

Willow Fire

Sierra National Forest

2500-8 BAER Assessment Report

August 25, 2015



Photo: Fire suppression aircraft drawing water from Bass Lake during initial attack of the Willow Fire, seen in background

**Willow Fire
Sierra National Forest
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August 20, 2015**

Executive Summary

On July 25, 2015, a wild fire occurred on the Bass Lake Ranger District, near the communities of Bass Lake and North Fork. The Willow Fire burned 5,702 acres of steep slopes called the South Fork Bluffs. Much of the Willow Fire was a re-burn of the 2000 North Fork Fire. This fire was stopped within a mile of the community of Cascadel Woods in the south and was contained along Forest Service Road 7S09 on its western edge.

Most of the Willow fire (68%) burned at a low soil burn severity or did not burn. Only 5% was high soil burn severity. In general, low and moderate soil burn severity is found in the live oak dominated lower half of the fire; the mid elevation is a mosaic of low, moderate and high severity and is dominated by Ponderosa Pine; and the mixed conifer upper elevation is mostly low and unburned with some high and moderate soil burn severity. The fire occurred all on National Forest System lands with the exception of 150 acres of private land.

A Burn Area Emergency Response (BAER) assessment was conducted in the fire area to determine values at risk, make an emergency determination on those values and make recommendations to reduce risk to life, property and resources. The main value at risk in the fire is Forest Road 7S09, because it is a major road for several private residences and a debris flow or washed out culvert crossing would prevent egress during an emergency. Other values at risk that were determined to be an emergency include Peckinpah Meadow. The spread of noxious weeds onto cleared ground is also a serious threat.

The Initial BAER Assessment Report requests \$137,000 in treatments to stabilize roads and burned watersheds that will now face the first damaging storms and possibly an El Nino winter.

USDA-FOREST SERVICE

FS-2500-8 (6/06)

August 25, 2015

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

- ☒ 1. Funding request for estimated emergency stabilization funds
- ☐ 2. Accomplishment Report
- ☐ 3. No Treatment Recommendation

B. Type of Action

- ☒ 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: Willow Fire

B. Fire Number: CA-SNF-001689

C. State: CA

D. County: Madera

E. Region: 05

F. Forest: Sierra NF

G. District: Bass Lake RD

H. Fire Incident Job Code: P5JZ48(0515)

I. Date Fire Started: 07/25/2015

J. Date Fire Contained: 95% on 08/08/2015

K. Suppression Cost: 19.4M

L. Fire Suppression Damages Repaired with Suppression Funds

1. Fireline waterbarred (miles): 22.3 miles total

2. Fireline seeded (miles): 0.0

3. Other (identify): None

M. Watershed Number: South Fork Willow Creek-Willow Creek #180400061103

N. Total Acres Burned: 5702

NFS Acres (5550) Other Federal (0) State (0) Private (150)

O. Vegetation Types: Vegetation types in the Willow burn perimeter are predominantly mixed conifer dominated by pine (31%); mixed chaparral dominated by canyon live oak; various ceanothus species, and manzanita (29%); and ponderosa pine (27%).

P. Dominant Soils: The primary soil series in the project area are Holland, Chewanakee, and Chaix soil series. Rock Outcrop is found in all map units but is dominant in some units.

Q. Geologic Types: The geology of the fire area includes three different Cretaceous granitic rock types of the Sierra Nevada Batholith as follows: Granodiorite of Whiskey Ridge, Granodiorite of Shuteye Peak, and Tonalite of Blue Canyon.

R. Miles of Stream Channels by Order or Class: 4.0 miles of perennial streams, 27 miles of intermittent streams, and 65 miles of ephemeral streams.

Total: 96

S. Transportation System

Trails: 2.2 miles Roads: 37.3 miles

PART III - WATERSHED CONDITION

A. Burn Severity (acres): Unburned – 1,032 (18%); low – 2857 (50%); moderate – 1546 (27%); high - 257 (5%) Appendix A, Figure 2 shows soil burn severity by ownweship

B. Water-Repellent Soil (acres): 3500 (100 percent of Unburned and 50% of Moderate Burn Severity Acres)

C. Soil Erosion Hazard Rating (acres):
896 (very low); 1695 (low); 1224 (moderate); 956 (high)

D. Erosion Potential: 2.3 tons/acre; Background Erosion: 0.5 tons/acre

edE. Sediment Potential: 349 cubic yards / square mile (30% delivery ratio assumed)

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 2-3

B. Design Chance of Success, (percent): 95%

C. Equivalent Design Recurrence Interval, (years): 2 and 25

D. Design Storm Duration, (hours): 6

E. Design Storm Magnitude, (inches): 2.2 and 3.4

F. Design Flow, (cubic feet / second/ square mile): South Fork Willow Creek-Willow Creek (HUC12): 18.9 for 2 year design storm and 95.2 for 25 year design storm

G. Estimated Reduction in Infiltration, (percent): 2 to 8%

H. Adjusted Design Flow, (cubic feet / second/ square mile): South Fork Willow Creek-Willow Creek (HUC12): 20.5 for 2 year design storm and 97.2 for 25 year design storm

PART V - SUMMARY OF ANALYSIS

On July 25, 2015, a wild fire occurred on the Bass Lake Ranger District, within the communities of Bass Lake and North Fork. The Willow Fire burned 5,702 acres of watershed on National Forest System lands and 150 acres of private land. About 62 % of the Willow Fire was a re-burn of the 2000 North Fork Fire. The fire burned within a mile of the community of Cascadel Woods in the south and was contained along Forest Service Road 7S09 on its western edge.

The Willow fire burned the South Fork Bluffs on very steep slopes. Most of the Willow fire (68%) burned at a low soil burn severity or did not burn. Only 5% was mapped as high soil burn severity. In general, low and moderate soil burn severity is found in the live oak dominated lower half of the fire; the mid elevation is a mosaic of low, moderate and high dominated by Ponderosa Pine; and the mixed conifer upper elevation is mostly low and unburned with some high and moderate soil burn severity.

The main value at risk in the fire is 7S09 because it is a major road for multiple private residences and a debris flow or washed out culvert crossing would prevent egress during an emergency.

Erosion Response

The Willow fire soil burn severity acres are summarized in table 1. Most of the fire, 68% was low and unburned with 32% Moderate and high made up 32% moderate and high. The Soil Burn Severity Map is found in Appendix A, Figure 1. Soil burn severity by ownership is found in Appendix A, Figure 3.

Erosion and sedimentation is not expected to be significant over the fire area (2.3 tons/acre average), but localized erosion on the steeper slopes in the high burn severity will occur for the next 4-5 years.

Table 1. Soil Burn Severity for Willow Fire

Severity	Acres	Percentage
Unburned	1,032	18
Low	2,857	50
Moderate	1,546	27
High	257	5
Total	5,702	100

Hydrologic Response

Hydrological analysis was conducted on one HUC 12 watershed (South Fork Willow Creek-Willow Creek) and nine pour point subdrainages located within or down stream of the fire, associated with values at risk. Appendix A, Figure 2 shows the location of pour points. Both 2 year and 25 year design storms were used to model discharge. For the Willow Fire, a 25 year¹ design storm was also included to account for the possible "strong" El Nino predicted for the 2015-2016 winter season. A 25 year return interval was used based on discussions with the National Weather Service in Hanford, CA and the 1997 gage data on the North Fork of Willow Creek.

The HUC 12 watershed and most of the subdrainages show only minimal increases in water yield, although several small subdrainages at culverts along 7S09 showed the most marked changes (Table 2). The engineering report details the treatments necessary to mitigate/prevent road prism failure, which could affect emergency egress for local residents.

Table 2: Post-burn runoff response for selected watersheds

Percent Increase in Water Yield by 5 th and 6 th Field Watersheds			
6th Field Watersheds	Watershed Area Miles ²	Percent increase in Water Yield	
		2 year	25 year
South Fork Willow Creek-Willow Creek	48.8	8.1%	2.1%
Subdrainage B	37.9	10.2%	2.9%
Subdrainage C	35.7	10.8%	3.1%
Subdrainage D	2.8	47.2%	12.1%
Subdrainage E	0.8	96.3%	24.0%
Subdrainage F	1.2	27.9%	7.8%
Subdrainage G	1.0	58.8%	15.3%
Subdrainage I	0.04	130.0%	24.9%
Subdrainage J	0.08	20.6%	4.7%
Subdrainage K	0.6	27.6%	14.6%

Geologic Response

The geologist assessed debris flow potential primarily along the 7S09 road. Steep areas of high and moderate soil burn severity channel runoff to this road. Values at risk were further evaluated with the aid of USGS debris flow modeling using a 10 year storm event. The main value at risk in the fire is 7S09 because it is a major road for multiple private residences and a debris flow would prevent egress during an emergency. Small debris flows have occurred on this road in the past.

