implementation)	$300	20	$6,000.00
GSA vehicle	$75	20	$1500.00
Total Request:			**$23,750.00**
Request Rounded			**$24,000.00**

Hillslope mulching treatment by helicopter was not selected due to values at risk were not great enough for cost and effectiveness of treatable ground on forest lands.

Channel Treatments: none

Roads and Trail Treatments: Road stormproofing and storm patrol (see treatment map).

Road stormproofing will consist of removing outside berms where appropiate, installing critical dips and to allow safe passage of anticipated increased water flows due to burned landscapes. Hazard trees will be removed where crews are working for safe ingress and egress.

Treatment Objective: Minimize the risk of road failure in the burn area through the placement and maintenance of effective water control measures. Prevent the channeling of water on roads. Ensure the diversion of runoff in controlled intervals to reduce erosion and further watershed degradation.

Road Treatments: An emergency determination was made on Forest Service roads: West Badger (31N93), West Prospect Lookout (32N12), Prospect Spur (32N12B), Prospect Spur (32N12C), Badger Spur (32N13Y), Little Bunchgrass (32N20), Bunchgrass West (32N38), Prospect Spur (32N43), Park Spur (32N75Y), Park Spur Sec.12 (32N75YA), and Park Spur Sec.1 (32N75YB). For more information see the Roads Specialist Report in the project record.

The following treatments were identified as BAER treatments for the Reading Fire burned area:

- Install Roadway Armored Rolling Dips.
- Install Drainage Armor (riprap rock).
- Install Culvert Cross Drains.

- Drainage Structure Cleanout (catchment basins, ditches).
- Out-Slope Roadway

Road Treatment Costs

Item	Unit	# of Units	Unit Cost	Total
Armored Rolling Dips	Each	75	$1,500.00	$112,500.00
Install Drainage Armor	Cubic Yard	43	$100.00	$4,300.00
Install Culvert Cross Drains	Foot	460	$150.00	$69,000.00
Catch Basin and Ditch Cleanout	Mile	16.4	$800.00	$13,120.00
Out-Slope Roadway	Mile	0.2	$14,000.00	$2,800.00
Total				**$201,720.00**

Protection/Safety Treatments: Burned area road and trail signs.

Safety: Posting of areas burned will alert the public to potential dangers of falling trees and rolling rocks. Repair of road signs burned will insure public safety (see treatment map). Closure signs for campgrounds that have potential for flooding with a 2yr-6hr storms.

Heritage Resource Prescriptions:

One heritage resource within the burn area requires emergency treatment.

FS#05065301300 This heritage property is a reported prehistoric seasonal camp with bedrock milling features, groundstone tools, and obsidian debitage. The fire severity in this area was low to moderate resulting in a majority of the ground cover being burned off. Surface visibility combined with the location of the site relative to a Forest Service system road provides an increased risk of vandalism and degradation to the site as a result of increased off highway vehicle (OHV) use. It is recommended that FS#05065301300 be treated by broadcasting natural materials (e.g. local pine needles, twigs and branches) along the upper surface of the site. This will provide the opportunity for vegetation in the area to recover, obscuring the surface artifacts and discourage unauthorized OHV use within the site.

Treatment Costs/Unit Costs:

Lassen National Forest Heritage Treatment Costs

Site Number	Unit	Unit Cost	Number of Units	Heritage Costs for BAER
FS#05065301300	Archaeologist GS-11	$308.00 per day	2	$616.00
	Archaeologist GS-9	$275.00 per day	2	$550.00
	Archaeologist GS-7	$180.00 per day	2	$360.00
	Archaeologist GS-5	$150.00 per day	2	$300.00
	Vehicle Cost	$0.57 per mile	350	$199.50
				$2,025.50

I. Monitoring Narrative:

(Describe the monitoring needs, what treatments will be monitored, how they will be monitored, and when monitoring will occur. A detailed monitoring plan must be submitted as a separate document to the Regional BAER coordinator.)

The noxious weed effectiveness monitoring needs identified for the Reading Fire include the following:

If weeds are detected in 2013 and are spreading then In 2013 and 2014, treat (with interim request) and reassess areas treated in 2013 to determine the effectiveness of treatments. Adaptive management analysis will determine whether treatments should continue, cease, or be changed to increase effectiveness. Methods of assessment in monitoring years will be the same as used for the original assessments.

Treatment of existing and new weed infestations – annual cost.

Expense	Estimated 2013 Cost per Day	# 8hr days	Total
GS-11 Botanist (coordination & planning)	$350	10	$3,500.00
GS-9 Crew leader (planning & implementation)	$300	20	$6,000.00
GS-5 Seasonal crew members (two for implementation)	$300	15	$4,500.00
GSA vehicle	$75	15	$1,125.00
Supplies & Materials (trash bags, gloves, herbicide, sprayer parts)			$1500.00
Total Request:			**$16,625.00**
Request Rounded			**$17,000.00**

See Appendix C below for road, heritage, and trail monitoring.

Part VI – Emergency Stabilization Treatments and Source of Funds Interim # 1

Click red icons for notes.	NFS Lands					Other Lands				Money Left
Line Items	Units	Unit Cost	# of Units	BAER $	Spent $	# of Units	Fed $	# of Units	Non Fed $	Total $
A. Land Treatments										
NX Weed Det. Surv.	mi	$1,200	20.0	$24,000	$0		$0		$0	$0
Hazard Trees	mi	$1,000	1.0	$1,000	$0		$0		$0	$0
Subtotal Land Treatments				$25,000	$0		$0		$0	$0
B. Channel Treatments - none										
				$0	$0		$0		$0	$0
Subtotal Channel Treatments				$0	$0		$0		$0	$0
C. Road and Trails										
Rolling dips w/rock outlets	ea	$1,500	75	$112,500	$0		$0		$0	$0
Reconditing ditches	mi	$800	16	$13,120	$0		$0		$0	$0
Install drainage armor	cuy	$100	43	$4,300	$0		$0		$0	$0
Out-sloping roadbed	mi	$14,000	0	$2,800	$0		$0		$0	$0
Install culvert cx-drains	ft	$150	460	$69,000	$0		$0		$0	$0
Trail (PCT) stormproofing	mi	$4,600	1	$4,600	$0		$0		$0	$0
Subtotal Road & Trails				$206,320	$0		$0		$0	$0
D. Protection/Safety										
Warning Signs	ea	$300	8	$2,400	$0		$0		$0	$0
Heritage Site Protection	ac	$2,025	1	$2,025	$0		$0		$0	$0
Closure Signs	ea	$200	5	$1,000						
Subtotal Protection				$5,425	$0		$0		$0	$0
E. BAER Evaluation										
Assessment Team	0520	H5BAER	---	---	$41,000	---	$0	---	$0	$0
	---	---	---	---	$0	---	$0	---	$0	$0
Subtotal Evaluation				---	$41,000	---	$0	---	$0	$0
F. Monitoring										
Road Monitoring	ea	$1,000	1	$1,000	$0		$0		$0	$0
Trail Monitoring	ea	$1,000	1	$1,000						
Heritage Site Monitoring	ea	$1,000	1	$1,000						
Subtotal Monitoring				$3,000	$0		$0		$0	$0
G. Totals				**$239,745**	**$0**		**$0**		**$0**	**$0**
Previously approved						Comments:				
Total for this request				**$239,745**						