Debris flows could be set off by a significant storm, during an El Nino year and the loss of the road itself, loss of egress to private residences, and the loss of life or injury to users is possible.

The Debris Flow Hazard Map (Appendix A, Figure 5) shows the probability of geologic hazard areas in the Willow Fire. The model shows the probability for debris flows ranges from **unlikely to possible** (0-20% and 20 -40% probability). Subsheds C and B at channel crossings 2 and 3 have a high risk of debris flow occurrence (Table 3).

Table 3: Debris Flow Risk on road 7S09

Value-at-Risk	Subshed	Storm Event	Debris Flow Probability	Debris Flow Volume Estimate (m ³)	Risk
Channel Crossing 1	Subshed A	2 Yr	0.9%	29,000	Intermediate
		10 Yr	1.6%	34,000	Intermediate
		25 Yr	2.3%	38,000	Intermediate
Channel Crossing 2	Subshed B	2 Yr	26%	1,000	High
		10 Yr	39%	8,500	High
		25 Yr	47%	9,000	High
Channel Crossing 3	Subshed C	2 Yr	19%	500	High
		10 Yr	29%	600	High
		25 Yr	36%	670	High
Channel Crossing 4	Subshed D	2 Yr	2%	2,500	Intermediate
		10 Yr	3%	3,000	Intermediate
		25 Yr	5%	3,300	Intermediate
Channel Crossing 5	Subshed E	2 Yr	3%	13,000	Intermediate
		10 Yr	6%	15,000	Intermediate
		25 Yr	8%	17,000	Intermediate
Channel Crossing 6	Subshed F	2 Yr	0.6%	14,000	Intermediate
		10 Yr	1%	17,000	Intermediate
		25 Yr	2%	18,000	Intermediate

Value-at-Risk	Subshed	Storm Event	Debris Flow Probability	Debris Flow Volume Estimate (m ³)	Risk
Channel Crossing 7	Subshed G	2 Yr	2%	17,000	Intermediate
		10 Yr	3%	18,000	Intermediate
		25 Yr	5%	22,000	Intermediate
Channel Crossing 8	Subshed H	2 Yr	10%	13,000	Intermediate
		10 Yr	24%	13,000	Intermediate
		25 Yr	31%	14,000	Intermediate

The road 7S09 is the main value at risk in the fire. Findings on the ground are as follows:

- Channel Crossing 2: The road crosses this channel with an 18 inch CMP. There is a **possible** occurrence for debris to block the channel and CMP. If a debris flow occurs most of the debris flow material will likely deposit along Douglas Station Road. However, there is an adequate line of site distance on both sides of the road to observe if the road is obstructed by debris.
- Channel Crossing 3: The road crosses this channel with a 12 inch CMP. **Possible** occurrence of a small debris flow occurring that could be as large as 600 m³. The 12 inch CMP is also **likely** to be blocked with woody debris and post-fire sediment.
- Channel Crossing 1: Peckinpah Crossing – The road crosses Peckinpah Creek with a 72 inch CMP. This pipe is likely sufficiently sized to pass a small debris flow. A large debris flow is **unlikely**.
- Channel Crossing 8: An OHV trail crosses subwatershed H. A sizable debris flow is **possible**.
- Other Channel Crossings 4,5,6,7: Probability of damage or loss is **unlikely**, magnitude of consequences is major, hence the crossings have an intermediate risk.

A. Describe Critical Values/Resources and Threats:

Emergency determinations were conducted using the risk assessment matrix in the Forest Service Manual for the BAER program (USFS, 2012). This matrix uses a combination of the probability of damage or loss and the magnitude of consequences associated with that damage or loss to determine a level of risk. The risk level is then used to determine if an emergency exists.

BAER Risk Assessment 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

1. Threats to Water Quality

The most noticeable effects on water quality will be increased sediment and ash from the burned area into the South Fork of Willow Creek and any on channel reservoirs located along South Fork of Willow Creek and other waterbodies in and downstream of the fire area. During storm events this will increase turbidity and contribute to pool filling.

2. Threats to Life or Property Forest Service Roads/Trails:

Roads: There are approximately 37.31 miles of NFSR within the Burn Perimeter of this mileage 32.11 miles of NFSR were accessible and surveyed for purposes of this report, of this mileage 10 miles are proposed for BAER road treatments. Two motorized trail segments within the burn perimeter were assessed. These trails include, 1.5 miles of Brown Creek 23E207 and 0.5 miles of 23E276.

It's possible that some drainage features at road crossings along the Douglas Ranger Station road 7S09 and two upper roads 8S09 and 8S28 will be inadequate to handle post burn increased water flows and additional movement of sediment down slope and into these drainage features, causing water to divert over and down the roadways. This occurrence has major consequences on road 7S09 and is considered a high risk to life and safety of residences and other road users accessing National Forest lands. There is the risk of flash flooding, debris flows, and potential for the loss of road function and denial of access on 7S09 to residents in the area. Restricted egress could potentially put human life at risk during storm conditions.

Trails: 23E07 and 23E276 are trails with burned trees that present some level of snag hazard. Trail 23E07 also has pre-existing gullies, however the limited amount of high soil severity burn along the trail is not expected to worsen the gulley.

Emergency Determination:

There is an emergency determination for roads 7S09, 8S09 and 8S28. See table 4 below.

There is an emergency determination for Trail 23E07 and Trail 23E276. Trail users are at high risk from burnt hazard trees along the trail corridor.

Table 4: Values at Risk Summary for Roads and Trails

Value (Life/Property/ Resources)	Value At Risk	Probability of Damage or Loss	Magnitude of Consequences	Risk	Types of Treatments
<ul style="list-style-type: none"> Life and Safety, Injury to Humans by Use of Road During Storms and Possible Loss of Access. Road Investment. 	Road 7S09 Stability	<ul style="list-style-type: none"> Possible for most Culverts by Flooding. Likely for Under Size Culverts and Loss of Access. 	Major	High	Storm Inspection and Response.
					Restore Drainage Functions Including Brushing by Cleaning Culvert Inlet and Outlet, Catch Basin, and Along Road-way Ditch Line.
					Install BAER Warning Signs.
					Install Critical Dip w/ Rock Armoring at Fill Slope.
					Inlet Culvert Modifications (Vertical Risers & Metal End Sections).
					Up-grade one 12" Culvert to 18" Currently Undersize for Potential Storm based on Hydrology Modeling.
<ul style="list-style-type: none"> Life and Safety, Injury to Humans by Use of Roads During Storms. Road Investment. 	<u>Roads</u> <ul style="list-style-type: none"> 8S09 8S28 	<ul style="list-style-type: none"> Likely, Loss of Road Investment Likely, Road Users 	Major	High	Storm Inspection and Response.
					Restore Drainage Functions Including Brushing by Cleaning Culvert Inlet and Outlet, Catch Basin, and Along Road-way Ditch Line.
					Install BAER Warning Signs.
					Install Critical Dip w/ Rock Armoring at Fill Slope.
<ul style="list-style-type: none"> Life and Safety, Injury to Humans by Use of Trails. 	<u>Trails</u> <ul style="list-style-type: none"> 23E07 23E276 	<ul style="list-style-type: none"> Possible 	Major	High	Install BAER Warning Signs.

3. Threats to Life /Property/Downstream Values

The primary potential threat is washouts and debris flows on the 7S09. Flooding and mobilization of woody debris and channel materials within the affected stream channels is possible. The individual channel crossings and the threat of debris flows is summarized in the Geologic Response section.

Private Residences/Private Land/Other Ownership:

- There are homes along South Fork Willow Creek, which are down stream of the burn area. Residences are well above the 100 year flood plain of South Fork Willow Creek and thus impact from flooding are considered **unlikely**. The resultant increase in runoff for a 25 year design storm is 3%. Very little of the watershed affecting storm runoff for the S.F. Willow is burned.
- The road drainage crossing on the small unnamed channel is shown in figure 9. There is an intermediate risk of flooding at this crossing (pour point K on the map). Modeling indicates a 28%

increase in flow for a 2 year storm and a 15% increase for a 25 year storm. Potential for flooding depends on size of culvert and storm event. See hydrology report. **Inform/coordinate with NRCS and users of the road.**

- **Dam at North Fork Recreation Area (County Land):** Accumulation of debris and potential damage to the dam is **likely** if the wooden boards used to hold back the water are not removed during the first runoff-producing storms.
- **Hydroelectric Dam Infrastructure (Private PG&E):** Of the analyzed subdrainage most of the area (91%) is unburned to low to soil burn severity. The resultant increase in runoff for a 25 year design storm is 14.6%. The culvert at this crossing has sufficient capacity to accommodate the predicted increase in flow and thus damage to the road prism and downstream resources is considered **unlikely**.

Emergency Determination

There is an emergency determination related to hydrologic and debris flow response for road 7S09 but not for Private Residences Along SF Willow Creek and the Hydroelectric Dam Infrastructure (PG&E). There is an emergency determination related to the Dam at North Fork Recreation Area (County Land), but it can be easily mitigated.

4. Threats to Resources-Cultural Resources:

Archaeological surveys identified 24 sites with low risk; there is no recommendation to mitigate the risk to these sites by the Forest Archaeologist

Emergency Determination

NO emergency exists for cultural resources.

5. Threats to Resources-Wildlife:

This report used soil burn severity data to assess potential impacts to Threatened and Endangered species habitats and Forest Service Sensitive species known to occur in the fire area.

There is potential for negative impacts to occur to Western pond turtle habitat within the South Fork Willow Creek, which has a known population of turtles. Debris flow analysis of the occupied area indicates a relatively high potential for a debris flow to occur with a 25 year storm event. Pond turtles are a Forest Service sensitive species, they are not a "critical BAER value. Post-fire impacts on the turtle are a wildlife program monitoring consideration.

Emergency Determination

Preliminary analysis of Pacific fisher habitat indicated no emergency exists for this species based on the very low probability of habitat fragmentation due to fire size and location in relation to suitable habitat. This determination is made solely utilizing soil burn severity data, and a more thorough analysis of Pacific fisher habitat within the fire area should be conducted when post-fire vegetation severity data becomes available.

Analysis for Sierra Nevada yellow-legged frog and Yosemite toad concluded that no emergency exists for either amphibian based on the fact that there are no occupied sites within the Fire area, and there appears to be an overall lack of impacts to suitable habitat based on low-unburned soil burn severity within those areas.

- Post-fire consultation with the USFWS should occur with T&E species.

6. Threats to Ecosystem Stability-Invasive Plants

Areas at risk of poor native vegetation recovery and diversity in the Willow Fire were estimated by evaluating suitable invasive weed environments (areas of fire disturbance, including fire lines, drop points, recently burned areas, and areas burned in the North Fork fire), vectors and pathways (roads, trails, fire lines), source invasive weed populations, and native vegetation recovery potential. These risk factors were combined into the BAER Risk Assessment matrix to determine high risk areas of invasive plant incursion, and thus pose a detriment to native plant reestablishment.

Fire lines and drop points considered for invasive species treatments are shown in Appendix A, Figure 6.

Emergency Determination

There is an emergency related to native vegetation recovery and diversity due to the introduction and expansion of invasive weeds on at least 1,813 acres of the burned area. Native vegetation was identified as a Critical Value by the BAER team, as there are few invasive weed infestations present in the majority of the burned area. The fire created conditions conducive to the establishment and rapid spread of invasive weeds known to be within and adjacent to the fire area. Furthermore, suppression activities have likely vectored invasive weed seeds into or through the burned area. As such, *disturbed native communities in the burn area are at risk of an irreversible impact to native vegetation recovery*. This BAER emergency can be mitigated by promptly detecting and treating newly established infestations to dramatically limit fire-related population growth.

- Probability of damage or loss is Very Likely; Magnitude of Consequences is Moderate
- **Risk Level: Very High**

7. Threats to Soil Productivity

The threat to soil productivity is limited to the small area of high soil burn severity and is limited in extent.

The soils of Peckinpah Meadow were considered at risk due to a 130 year old sawdust pile that ignited and burned for a week and continues to burn. It is expected that very little soil stabilizing vegetation will colonize the site prior to the first damaging storm. Because of the nick points in the meadow and the proximity of the burned area to the active channels, the risk of rill erosion and head-cutting is strongly elevated. A treatment is proposed.

Emergency Determination:

No BAER emergency was determined for the soil resource, with the exception of Peckinpah Meadow. Peckinpah Meadow: Synergistic effects of accelerated gully dewatering, and the incursion of non-native invasive plants, may result in irreversible loss soil and hydrology functions in the meadow as well as the loss of native vegetation recovery and diversity

The team discussed the VAR risk and determined that:

- The Magnitude of Consequences is Moderate for soils, hydrology, botany and cultural resources because of the long-term effects to a valuable meadow of the Sierra National Forest
- The Probability of Damage or Loss was determined to be **likely** for soils, hydrology, botany and cultural resources due to the severity and the long residence time of the smoldering fire.
- **Risk Level: High**

7. Other Values at Risk (VAR) Evaluated

Heritage, archaeology and wildlife resources were evaluated and determined not be be a BAER emergency. Reports are available in the project record.

B. Emergency Treatment Objectives:

- Prescribe emergency response actions to stabilize and prevent unacceptable degradation to natural and cultural resources, to minimize threats to life or property resulting from the effects of a fire, or to repair/replace/construct physical improvements necessary to prevent degradation of land or resources.
- Implement emergency response actions to help stabilize soil; control water, sediment and debris movement and potentially reduce threats to the **BAER** values identified above when an analysis shows that planned actions are likely to reduce risks substantially within the first year following containment of the fire.
- Determine if new invasive species have been introduced due to suppression activities.
- Monitor the implementation and effectiveness of emergency treatments that were applied on **National Forest System** lands.

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

Land 90 % Channel n/a % Roads/Trails 90 % Protection/Safety 100 %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	80-90%	60-70%	50-60%
Channel	n/a	n/a	n/a
Roads/Trails	90	80	70
Protection/Safety	90	80	70

E. Cost of No-Action (Including Loss): **\$770,000**

There is approximately 10 miles of road with treatments. Consequences of No-Action would include 1) likely loss of road infrastructure on 7S09 and possible loss of infrastructure on roads 8S26, 8S09, 7S94, and 7S94B; and 2) likely spread of noxious weeds over ground disturbed areas of the fire.

- Cost of no treatment for roads is estimated at \$500000*. B/C ratio 5
- Cost of no treatment for noxious weeds is estimated at 270,000 B/C ratio 10*

*Very conservative, literature indicates 17/1 benefit cost ration

The **No Action** alternative could result in conservative future costs exceeding \$770,000 to achieve the same goals. This analysis does not include the cost of loss of access for residents along the Douglas Station Road (7S09) and loss of soil/meadow productivity in Peckinpah meadow.

F. Cost of Selected Alternative (Including Loss): no alternative proposed

G. Skills Represented on Burned-Area Survey Team:

<input checked="" type="checkbox"/> Hydrology	<input checked="" type="checkbox"/> Soils	<input checked="" type="checkbox"/> Geology	<input checked="" type="checkbox"/> Range
<input type="checkbox"/> Forestry	<input checked="" type="checkbox"/> Wildlife	<input type="checkbox"/> Fire Mgmt.	<input checked="" type="checkbox"/> Engineering
<input type="checkbox"/> Contracting	<input checked="" type="checkbox"/> Ecology	<input checked="" type="checkbox"/> Botany	<input checked="" type="checkbox"/> Archaeology
<input type="checkbox"/> Fisheries	<input type="checkbox"/> Research	<input type="checkbox"/> Landscape Arch	<input checked="" type="checkbox"/> GIS

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H. Treatment Narrative:

(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. For seeding treatments, include species, application rates and species selection rationale.)

Treatments to Mitigate the Emergency

1) Land Treatments

Invasive Plants:

The risk of invasive non-native species impeding native plant recovery and diversity is indicated in Appendix A, Figure 7. Treatments are proposed and grouped by priorities 1,2 and 3.