PART VII - APPROVALS

1. */s/ Jerry Bird*_____ *9/10/12*_____
Forest Supervisor (signature) Date

2. Jeanne Wade Evans 9/18/12
Regional Forester (signature) Date

APPENDICES: Supporting Information:

Appendix A: Reading Fire BAER Team

Appendix B: Reading Fire BAER Team Recommendations

Appendix C: Monitoring for Roads, Heritage, and Trails

Appendix D: Resource at Risk - Specialist Reports

Appendix E: Summary of Hydro Cals.

Appendix F: Summary of Cost-Risk Analysis

Appendix A: Reading Fire BAER Team:

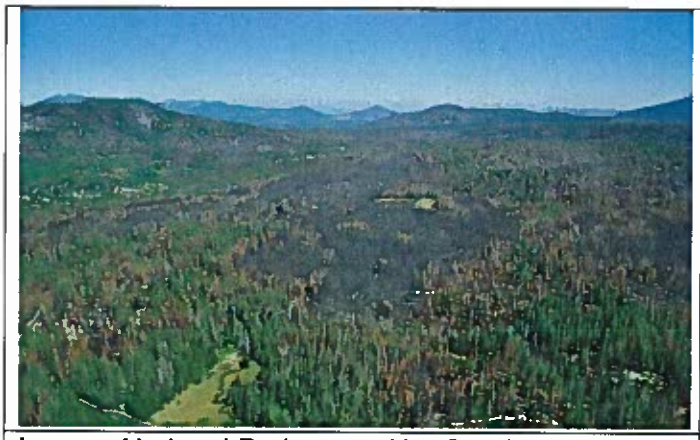
Position	Name	Quals	Cell Phone	Work Phone
USFS:				
BAER Coord.	Doug Peters – USFS Lassen	-	661-246-9723	530-252-6456
Team Leader	Brad Rust – USFS Shasta-Trinity	BAES	530-917-0434	530-226-2427
Co-Lead/Soils	Dave Young – USFS R5	BAES	530-227-9050	530-226-2545
Soils Trainee	Doug Peters – USFS Lassen	THSP*	661-246-9723	530-252-6456
Soils Trainee	Brian Bergman – USFS Sequoia	BAES	-	760-376-3781
Hydrology	Chris Stewart – USFS Sequoia	BAES	509-310-3121	760-376-3781
Engineering	Randen Nagel – USFS Lassen	BAES	530-310-5644	530-252-6483
Hydrology Trainee	Shawn Wheelock – USFS Lassen	THSP*	-	530-336-5521
Archaeology	Bob Foxworth – USFS Lassen	READ	214-608-3146	530-242-
Fisheries	Dan Teater – USFS Tahoe	BAES	530-613-7040	530-367-2224
Forestry	Todd Hamilton– USFS Shasta-T	BAES	-	209-962-7825
GIS	?? – USFS Shasta-T	THSP		
Botany	Allison Sanger – USFS Lassen	THSP		530-623-
Wildlife/Aquatics	Dan Burton– USFS Lassen	THSP*	530-592-8103	530-592-8103
Geology	Angie Bell – USFS Klamath	THSP*	814-282-7932	530-841-4583
NPS:				
Co-Lead/ Geology	Brian Rasmussen – Whiskeytown	BAES	530-949-9838	530-242-3444
Co-Lead/ Forestry	Karl Brown – Nat Res. Prog. Ctr.	BAES	970-231-4918	970-225-3591
Co-Lead/ Cultural Resources	Joe Svinarich – Whiskeytown	FF2 BAES	530-638-6744	530-638-6744
Vegetation	Janet Coles – Guadalupe Mountains	BAES	432-853-0359	915-828-3251
Vegetation	Eamon Engber – Redwood	FF2		707-272-1036
Vegetation	Terra Perkins – Whiskeytown	FF2	530-355-4684	530-242-3465
Vegetation/READ	Kendra Graff – Yellowstone	READ	303-319-6445	-
Cultural Resources/ Documentation	Stephanie Mack – Whiskeytown	BAES	225-936-6664	-
BAER Coord.	Nelson Siefkin – NPS-PWR	-	510-207-7357	209-664-9944
BAER Coord.	Rich Schwab – NPS-NIFC	-	208-830-4791	202-513-7129

Appendix B: Reading Fire BAER Team Recommendations (see specialists reports):

Recommendations for Lassen National Park, Lassen National Forest, and private landowners (see pictures below):

Lassen National Park:

Upper Hat Creek Aspen Restoration Project: These areas are lodgepole thickets that are completely consumed that have residual Quaking aspen groves that were choaked out by lodgepole. After the fire these areas will come back rapidly with lodgepole choking out aspen groves. These areas need to be restored to aspen groves through hand thinning of lodgepole and fencing to reduce competition for aspen regeneration and meadow development. Soils are sandy loams that have high water tables making them ideal for aspen. See Botany report.



Lassen National Park upper Hat Creek

Upper Hat Creek aspen grove regeneration

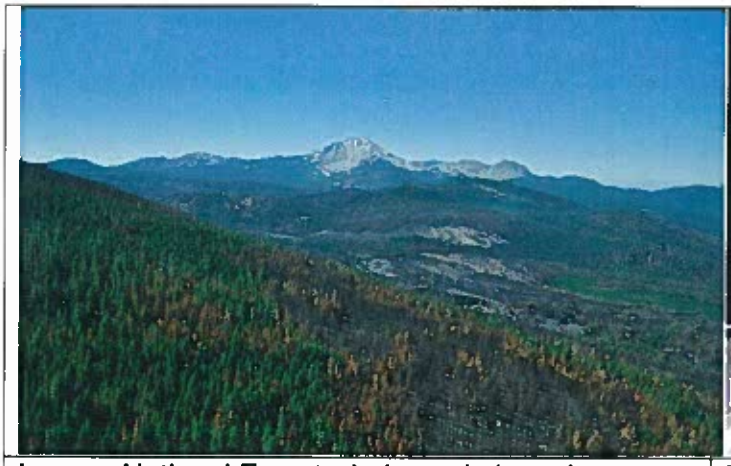
Lassen National Forest:

Forest Service Hat Creek Aspen Restoration Project in coordination with the Lassen National Park Upper Hat Creek Aspen Restoration Project.