The most effective treatments addressing the burn area in its entirety would be to conduct EDRR surveys on priority 1, 2, and 3 areas as shown in figure 7. The survey footprint includes new fire line construction (59.7 miles) and equipment concentration points (20.2 acres) and a 20% sample of those high and moderate severity burned areas that are at risk of invasive plant incursion. The overall cost of this alternative is **\$27,738**. This alternative was chosen by the line officer.

- Invasive plant detection surveys in "Very High," "High" and "Intermediate" risk areas (up to 527 acres of the 1,813 acres at risk), would be conducted in spring (or as soon as the weed species are identifiable) to detect and control early season invasive weeds and/or in the summer to detect and control late season invasive weeds. Infestations will be mapped with GPS, photographed, and flagged with invasive weed tape. New or isolated infestations would be manually removed during survey and mapping (EDRR). For most invasive non-native species likely to occur in or near the Willow Fire area, hand pulling consists of pulling the plant up by the roots and bagging for disposal if flowers or seed heads are present.
- Conduct surveys and treatments with a two-person crew, with the goal of timing the visits appropriately so that when possible only one visit per site is needed. However, depending on phenology, infestation size, and treatment strategy, some infestations may be treated more than once. Emergency surveys and treatments will be conducted for one year only with BAER funds per BAER policy. Survey and treatment in subsequent years may be accomplished through a combination of Forest Service program funding or coordination with Pacific Gas & Electric Company or other partners.

Item	Daily Rate per Person	241 burned acres, and 59.7 miles of fire line		152 additional burned acres at high risk		20% of 672 additional burned acres at high risk = 134 acres	
		Priority 1		Priority 2		Priority 3	
		# Days	Total	# Days	Total	# Days	Total
Invasive Species Survey and Treatments Personnel							
GS- 11 Botanist (1) (hiring, training,	380.00	20	7,600.00	5		5	

supervision, reporting)					1,900.00		1,900.00
GS-7 Temporary Botanist (2 people) (Survey and Treatments)	155.00	50	7,750.00	20	3,100.00	20	3,100.00
Personnel Subtotal							
Materials and Supplies							
Vehicle Mileage (survey and treatment)	0.54	1,000	540.00	600	324.00	600	324.00
Supplies & Materials (trash bags, gloves, safety items; etc.)			800.00		200.00		200.00
Total Weed Survey and Treatment			\$16,690		\$5,524		5,524
Total for All 3 Priority Areas					\$ 27,738		

A less costly, but higher risk alternative would be to conduct EDRR on new fire line construction (59.7 miles) and equipment concentration points (20.2 acres) and those high and moderate severity burned areas that have been subjected to multiple high intensity disturbances or where fire suppression activity occurred before weed washing was required (resulting in a higher risk in these areas) (394 acres). The overall cost of implementing these surveys would be \$22,214. This alternative was presented to the line officer and was not chosen.

Land Treatments

Soil Productivity:

Soil stabilization treatments are proposed for the high severity burn area (old sawdust piles) in the meadow. Treatments include transplanting small plugs of native vegetation, spreading native meadow hay, Invasive species EDRR, and temporary excluding livestock from the critical area. The objectives of meadow treatments are to stabilize severely burned soil to reduce the risk of altered meadow hydrology and promote the reestablishment of native meadow species in the old sawdust pile locations

Treatment Description

Implement soil stabilization and native vegetation recovery treatments. Total cost of treatment is **\$5,708**.

- Transplant small plugs of native meadow sod from adjacent areas within the meadow to the area where sawdust burned (< 1.4 acres).
- Spread native meadow "hay" in fall of 2015 from elsewhere in the meadow over the bare area for erosion control and to provide a seed source for native plant reestablishment. Additional seeds of desirable plants from the meadow may also be placed in the barren area. Desired hay depth is 1/4 inch (1 ton per acre) where feasible.
- Promptly treat any invasive weeds that appear in the burned sawdust area to prevent seed set and establishment using EDRR processes described above.
- Construct a temporary fence to exclude livestock from the recovering area for 1-3 years. The need for the enclosure will be evaluated annually. Fence perimeter is approximately 1000 feet.
- Involve Mono tribal elders and to further overall goals of meadow restoration in the Sierra NF in a meadow of unique importance to the Mono people.

Personnel	Daily Rate	# person-Days (8 hrs/day)	Total
GS-11 botanist (1) (hiring, training, supervision, reporting)	\$380.00	2	\$760.00
GS-11 soil scientist for soil assessment and assistance with implementation	\$380.00	2	\$760.00
GS-11 rangeland manager	\$380.00	2	\$760.00

GS-5s (4 people for 2 days) (surveys and treatments)	\$132.69	8	\$1,061.52
2 GS-5 range technicians to build the temporary fence (2 people for 3 days)	\$132.69	6	\$796.14
Subtotal			\$4,137.66
Fleet/Supplies	Cost	Miles or Unit	Total
Materials and supplies for temporary fence	\$1,000	1	\$1,000.00
Mileage (40 miles roundtrip from North Fork to Peckinpah Meadow) for 10 trips	\$0.54/mile	500	\$270.00
Misc supplies: batteries, thick garbage bags for invasive weeds, tools for moving sod plugs, cutting meadow hay	\$500.00	1	\$300.00
Subtotal			\$1,570.00
Total Cost			\$5707.66

2) Channel Treatments: There are no channel treatments for the Willow Fire.

3) Life and Property

Roads and Trail Treatments:

Accepted and economical BAER road treatments to mitigate the risks to life and safety are to install BAER warning signs at main entry points on the Douglas Ranger Station road 7S09 and Peckinpah road 8S09 and BAER flash flooding signs at drainage crossings. Storm inspection and response (storm patrol) along these roads between and after major storms will help insure drainage features continue to function at full capacity and debris flows, rock slides and downed trees are removed from the traveled.

To mitigate the risk to invested road improvements and access, accepted and economical BAER road treatments include the installation vertical riser pipes, metal end sections, metal over side drains, rock spillways, critical dips with drainage armor, culvert up sizing, restoring drainage function to culvert inlets and outlets roadway ditch lines and storm inspection and response

Culverts along Forest Road 7S09 should be upsized and/or retrofitted as necessary to allow for the unobstructed passage of storm flows. Where modifications to culverts do not occur (and where appropriate), critical dips should be installed where bypass potential is considered high (see engineering report for specific treatments). In addition to treatments, a storm patrol should also be used during the first runoff producing storms to ensure that blockage to the culverts does not occur. Signage should be installed warning residents of post fire flood hazards and kept in place for at least 3 years. Table 5 itemizes treatments and costs by road. **Total road treatment costs are \$98,244 including mobilization and contracting.**

Table 5: Road treatments and Costs

Road #	Line Items	Units	Unit Cost	Quantity	BAER Cost
7509 & 8509					
	Install BEAR Warning Signs	EA	\$ 250	7	\$ 1,750
7509, 8509, 8528					
	Restore Drainage Function	Mile	\$ 1,500	10.05	\$ 15,075
7509, 8509					
	Storm Inspection and Response	Day	\$ 2,500	10	\$ 25,000
7509					
	Install Critical Dip	EA	\$ 1,500	3	\$ 4,500
	Install Drainage Armor	C.Y.	\$ 200	25	\$ 5,000
	Install Metal End Section 18"-24"	EA	\$ 1,000	2	\$ 2,000
	Install Vertical Riser 18"-24"	EA	\$ 2,000	2	\$ 4,000
	Install Over Side Drain w/ 15' Flume	EA	\$ 2,800	1	\$ 2,800
	Remove 12" culvert and Install 18"x30'	L.F.	\$ 200.00	30	\$ 6,000
8509					
	Install Metal End Section 18"-24"	EA	\$ 1,000	2	\$ 2,000
	Install Critical Dip	EA	\$ 1,500	1	\$ 1,500
	Install Drainage Armor	C.Y.	\$ 200	15	\$ 3,000
	Install Vertical Riser 18"x6'	EA	\$ 2,000	1	\$ 2,000
	Mobilization @ 10%	L.S.	\$ 4,962.50	1	\$ 4,963
	Overhead (contract prep, administration, implementation) @ 25%	L.S.	\$ 18,656.25	1	\$ 18,656
TOTAL Estimate					\$ 98,244
Trail #					
23E07 & 23E276					
	Install BEAR Warning Signs	EA	\$ 250.00	4	\$ 1,000.00
TOTAL Estimate					\$ 1,000

Consultation/Coordination on Permitted/Other Lands

Dam at North Fork Recreation Area (County Land): Coordinate with and inform County of value at risk. The dam at the North Fork Recreation Area Memorial Park should be opened (i.e., the boards used to impound water should be removed) to allow through-flow of South Fork Willow Creek during storm flows to prevent accumulation of debris and damage to the dam.

Hydroelectric Dam Infrastructure (Private PG&E): Coordinate with and inform PG&E of down stream value at risk. Contact with PG&E was attempted, but they did not respond. Assuming the dam has sufficient free board and/or a proper functioning spillway, damage from flooding is considered unlikely.

Private Residences Along SF Willow Creek (Private Land): Inform private landowners of low risk of flooding. Most residences are well above the 100 year flood plain of South Fork Willow Creek and thus impact from flooding are considered unlikely. **Inform/Consult with NRCS and land owners** using the K subbasin road crossing identified in Appendix A, Figure 9.

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.)

Forest personnel will conduct a Level 1 Effectiveness monitoring of the road treatments to check that treatments are present and functioning properly. The purpose is to ensure the action is meeting site-specific objectives or if there is a need for follow-up or re-treatment. Monitoring will be conducted after storm events. The report would include photographs and a recommendation on whether additional treatments are necessary. If the monitoring shows the treatment to be ineffective at stabilizing the road and there is extensive loss of road bed or infrastructure an interim report will be submitted. A several page monitoring report would be completed after the site visit.


Part VI – Emergency Stabilization Treatments and Source of Funds

Interim #

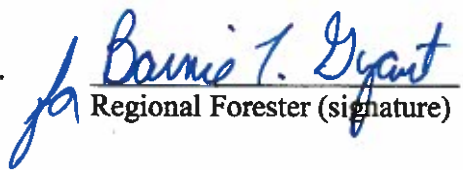
			NFS Lands				Other Lands			All
		Unit	# of		Other			# of	Non	
Line Items	Units	Cost	Units	BAER \$	\$		\$	Units	Fed	Total
A. Land Treatments										
Invasive weeds, dozer & Drew mdw	ls	27738	1	\$27,738	\$0	0	\$0	0	\$0	\$27,738
Peckinpah Soil Treatment	ls	6700	1	\$6,700	\$0		\$0	0	\$0	\$6,700
<i>Insert new items above this line!</i>				\$0	\$0	0	\$0	0	\$0	\$0
<i>Subtotal Land Treatments</i>				\$34,438	\$0	0	\$0	0	\$0	\$34,438
B. Channel Treatments						0	\$0	0	\$0	
		0		\$0	\$0	0	\$0	0	\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0	0	\$0	0	\$0	\$0
<i>Subtotal Channel Treat.</i>				\$0	\$0	0	\$0	0	\$0	\$0
C. Road and Trails						0		0		
Install BAER warning signs	ea	250	7	\$1,750	\$0	0	\$0	0	\$0	\$1,750
Storm inspection and response	day	2500	10	\$25,000	\$0	0	\$0	0	\$0	\$25,000
Restore drainage function	mi	1500	10.05	\$15,075	\$0	0	\$0	0	\$0	\$15,075
Install critical dip	ea	1500	4	\$6,000	\$0	0	\$0	0	\$0	\$6,000
Install drainage armor	c.y.	200	40	\$8,000	\$0	0	\$0	0	\$0	\$8,000
Install metal end section	ea	1000	4	\$4,000	\$0	0	\$0	0	\$0	\$4,000
Install vertical riser	ea	2000	3	\$6,000	\$0	0	\$0	0	\$0	\$6,000
Install overside drain with flume	ea	2800	1	\$2,800	\$0	0	\$0	0	\$0	\$2,800
Remove 12" culvert, install 18"	l.f.	200	30	\$6,000	\$0	0	\$0	0	\$0	\$6,000
Mobilization @ 10%	l.s.	4962.5	1	\$4,963	\$0	0	\$0	0	\$0	\$4,963
Contracting @ 25%	l.s.	18656.25	1	\$18,656	\$0	0	\$0	0	\$0	\$18,656
<i>Insert new items above this line!</i>				\$0	\$0	0	\$0		\$0	\$0
<i>Subtotal Road & Trails</i>				\$98,244	\$0	0	\$0		\$0	\$98,244
D. Protection/Safety						0				
				\$0	\$0	0	\$0		\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0	0	\$0		\$0	\$0
<i>Subtotal Structures</i>				\$0	\$0	0	\$0		\$0	\$0
E. BAER Evaluation						0				
Salary and travel	proje ct	63,942	1	\$63,942		0	\$0		\$0	\$0
Coordination Lead	days	350	12	\$4,200		0	\$0		\$0	\$4,200
<i>Insert new items above this line!</i>				---	\$0	0	\$0		\$0	\$0
<i>Subtotal Evaluation</i>				\$4,200	\$0	0	\$0		\$0	\$4,200
F. Monitoring						0				
Coordination Lead				\$0	\$0	0	\$0		\$0	\$0
<i>Insert new items above this line!</i>				\$0	\$0	0	\$0		\$0	\$0
<i>Subtotal Monitoring</i>				\$0	\$0	0	\$0		\$0	\$0
G. Totals				\$136,882	\$0	0	\$0		\$0	\$136,882
Previously approved						0				
Total for this request				\$136,882		0				

PART VII - APPROVALS

1.

 8/24/16
Forest Supervisor (signature) Date

2.