Windrow Re-spreading Project: Large areas of plantations were destroyed by the Reading Fire (see pics below). Many of these plantations were windrowed plantations. Since the plantations are dead it is the ideal time to biomass, masticate, and spread windrows that contain nutritious topsoil, and replant. This would greatly improve these areas for tree growth and maximum production (see Blacks Mtn. Study, PSW, 2011).

Reading Fire Water Quality Testing Project: Hydrothermal fluids associated with the formation of volcanic terrains often scour and concentrate heavy metals. These are re-deposited once the heat is dissipated (Klein Hurlburt, 1999)(Francis, P.2001). Testing of water quality parameters at Old Station while the Reading fire was burning have shown that both the pH and ORP (Oxidation Reduction Potential) of the water have shifted. This would affect the stability and speciation of many heavy metals which are often found in volcanic centers, such as Lassen. These potentially include arsenic, selenium, chromium, mercury (Drever, 2002). While the possibility exists of these being mobilized into Hat Creek, its likelihood cannot be assessed without laboratory analyses of water. It is therefore recommended that Lassen National Forest have water from Hat Creek at Old Station tested for heavy

metals as soon as is practical. This would serve as a baseline. This testing should be repeated after precipitation events have caused erosion of ash and other materials into Hat Creek.



Lassen National Forest windrowed plantations

Burned windrow plantation

Private Landowners:

Windrow Re-spreading Project: Private landowners adjacent to FS plantations could benefit by having their plantations similarly treated along with the FS lands saving cost and increasing productivity of their lands.

Appendix C: Monitoring Protocols:

Reading Fire
Road Effectiveness Monitoring

The 2500-8 report requests funds to monitor the effectiveness of road treatments on Reading Fire roads.

4. Monitoring Questions
- Is the road-tread stable?
- Is the road leading to concentrating runoff leading to unacceptable off-site consequences?

2. Measurable Indicators
- Rills and/or gullies forming of the road
- Loss of road bed.

3. Data Collection Techniques
- Photo documentation of site
- Inspection Checklist (attached)

4. Analysis, evaluation, and reporting techniques

- Monitoring will be conducted after storm events. If the monitoring shows the treatment to be ineffective at stabilizing road and there is extensive loss of road bed or infrastructure an interim report will be submitted. A several page report would be completed after the site visit. The report would include photographs and a recommendation on whether additional treatments are necessary.

Road Inspection Checklist

Date:_____ Inspector_____
Time:_____ Forest Road_____

Describe locations reviewed during inspection:_____

_____

_____

Was there road damage?

Was culvert plugged?_____.

GPS _____

Describe damage and cost to repair? (GPS)_____

Photo taken of road damage_____

Recommended actions to repair:_____

Reading Fire
Cultural Site Mulching Effectiveness Monitoring

The 2500-8 report requests funds to monitor the effectiveness of straw handmulch treatments on Iron-Alps Complex heritage sites.

4. Monitoring Questions
- Is the straw mulch with good cover stable?
- Is the straw mulch being undercut by concentrated runoff leading to unacceptable on-site erosion?

2. Measurable Indicators
- Rills and/or gullies forming around the artifacts
- Loss of artifacts

3. Data Collection Techniques
- Photo documentation of site
- Inspection Checklist (attached)

4. Analysis, evaluation, and reporting techniques

- Monitoring will be conducted after storm events. If the monitoring shows the treatment to be ineffective at stabilizing and there is extensive rilling an interim report will be submitted. A several page report would be completed after the site visit. The report would include photographs and a recommendation on whether additional treatments are necessary.

Heritage Protection Inspection Checklist

Date:_____ Inspector_____
Time:_____ Forest Road Nearby_____

Describe locations reviewed during inspection:_____

_____

_____

Was there artifact damage?

Was artifacts covered or eroded?_____.

GPS)_____

Describe damage and cost to repair? (GPS)_____

Photo taken of artifact damage_____

Recommended actions to repair:_____

Reading Fire
Trail Effectiveness Monitoring

The 2500-8 report requests funds to monitor the effectiveness of trail treatments on Forest Trails in the Reading Fire.

1. Monitoring Questions
   - Is the trail tread stable?
   - Is the trail leading to concentrating runoff leading to unacceptable off-site consequences?

2. Measurable Indicators
   - Rills and/or gullies forming on the trail
   - Loss of trail bed

3. Data Collection Techniques
   - Photo documentation of site
   - Inspection Checklist (attached)

4. Analysis, evaluation, and reporting techniques

   - Monitoring will be conducted after storm events. If the monitoring shows the treatment to be ineffective at stabilizing trail and there is extensive loss of trail bed or infrastructure an interim report will be submitted. A several page report would be completed after the site visit. The report would include photographs and a recommendation on whether additional treatments are necessary.

Trail Inspection Checklist

Date:_____ Inspector_____
Time:_____ Forest Trail_____

Describe locations reviewed during inspection:_____

_____

_____

Was there trail damage?
Did the trail crossing fail?_____.
GPS)_____

Describe damage and cost to repair? (GPS)_____

Photo taken of trail damage_____

Recommended actions to repair:_____

Appendix D: Resource at Risk - Specialist Reports

Reading Fire

Roads / Engineering

BAER SPECIALIST REPORT

Lassen National Forest	August 31, 2012
Assessment by: Randen Nagel Transportation Planner/Road Maintenance Engineer Lassen National Forest	

I. Resource Condition Assessment

A. Resource Setting -Figure A-1 shows an overview and the burn severity for the Reading Fire.

1. Forest Service System Roads (FSR) with in the fire area are primarily maintenance level ML-2 and 3, single lane, native surface roads, located on steep slopes, ridge tops and drainage bottoms. Roads are designed both in-sloped and out-sloped, with lead off ditches, rolling dips and metal culvert cross drains. The potential for loss of control of water and road damage is intensified where these roads, in steep terrain also have steep grades over 6%, roads that are drained with dips, culverts, and culverts are easily plugged with the increased amount of sediment from the burned hill slopes above.

2. Initial concerns, flood threats and risk include :

- Increased runoff and sediments resulting in downstream impacts to life, safety and property.
- Loss of roadway improvements including road drainage structures, surfacing and the roadway structure itself.
- Effects by roadways with potential for water diversion, causing concentration of increased water flow during storm events, leading to increased sediment transport to streams.

3. There are approximately **45.0** miles of National Forest System Road (NFSR) within the Reading fire perimeter, with additional mileage adjacent too or below the burned watershed that could be affected. Of these 45.0 miles **29.1** miles are proposed for BAER treatments.

4. The maintenance level breakdown for system roads is shown in the table below:

Maintenance Level	Approximate Length (Miles)
3	9.0 – Suitable for Passenger Cars
2	31.8 – High Clearance Vehicles
1	4.2 – Closed to Motor Vehicles

5. The dominant road features on the landscape are inboard ditch designs. These roads were surveyed in this assessment.

6. Other roads inside the burned area, primarily ML-2 roads, are managed and maintained for vegetation management, some unclassified roads within the burn are being used as trails. Due to time constraints, access issues and safety, these roads were not surveyed.

7. Several primitive camp grounds and wilderness trail heads are located within the burn area and are accessed by the road system.

B. Findings of the On-The-Ground Survey

1. The Reading Fire burned approximately 28,079 acres. Of this acreage, burn severity was determined to be 17% high, 35% moderate, 35% low, and 12% unburned. 11,064 of these acres burned, occurred on the Hat Creek Ranger District of the Lassen National Forest. The effects of the fire were diminished ground cover and vegetation. The condition is expected to result in increased, flashy runoff; down slope movement of fine ash and sediment; and rock fall, until vegetation is re-established.

2. Fire area maps were consulted, access permitting on the ground reconnaissance of roads within and adjacent too the fire perimeter were driven to determine an initial assessment as to which roads held the highest potential for fire related flood damage.

3. Threats to Life, Safety and Property, effects on water quality and soil productivity and the Forest Service infrastructure (roads) are considered the **Values at Risk**. These roads are a Government asset and are needed for long term administrative, emergency, permittee, recreation, and in-holder access during and after the fire recovery period. There is a risk to the infrastructure from potential loss of control of water on the following roads: 31N93, 32N12, 32N12B, 32N12C, 32N13Y, 32N20, 32N38, 32N43, 32N75Y, 32N75YA, and 32N75YB. Threats to sensitive resources from loss of control of water on roads can lead to significant erosion and sedimentation to streams.

4. **Condition of Values at Risk**: many of the drainage structures on roads within the fire area are functional but not operating at full design capability. Road rehabilitation and repair was performed post fire on roads within the burn. Roads were graded, but drainage function was not fully restored, and drain inlets/outlets were not cleaned. In some cases storm proofing is needed

as additional back up, constructing rolling drainage dips, cleaning ditches and culvert catch basins, and upsized culverts, along with drainage armor (rock) installed in order to insure stability of the road and control water and the downslope movement of fine ash, sediments and rock that could potentially affect the drainage facilities and function of the road system, causing risk to property, water quality, soil productivity and other downstream values.

II. Emergency Determination

This assessment identifies an emergency related to the road system based on the following threats:

A. ***Life and Safety:*** Flash flooding, rock fall, road wash-outs.

B. ***Water Quality and Soil Productivity:*** On and off site wash-outs, erosion and riling.

C. ***Property (infrastructure) Loss of Control of Water:*** Blocked or plugged drainage features.

1. An emergency determination was made on all roads within the fire perimeter.

2. Segments of native surface roads that are located on steep terrain have the greatest potential for water diversion, and pose a threat to the identified values. These road segments include: West Badger (31N93), West Prospect Lookout (32N12), Prospect Spur (32N12B), Prospect Spur (32N12C), Badger Spur (32N13Y), Little Bunchgrass (32N20), Bunchgrass West (32N38), Prospect Spur (32N43), Park Spur (32N75Y), Park Spur Sec.12 (32N75YA), and Park Spur Sec.1 (32N75YB).

III. Treatments to Mitigate the Emergency

The following treatments were identified as BAER treatments for the Reading Fire burned area:

- Roadway Rolling Dips (relief dips at culvert crossings).
- Upsize Culverts (replace undersize culverts).
- Install Drainage Armor (rip/rap rock).
- Clean ditches and catch basins (inlets and outlets).

Estimated cost of the proposed road treatments related to storm proofing and storm patrol for those roads assessed and summarized in this report are approximately **$201,720.00** or **$6,932.00** per mile.

The cost to replace the NF road system within the fire varies depending on location, design and assigned maintenance levels. Estimated costs are at **$50,000.00** to **$75,000.00** per mile.

There is a much greater value placed on needed roads when the road function is lost and access is denied.

The treatments proposed are considered to be **75% to 90%** effective in reducing the risk to life and safety effects on water quality, soil productivity, and property invested infrastructure (roads) and adjacent resource values and assure future availability of the road system.

The road is considered the value at risk when the cost to repair the damage anticipated, is greater than the cost to prevent that damage.

See appendix –B for proposed road treatment cost breakdown. Detailed road treatment specifications and location are found in appendix –C

IV. Discussion/Summary/Recommendations

A. Implement proposed road treatments as shown on the treatment map and as recommended above. Treatments related to storm proofing include culvert upsizing, ditch and catchment basin reconditioning, rolling dips construction, roadway out-sloping, and placement of rip rap will insure the control of water.

B. Provide field notes, maps, road logs, and the BAER road report to local Lassen NF engineers for implementation.

C. Reference 23.4 Roads and Trails Normal road and trail maintenance must be done with appropriated funds. FSH 2509.13 Chapter 20.

V. Contacts and References

A. INFRA Travel Routes Inventory.

B. BAER Team meetings and discussions.

C. FSH 2509-23.4 Roads & Trails 26.3 Roads & Trails Treatments.

D. Randen Nagel (Lassen NF Transportation Planner).

VI. Appendices

A. Fire Area Road Treatment Map.

B. Road Treatment Cost.

C. Road Treatment Specifications.

D. Digital Photo File.

E. Road GIS Shape File.

F. Value at Risk.

G. 32N12 Culvert Sizing.

H. Paper Road Logs (PRL) field copies.

TECHNICAL SPECIALIST'S REPORT – BURNED AREA EMERGENCY RESPONSE

Resource: Native Plant Communities / Noxious Weeds
Fire Name: Reading Month/Year: August 2012

Authors' Names: Janet Coles, Chief of Resource Management, Guadalupe Mountains NP
Terra Perkins, Exotic Plant Program Crew Leader, Whiskeytown NRA

I. Potential Values at Risk

Natural Resources: Ecological integrity of native plant communities in and immediately adjacent to the burned area that may be at risk from expanding noxious weed populations.

II. Resource Condition Assessment

A. Resource Setting

The Reading Fire area burned in an area of native forests, shrublands, meadows, and riparian vegetation typical of the southern Cascade mountains (Table 1). Most of the burned area was forested by a mosaic of stands dominated by white fir, lodgepole pine, red fir, or Jeffrey/ponderosa pine (Figure 1). Patches of montane chaparral are dominated by species also found in the understory of adjacent forests: Greenleaf manzanita, chinquapin, tobaccobrush, whitethorn, and gooseberry. Meadows in the area tend to be dry and dominated by upland bunchgrasses such as western needlegrass and squirreltail, except where the water table remains near the surface; in these areas blue wildrye and sedges comprise most of the herbaceous vegetation. Riparian zones and aspen stands occupy small areas but are critical contributors to ecosystem health and diversity.