 8/31/15
Regional Forester (signature) Date

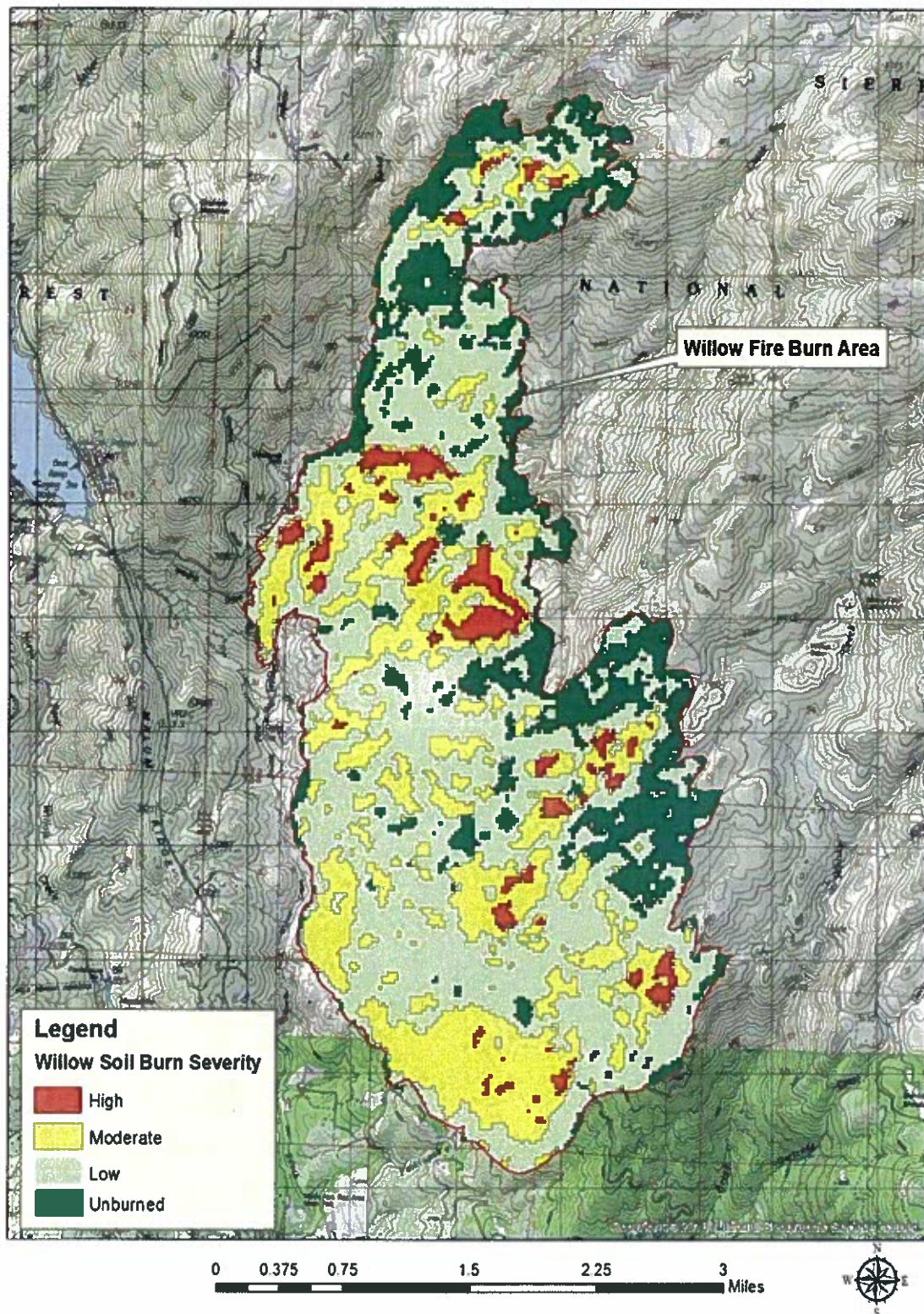


Figure 1: Willow Fire Soil Burn Severity Map

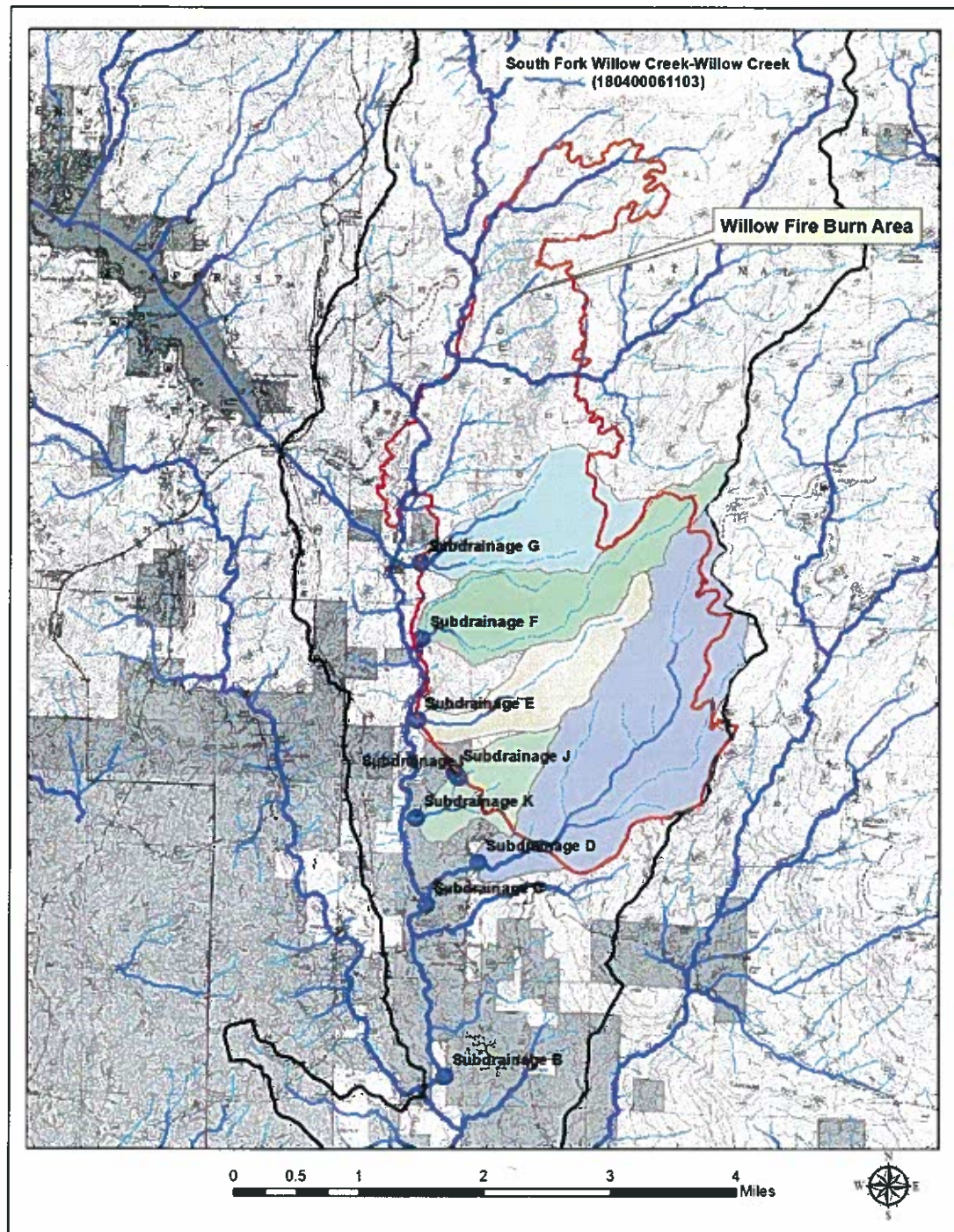


Figure 2: Willow Fire drain points defined for Values at Risk.