The fire area is relatively well surveyed for weeds and has relatively few weed infestations. However, the known infestations are situated (e.g., road sides, stream banks, upwind or upslope) such that they may act as sources for areas affected directly by the fire or suppression activities (Figure 2). If new infestations are established, the negative consequences to native plant communities and wildlife habitat could be significant and long-term.

During our on-site assessments and consultation with the Lassen Forest Botanist and Lassen Volcanic National Park databases, we identified priority species that have the potential to adversely affect native plant communities in the area affected by fire and fire management (Table 2, Appendix A). These are species that are either documented from the fire area or occur close by. The following species are declared to be noxious weeds by the California Department of Food and Agriculture (2012):

- *Centaurea maculosa* (spotted knapweed) - potential
- *Centaurea solstitialis* (yellow starthistle) - potential
- *Centaurea squarrosa* (squarrose knapweed) - potential
- *Cirsium arvense* (Canada thistle) - potential
- *Hypericum perforatum* (Klamathweed) - present
- *Lepidium latifolium* (perennial pepperweed) – potential
- *Taeniatherum caput-medusae* (Medusa-head rye) - present

Several additional species are rated by the California Invasive Plant Council (Cal-IPC) as having significant potential to invade or expand within the burned area and degrade the integrity of native plant communities:

- *Bromus tectorum* (cheatgrass) - present
- *Cirsium vulgare* (bull thistle) - present
- *Leucanthemum vulgare* (oxeye daisy) - present
- *Phalaris arundinacea* (reed canary grass) - potential
- *Verbascum thapsus* (woolly mullein) - potential

B. Findings of the On-the-Ground Survey

1. Resource condition resulting from the fire and suppression activities: Many disturbed sites were created within and adjacent to the burned area boundary. These either contain known noxious weed populations or are vulnerable to noxious weed invasion.

    a. New disturbance areas were created by fire suppression activities:
        - Construction of dozer line (estimated 31 miles, approximately 73 acres disturbed)
        - Construction of hand line (estimated 47 miles, approximately 56 acres)
        - Construction and/or use of miscellaneous sites (helispots, drop points, spike camps, water sources (estimated 13 acres)

    b. Personnel, equipment, and material can serve as both source and vector for new noxious weed infestations. Although an equipment washing station was established early in the incident, it was not in operation for three days during the transition from a Type 1 to a Type 3 incident management team. In addition, straw bales and rice straw wattles were used in rehabilitating disturbed USFS sites; this material was not certified free of the seeds of noxious weeds. Personnel assigned to the fire line can serve as vectors for propagules, carried on clothing, personal gear and other equipment. We expect approximately five acres of new noxious weed infestations because of these activities, based on field surveys of equipment staging areas and rehabilitated site, the miles of fire line constructed and the number and location of spike camps.

    c. Fornwalt et al. (2010) determined that exotic species frequency and cover increase in areas experiencing high and moderate severity burns. Fire-induced changes in soil chemistry, water holding capacity and seed bank all favor the establishment of noxious weeds over native species. Although most areas of moderate and high severity burning are remote from control activities and known weed occurrences, some are not and therefore are vulnerable to new infestations. We estimate that approximately 78 additional acres have the potential to become infested with noxious weeds because of burn severity (0.5% of the total area of moderate and high burn severity).

    d. Increased runoff and sediment movement will affect some sections of roads, trails, and drainages in the fire area. Each impacted site is likely to provide conditions needed for noxious weed establishment. We can expect an increase of approximately 15 acres of weeds in these areas, based on estimates of erosion hazard and soil burn severity combined with slope and landscape position.

2. Resource condition resulting from BAER implementation measures: New noxious weed

occurrences or expansions of existing occurrences are most likely to occur in disturbed sites or from introduced materials.

a. New disturbed areas are likely to be created during BAER implementation, including
   - Bringing in machinery to chip and shred felled trees
   - Construction or use of helispots
   - Storage sites for straw mulch
   - Drop sites and sites where equipment is stored or staged

b. Noxious weed seed can be unintentionally introduced into the burn area as a result of BAER implementation, especially in the use of contaminated straw mulch used to reduce erosion or by using contaminated vehicles or equipment.

The number of affected acres will be determined after implementation is complete. New noxious weed invasions resulting from BAER implementation will not be detected until the first growing season after measures are implemented. Funding for treating these areas should be submitted in an interim BAER request.

3. Condition of Values at Risk

Burn severity, increased soil disturbance and non-native material introduced into the fire area pose a risk to the ecological integrity of native plant communities in and immediately adjacent to the area. This is a threat to the natural resources of the burned area. Before the fire, this area supported intact mixed conifer forests, yellow pine forests, and mountain chaparral shrublands. Hat Creek, Lost Creek, and their perennial tributaries supported narrow but intact and functioning belt of primarily native riparian vegetation. The composition of these communities can be disrupted by noxious weeds in that they crowd out native grasses and forbs; the structure can also be altered, in that several of the weeds on the potential invasives list (Table 2) can delay or prevent the establishment of pine and fir seedlings in heavily infested areas.

III. Emergency Determination

The BAER team has concluded that the risk to this natural resource is Very High. The components of the risk analysis are Probability of Damage or Loss and Magnitude of Consequences. The BAER team determined that the probability of damage or loss is Very Likely, while the magnitude of consequences is Moderate.

IV. Treatments to Mitigate the Emergency

A. Treatment Type

We recommend Early Detection and Rapid Response (EDRR) assessments of areas with a high likelihood of noxious weed establishment or expansion. Because the area with high likelihood is large (section II.B. above), assessments should be prioritized as follows:

1. Burned areas or lands with ground disturbance from fire suppression or BAER activities that contain existing noxious weed occurrences. This category also includes all areas where straw was applied or stored, and all riparian areas and wetland margins regardless of burn severity.

2. High and Moderate burn severity sites and disturbed lands without existing noxious weed occurrences or straw applications.

3. Low burn severity sites.

Each noxious weed occurrence detected or relocated should be treated immediately. Manual or chemical treatments should be applied as appropriate for each location, occurrence size, and weed species. All herbicide treatments will be ground based, using spot treatments. All treatments on USFS lands will comply with the Lassen National Forest Land and Resource Management Plan (1992). All treatments on NPS lands will comply with the LAVO General Management Plan (2002) and the LAVO Weed Management Plan (2008).

All herbicide label requirements will be followed and applicators will be trained and certified pesticide applicators. Mechanical treatments may be applied by hand or machinery (such as tilling) as appropriate for the site, the weed(s) being treated, and the size of the infestation.

Assessments and treatments should be monitored for two years following the initial year in order to ensure that assessments are complete and treatments are effective.

B. Treatment Objectives

The primary objectives are to prevent the establishment and expansion of noxious weeds in areas affected by the Reading Fire and related suppression and BAER activities. This will allow natural regeneration of native plant communities affected by the fire and prevent loss of ecological diversity and resilience as a result of weed infestations.

V. Discussion/Summary/Recommendations

In summary, the prescribed treatments for noxious weeds are designed to help protect the ecological integrity of native forests, shrublands, and wetland/riparian communities in the burned area that are at risk from expanding noxious weed populations. The treatments are designed to prevent and reduce the spread of these invasive species, in the face of a very high risk of noxious weed infestations.

VI. References and Contacts

California Invasive Plant Council [Cal-IPC]. 2012. California Invasive Plant Inventory Database. Available online at www.cal-ipc.org/ip/inventory/weedlist.php.

California Department of Food and Agriculture. 2012. Encycloweedia – Data Sheets for California Noxious Weeds. Available online at www.cdfa.ca.gov/plant/ipc/weedinfo/.

Fornwalt, P.J., M.R. Kaufmann, T.J. Stohlgren. 2010. Impacts of mixed severity wildfire on exotic plants in a Colorado ponderosa pine-Douglas-fir forest. Biological Invasions 12(8): 2683-2695.

USDA-Forest Service. 1992. Land and Resource Management Plan – Lassen National Forest. Susanville, CA.

USDA-Forest Service. 2012. CalVeg – Vegetation Classification and Mapping for the USFS Pacific Southwest Region. Available online at www.fs.fed.us.r5/rsl/projects/mapping/.

Contacts: Allison Sanger, Forest Botanist, Lassen National Forest
Martin Hutten, Ecologist, Lassen Volcanic National Park

VII. Tables and Figures

Table 1. Existing Vegetation of the Reading Fire area.

Table 2. List of noxious weed species in or near the Reading Fire.

Figure 1. Map of known noxious weed infestations.

VIII. Appendices

Appendix A. Noxious weed profiles.

Table 1. Vegetation types for the Reading Fire as classified and mapped by CalVeg (USDA-Forest Service 2012). This classification describes existing vegetation.

Vegetation Type	Major Species (pre-burn)	Acres Affected by Fire (NPS / USFS)	Average Stand Size (acres)
Forests and Woodlands			
Mixed Conifer – Fir	*Abies concolor, Pinus jeffreyi, Arctostaphylos patula*	7504.2 / 6864.6	319.3
Mixed Conifer – Pine	*Pinus ponderosa, Calocedrus decurrens, Abies concolor, Pinus lambertiana*	1.379 / 224.8	56.5
Mountain Hemlock	*Tsuga mertensiana, Pinus monticola, Abies magnifica*	0 / 69.9	'35.0
Quaking Aspen	*Populus tremuloides, Abies concolor, Pinus contorta*	6.7 / 0	3.5
Red Fir	*Abies magnifica, Abies concolor, Pinus monticola*	7487.4 / 1835.7	172.6
Lodgepole Pine	*Pinus contorta var. murrayana, Elymus elymoides*	591.8 / 5.1	54.3
White Fir	*Abies concolor, Arctostaphylos patula*	789.4 / 1372.3	22.5
Shrublands			
Montane Mixed Chaparral	*Arctostaphylos patula, Chrysolepis sempervirens, Ceanothus velutinus, Prunus emarginata, Ceanothus cordulatus*	347.7 / 548.2	12.4
Herbaceous Vegetation			
Annual Grassland/Forbland	*Elymus elymoides, Stipa occidentalis*	19.0 / 6.7	5.2
Wet Meadow	*Elymus glaucus, Carex spp., Calamagrostis canadensis, Juncus spp.*	35.2 / 0	5.7
Unvegetated			
Barren rock, cliff, talus, lava		24.8 / 231.4	10.4
Water		100.3 / 0.0	10.1

Table 2. Noxious weed ratings for the species known to occur in or near the Reading Fire (Cal-IPC 2012).

Scientific Name	Common Name	Ecological Impact	Invasiveness	Distribution in CA	Overall Concern Rating
Bromus tectorum	Cheatgrass	High	Moderate	High	High
Centaurea maculosa	Spotted knapweed	High	Moderate	Moderate	High
Centaurea solstitialis	Yellow starthistle	High	Moderate	High	High
Centaurea squarrosa	Squarrose knapweed	Moderate	Moderate	Moderate	Moderate
Cirsium arvense	Canada thistle	Moderate	Moderate	Moderate	Moderate
Cirsium vulgare	Bull thistle	Moderate	Moderate	Moderate	Moderate
Hypericum perforatum	Klamathweed	Moderate	Moderate	Moderate	Moderate
Lepidium latifolium	Perennial pepperweed	High	High	High	High
Leucanthemum vulgare	Oxeye daisy	Moderate	Moderate	Moderate	Moderate
Phalaris arundinacea	Reed canary grass	Moderate	Moderate	High	Moderate
Taeniatherum caput-medusae	Medusa-head rye	High	High	High	High
Verbascum thapsus	Woolly mullein	Limited	Moderate	Moderate	Limited

Key:
High = Severe ecological impacts, disruptive to native ecosystems, widely distributed and highly invasive.
Moderate = Substantial and apparent ecological impacts and moderate disruption of native ecosystems; may be limited or widely distributed
Limited= invasive but ecological impacts are relatively minor, although may create problems on a local scale.

APPENDIX A

Profiles for Weeds Known From or Likely to Infest the Reading Fire Area

Centaurea solstitialis - Yellow Starthistle
Yellow Starthistle is a winter annual that can form dense impenetrable stands that displace desirable vegetation in natural areas, rangelands, and other places. It is best adapted to open grasslands with deep well-drained soils. Yellow Starthistle originated from southern Europe but was introduced from Chile to California during the gold rush. It has spread rapidly since the mid-1900s and is now estimated to infest 15-20 million acres in California and a couple of additional million acres in other western states. It occurs along Highway 44, and at Old Station, in areas used by equipment as pullouts.

Centaurea maculosa – Spotted knapweed
Spotted knapweed is a highly aggressive weed species that is increasing in both its range and frequency throughout western North America. This species is adept at using available moisture and nutrients, allowing it to quickly colonize both disturbed and undisturbed habitats. Spotted knapweed is able to spread through seed dispersal as well as vegetatively from lateral roots. There are currently several control methods available for this species; these include mechanical, biological, and chemical methods, which have shown variable levels of effectiveness (Mauer, Russo, and Evans 1987). It occurs at Old Station at the head of the main road into the northern part of the burn area and West Prospect Peak.