Willow Fire BAER Land Ownership Map

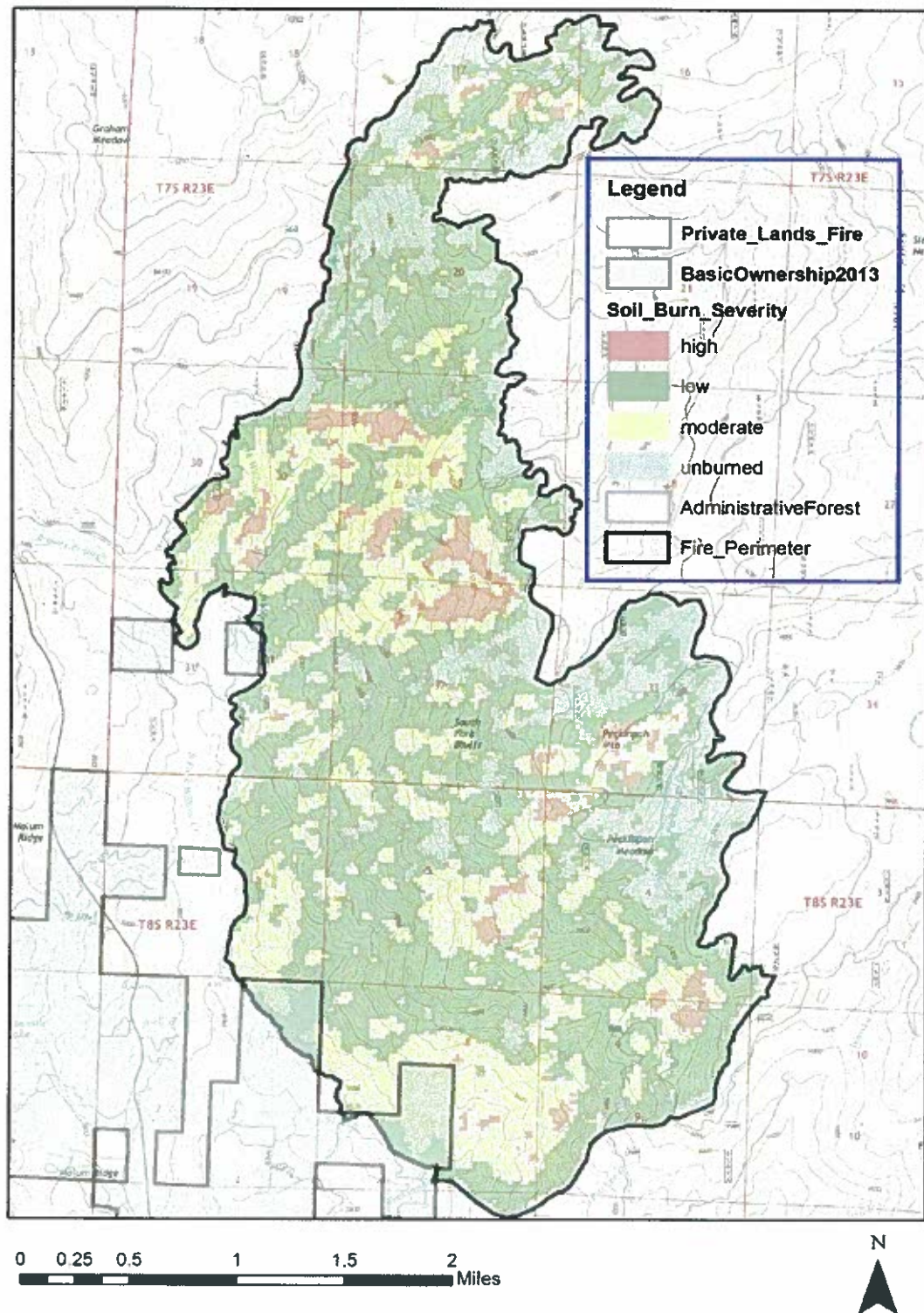


Figure 3: Ownership Map for the Willow Fire

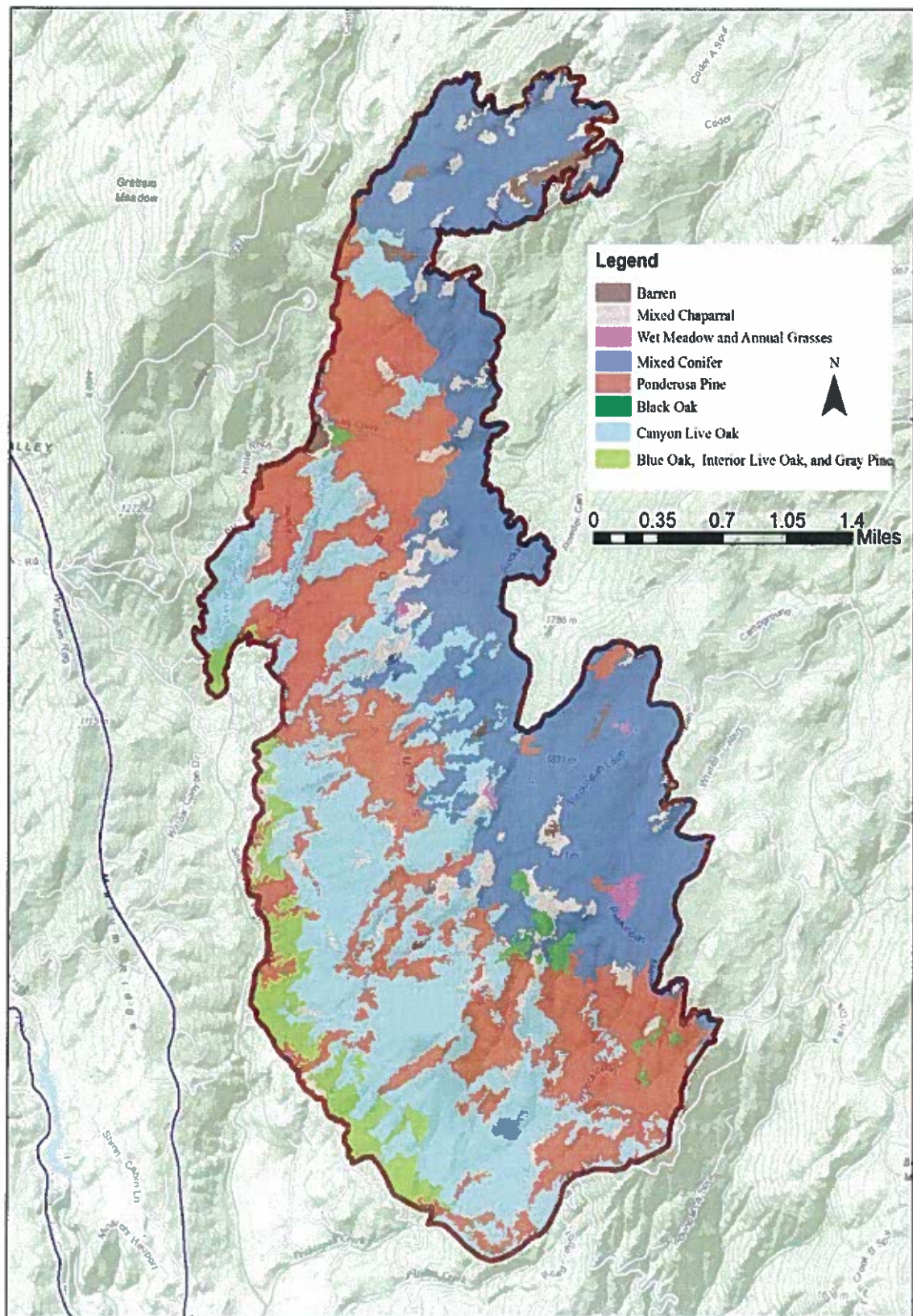
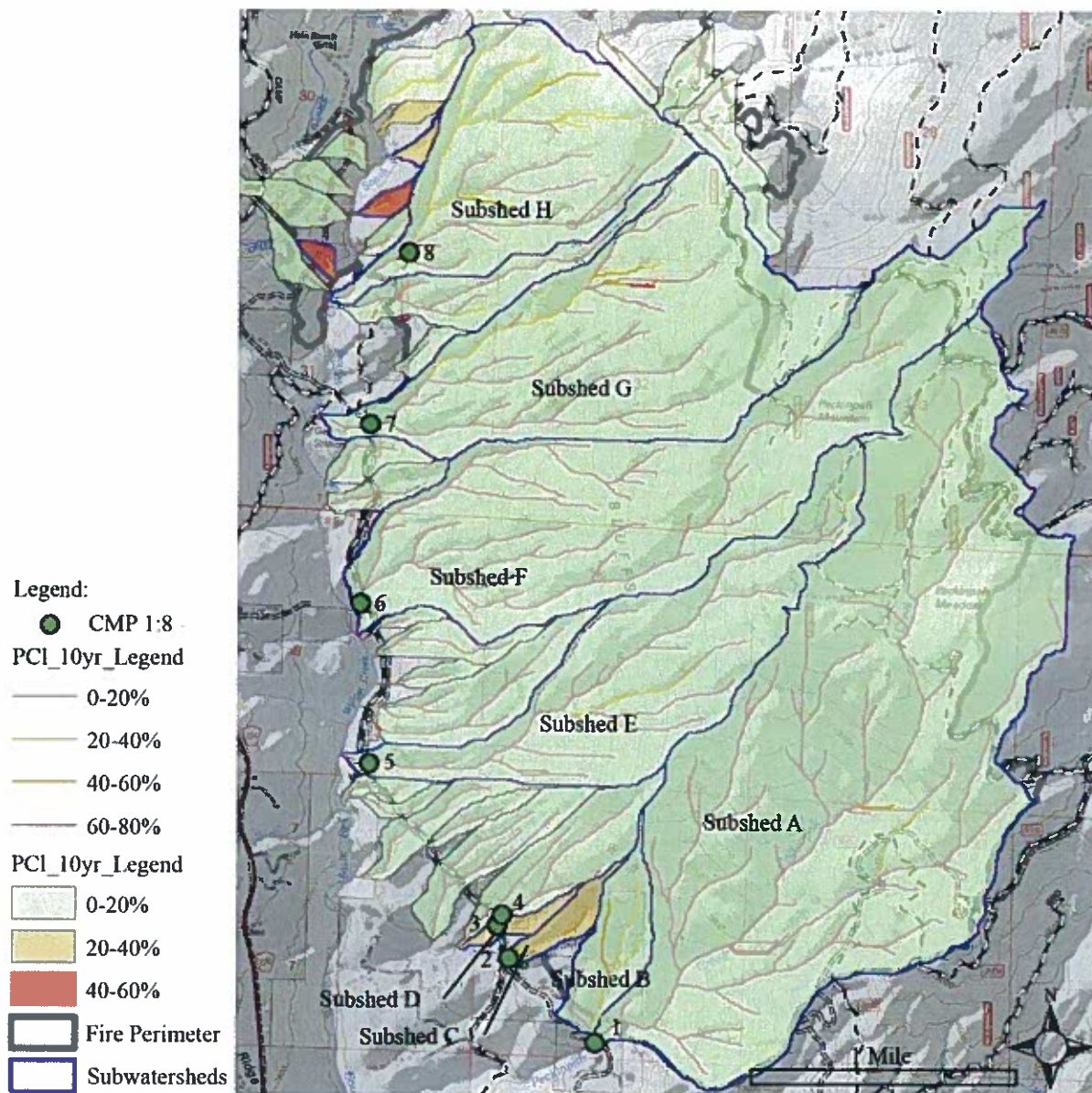


Figure 4: Vegetation communities in the Willow Fire.