Cirsium arvense – Canada thistle
Canada thistle spreads rapidly by producing long horizontal underground roots that give rise to aerial shoots. Canada thistle has an extensive root system; the species has been shown to produce over 66 feet of new roots over a two year period, some of which have been shown to grow 15–20 feet deep. This species is considered particularly difficult to eradicate. Several insect species have been identified as possible biocontrol agents, but none of them have been shown to be effective controls. Mechanical methods, such as hand pulling or mowing, are generally not recommended because they may exacerbate the problem by spreading root fragments to new locations. The most effective method is herbicide control, which is oftentimes used in conjunction with revegetation activities. It occurs several miles upwind of the burn area; because seeds are primarily wind dispersed, it poses a threat to the area affected by the Reading Fire.

Circium vulgare - Bull Thistle
Bull Thistle is a biennial herb that displaces native vegetation along road, landings, and other disturbed areas. It grows a deep root and a basal rosette the first year of its life. It bolts, flowers, sets seed, and dies in its second year. It thrives on light and moderate mechanical soil disturbance. Numerous locations within the burn area and areas disturbed during suppression are known to support infestations of this thistle.

Taeniatherum caput-medusae - Medusahead
This Eurasian winter annual grass is found throughout the west and is extremely invasive. It typically invades rangeland communities and will out-compete desired species reducing grazing capacity. Dense stands often develop, displacing desirable vegetation and wildlife, and lowering the livestock carrying capacity. It forms a dense layer of litter that decomposes slowly, changing the temperature and moisture dynamics of the soil, greatly reducing seed germination of other species, and creating more fuel for wildfires. It occurs at Old Station and along Highway 44.

Centaurea squarrosa – Squarrose knapweed
Squarrose knapweed differs slightly from the other invasive knapweeds in that it's a perennial with a woody base and stout taproot. It is scattered but well established in the Klamath and Cascade mountain ranges and the Modoc Plateau. It often occupies disturbed rangeland and roadsides. Squarrose knapweed prefers open sites and is adapted to drought and cold temperatures. It is extremely difficult to eradicate because of the deep taproot and its long-lived seeds.

Hypericum perforatum – Klamathweed
Klamathweed is a widespread invasive forb native to Europe. It first became established in the western United States in the early 1900s. It's commonly found in lower elevation prairies and annual grasslands, but it easily disperses into forested areas that have been impacted by logging, grazing and fire. Klamathweed has a deep root system and high seed viability, which make it a difficult weed to eradicate once established, especially in burned areas. A small occurrence of Klamathweed was found in Ashpan Campground; an area that was utilized as a spike camp for fire crews. Other known infestations are located at Old Station and at the location of the Summertown spike camp.

Lepidium latifolium – *Perennial pepperweed*
This perennial mustard is a native of western Asia and eastern Europe. Its aboveground stems grow to three or more feet tall. Perennial pepperweed is considered a high priority noxious weed because it forms dense, monospecific stands in grasslands, sagebrush and riparian ecosystems. It can tolerate saline and alkaline soils and is often difficult to eradicate because the seeds are long-lived and easily transported. There are documented occurrences on Highway 44 near Ashpan and at Old Station.

Bromus tectorum – *Cheatgrass*
This winter annual grass is a high priority weed within the Reading Fire area. Several populations are documented both on Park Service and Forest Service land. Cheatgrass can easily take over entire ecosystems and is easily transported by wind, wildlife and humans. Once established, it is very difficult to eradicate due to its rapid life cycle, mobility, and acquired resistance to many common herbicides. It is also known to be highly flammable once dried and can alter fire regimes if allowed to establish over a large area. It is common in pine woodlands and disturbed sites. Once established, it moves into undisturbed habitat readily.

Leucanthemum vulgare –*Oxeye daisy*
A member of the sunflower family, this perennial herb is a common ornamental introduced the United States from Europe. Oxeye daisy often occupies disturbed areas such as roadsides and grazed meadows. It has shallow roots and often inhabits heavy or damp soils. Riparian wildlands are especially susceptible to oxeye daisy for this reason. Oxeye daisy is fast-reproducing and difficult to eradicate because the seeds are long lived. IT has been documented in the lower Lost Creek drainage just outside the burned area.

Phalaris arundinacea – Reed canary grass
Reed canary grass is a rhizomatous perennial grass that grows from 2 to 7 feet tall. It is often found in wetland ecosystems, including meadows and riparian areas. It is rhizomatous and often forms thick mats along waterways. If reed canary grass is established in an area that experiences fire, it is able to survive and regenerate quickly in a post-fire community, thereby excluding native vegetation. There is a known infestation of reed canary grass in Dersch Meadows. Although this occurrence is outside the fire boundary, wind and water will likely carry seeds inside it.

Verbascum thapsus – *Woolly mullein*
Woolly mullein is a woody biennial that can grow up to 6 feet tall when flowering. It starts as a large furry rosette often establishing in areas with lots of sunlight and dry, sandy soil. When flowering, usually during the second year of growth, the rosette will shoot up a terminal inflorescence of densly packed flowers that can produce more than 10,000 seeds. Seeds are extremely long lived and often don't distribute themselves very far from the parent plant. Woolly mullein is a common plant in post fire communities and often establishes from a soil seed bank. Mullein has been documented as retarding the germination and growth of native pines. There are several large occurrences of mullein along the NPS and USFS boundary, including near drop points, roads, and dozer lines. The USFS doesn't actively treat mullein; however, Lassen Volcanic National Park considers it a high priority invasive weed and treats woolly mullein annually.

Appendix E: Summary of Hydro Cals.

			Burn Severity				Post Fire Discharge in cfs					Pre Fire Discharge				2500-8 data	
Watershed	Watershed acres	Watershed Miles	Miles² High	Miles² Moderate	Miles² Low	Miles² Unburned	Discharge High	Discharge Moderate	Discharge Low	Discharge Unburned	Total Discharge	Q2	Q2	Q5	Q10	Pre-fire flow in cfs/m²	Post-fire flow in cfs/m²
1.Hat Creek at Old Station	76025	118.79	4.12	6.51	7.77	100.39	22.0	21.6	9.7	125.7	179.02	148.7	148.7	394.8	611.8	1.3	1.51
2. Hat Creek with Lost Creek	57932	90.52	4.12	6.51	7.77	72.12	25.3	25.1	11.4	106.3	168.10	133.4	133.4	349.4	554.8	1.5	1.86
3. Hat Creek Culvert 32N12	13826	21.60	2.77	4.41	5.21	9.21	35.3	37.4	18.1	32 1	122.88	75.2	75.2	183.4	274.9	3.5	5.69
4. Hat Creek at Fire Perimeter	13057	20.40	2.76	4.4	5.18	8.06	36.2	38.5	18.7	29.0	122.40	73.5	73.5	178.7	267.1	3.6	6.00
5. Hat Creek Falls	10833	16.93	1.93	3.55	3.73	7.72	27.8	34.5	15.0	31 1	108.42	68.2	68.2	164.3	244.9	4.0	6.41
6. Park Hwy Culvert	862	1.35	0.01	0.09	0.11	1.14	0.5	3.5	2.0	21.0	27.04	24.8	24.8	52.6	70.6	18.4	20.08
7. Lost Creek Culvert 32N12	39967	62.45	0.62	0.56	1.09	60.18	4.6	2.7	2.0	110.8	120.06	115.0	115.0	295.6	462.5	1.8	1.92
8. Lost Creek at Fire Perimeter	5334	8.33	0.53	0.35	0.66	6.79	11.0	5.0	4.1	41.9	61.91	51.4	51.4	119.4	172.4	6.2	7.43
9. Lost Creek Upper	2843	4.44	0.03	0.09	0.15	4.17	0.9	1.8	1.3	37.5	41.52	39.9	39.9	90.0	126.7	9.0	9.35
10. Box Canyon at Fire Perimeter	9520	14.88	2.57	5.24	4.54	2.53	39.6	54.6	19.8	11.0	124.96	64.8	64.8	155.0	229.0	4.4	8.40
11. Box Canyon Culvert 32N12	6475	10.12	1.48	3.53	3 29	1.82	27.7	45.5	18.1	10.0	101.25	55.5	55.5	130.3	189.6	5.5	10.01
12. Box Canyon Upper	1476	2.31	0.14	0.95	0.67	0.55	5.6	27.6	8.9	7 3	49.43	30.7	30.7	67.0	91.9	13.3	21.43
13. Park Cabin Twin Lakes	2485	3.88	0.004	0.114	0.272	3.49	0.1	2.5	2.7	34.0	39.28	37.9	37.9	84.7	118.6	9.7	10.12
14. Butte Creek	37411	58.45	0.41	2.19	1.89	53.96	3.1	10.8	3.6	103.4	120.88	112.0	112.0	267.0	447.8	1.9	2.07

Fire effects on runoff are determined by modeling pre-fire and post-fire discharges for watersheds using methods specified in the USGS Magnitude and Frequency of Floods in California (Waananen and Crippen, 1977). Elevated streamflows can be expected in the burned watersheds, with greater flow increases in drainages having higher percentages of high burn severity. Projected flow increases resulting from increases in runoff from the burn areas are shown above.

Appendix F: Summary of Cost-Risk Analysis For All Resources:

Reading Fire Benefit Cost Analysis (for all ownerships):

Total benefits of resources for whole fire regardless of ownership:

All Resource	Value $
all roads (FS)	$1,500,000
native plants	$150,000
water quality	$500,000
aquatics/fisheries	$2,000,000
soil productivity	$66,000
public safety	$1,000,000
Heritage sites	$60,000

Probability of loss without and with treatments:

All Resource	Probability loss no treatments:	Probability loss w/ treatments:	Reduction in probability of loss
all roads (FS)	50%	15%	35%
native plants	50%	20%	30%
water quality	65%	45%	20%
aquatics/fisheries	40%	35%	5%
soil productivity	50%	40%	10%
public safety	75%	15%	60%
Heritage sites	50%	20%	30%

Total cost of treatments on Forest Service:

Click red icons for notes.		NFS Lands				Other Lands				Money Left
Line Items	Units	Unit Cost	# of Units	BAER $	Spent $	# of Units	Fed $	# of Units	Non Fed $	Total
A. Land Treatments										
NX Weed Det. Surv.	mi	$1,200	20.0	$24,000	$0		$0		$0	$0
Hazard Trees	mi	$1,000	1.0	$1,000	$0		$0		$0	$0
Subtotal Land Treatments				$25,000	$0		$0		$0	$0
B. Channel Treatments - none										
				$0	$0		$0		$0	$0
Subtotal Channel Treatments				$0	$0		$0		$0	$0
C. Road and Trails										
Rolling dips w/rock outlets	ea	$1,500	75	$112,500	$0		$0		$0	$0
Reconditing ditches	mi	$800	16	$13,120	$0		$0		$0	$0
Install drainage armor	cuy	$100	43	$4,300	$0		$0		$0	$0
Out-sloping roadbed	mi	$14,000	0	$2,800	$0		$0		$0	$0
Install culvert cx-drains	ft	$150	460	$69,000	$0		$0		$0	$0
Trail (PCT) stormproofing	mi	$4,600	1	$4,600	$0		$0		$0	$0
Subtotal Road & Trails				$206,320	$0		$0		$0	$0
D. Protection/Safety										
Warning Signs	ea	$300	8	$2,400	$0		$0		$0	$0
Heritage Site Protection	ac	$2,000	1	$2,000	$0		$0		$0	$0
Closure Signs	ea	$200	5	$1,000						
Subtotal Protection				$5,400	$0		$0		$0	$0
E. BAER Evaluation										
Assessment Team	0520	H5BAER	---	---	$41,000	---	$0	---	$0	$0
	---	---	---	---	$0	---	$0	---	$0	$0
Subtotal Evaluation				---	$41,000	---	$0	---	$0	$0
F. Monitoring										
Road Monitoring	ea	$1,000	1	$1,000	$0		$0		$0	$0
Trail Monitoring	ea	$1,000	1	$1,000						
Heritage Site Monitoring	ea	$1,000	1	$1,000						
Subtotal Monitoring				$3,000	$0		$0		$0	$0
G. Totals				$239,720	$0		$0		$0	$0
Previously approved						Comments:				
Total for this request				$239,720						

Benefit of treatments:

All Resource	Value $	Reduction in probability of loss
all roads (FS, NPS, Pvt.)	$1,500,000	35%
native plants	$150,000	30%
water quality	$500,000	20%
aquatics/fisheries	$2,000,000	5%
soil productivity	$66,000	10%
public safety	$1,000,000	60%
Heritage sites	$60,000	30%
	$5,216,000	

Benefit/cost ratio:

All Resource	Benefit of treatment	Treatment Cost	B/C ratio	Justified
all roads (FS)	$525,000	$206,320	2.5	yes
native plants	$45,000	$24,000	1.9	yes
water quality	$100,000	$1,600,000	0.1	no
aquatics/fisheries	$100,000	$1,600,000	0.1	no
soil productivity	$6,600	$1,600,000	0.0	no
public safety	$600,000	$4,000	150.0	yes
Heritage sites	$18,000	$5,400	3.3	yes
	$1,394,600	$239,720		

water, fish, and soil treatments of $1,600,000 is to compare cost of treating 800 acres with mulch at $2,000/ac for comparision only