Debris Flow Hazard Map showing probability of debris flow hazard areas in the Willow Fire area. The green subwatershed areas have a 0-20% debris flow probability, and the yellow line segments have a 20-40% debris flow probability.

Figure 5: Debris Flow Hazard Map

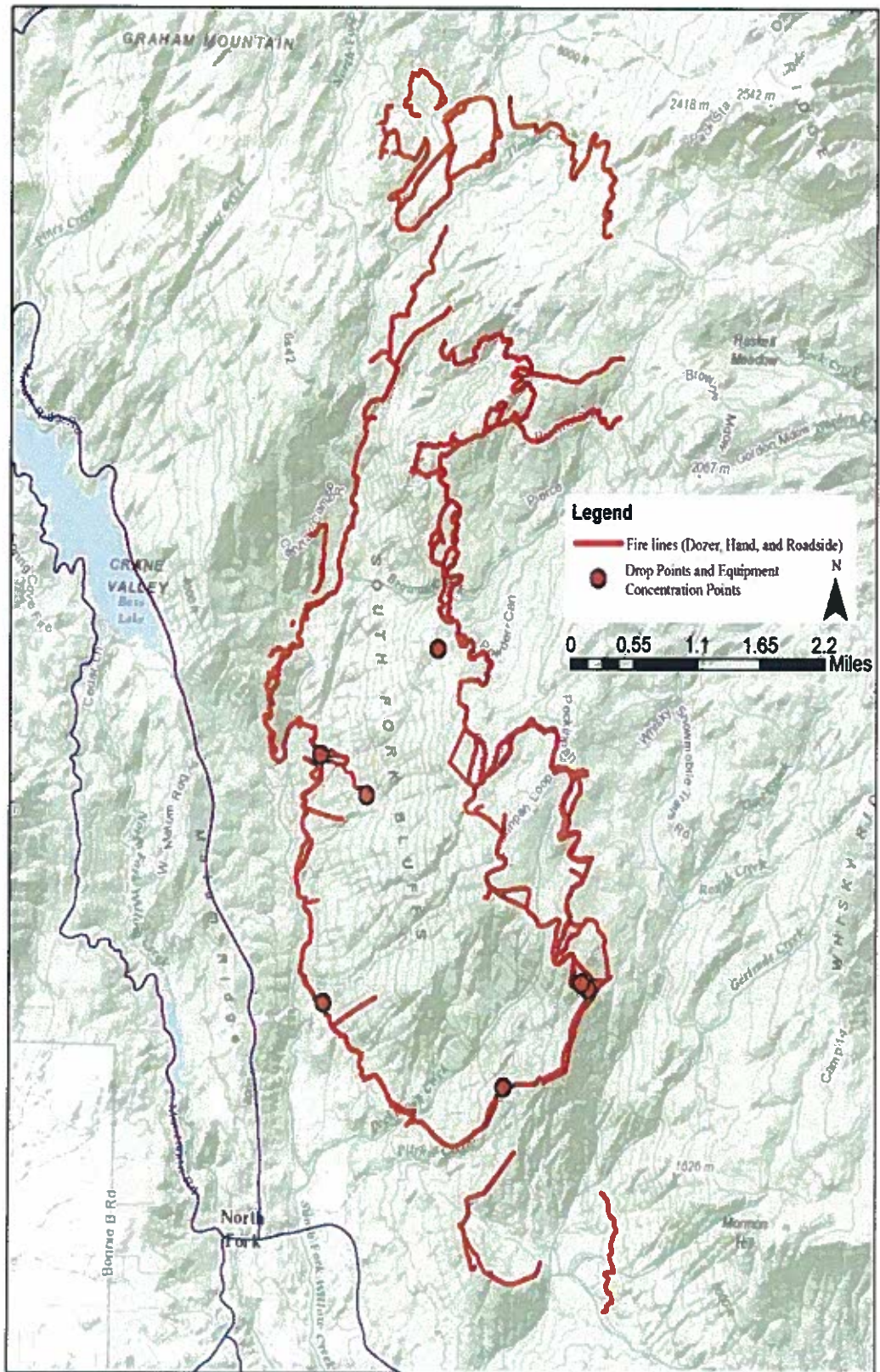


Figure 6: Fire lines and drop points considered for invasive species treatments.

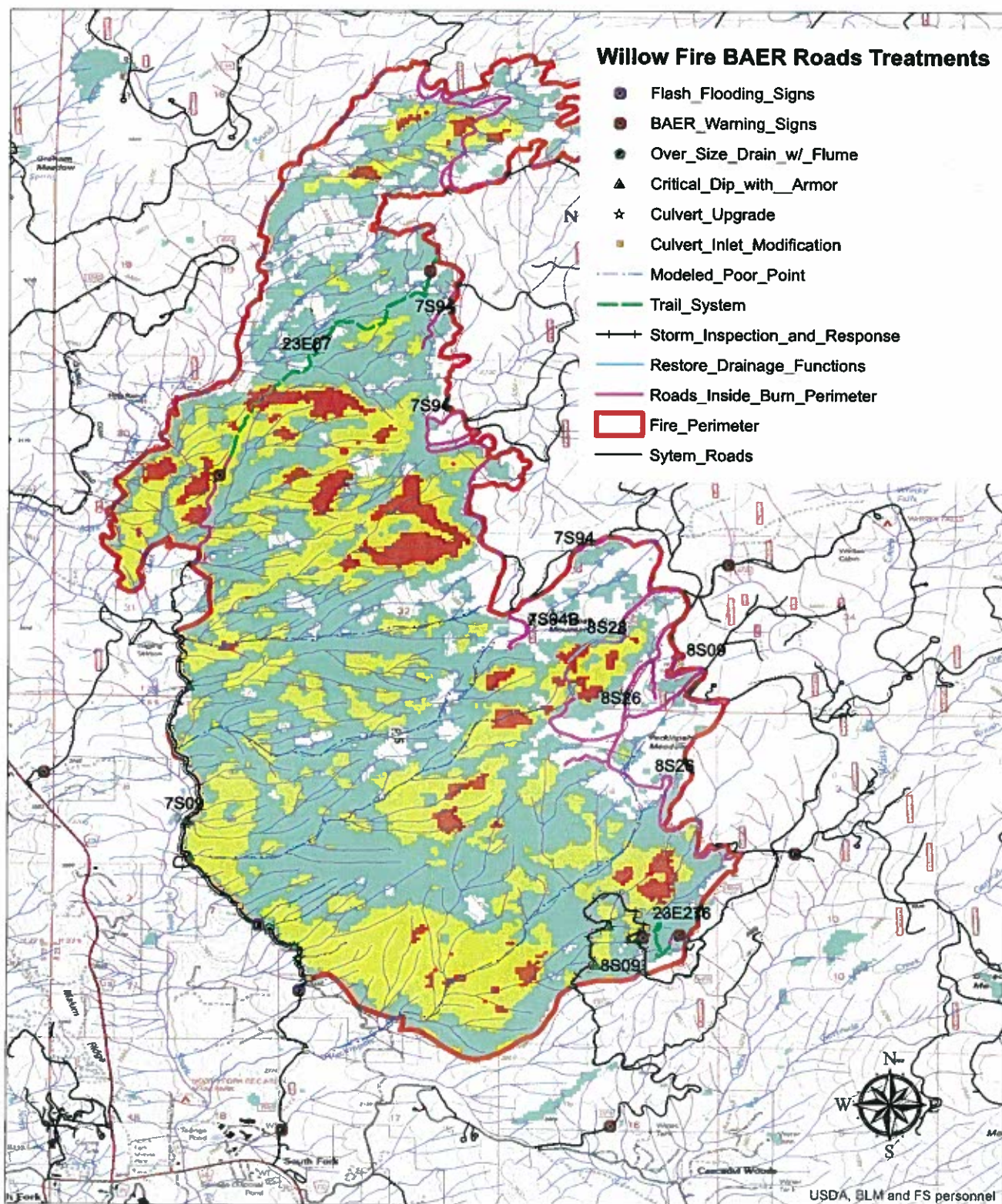


Figure 8: Road Treatment Map

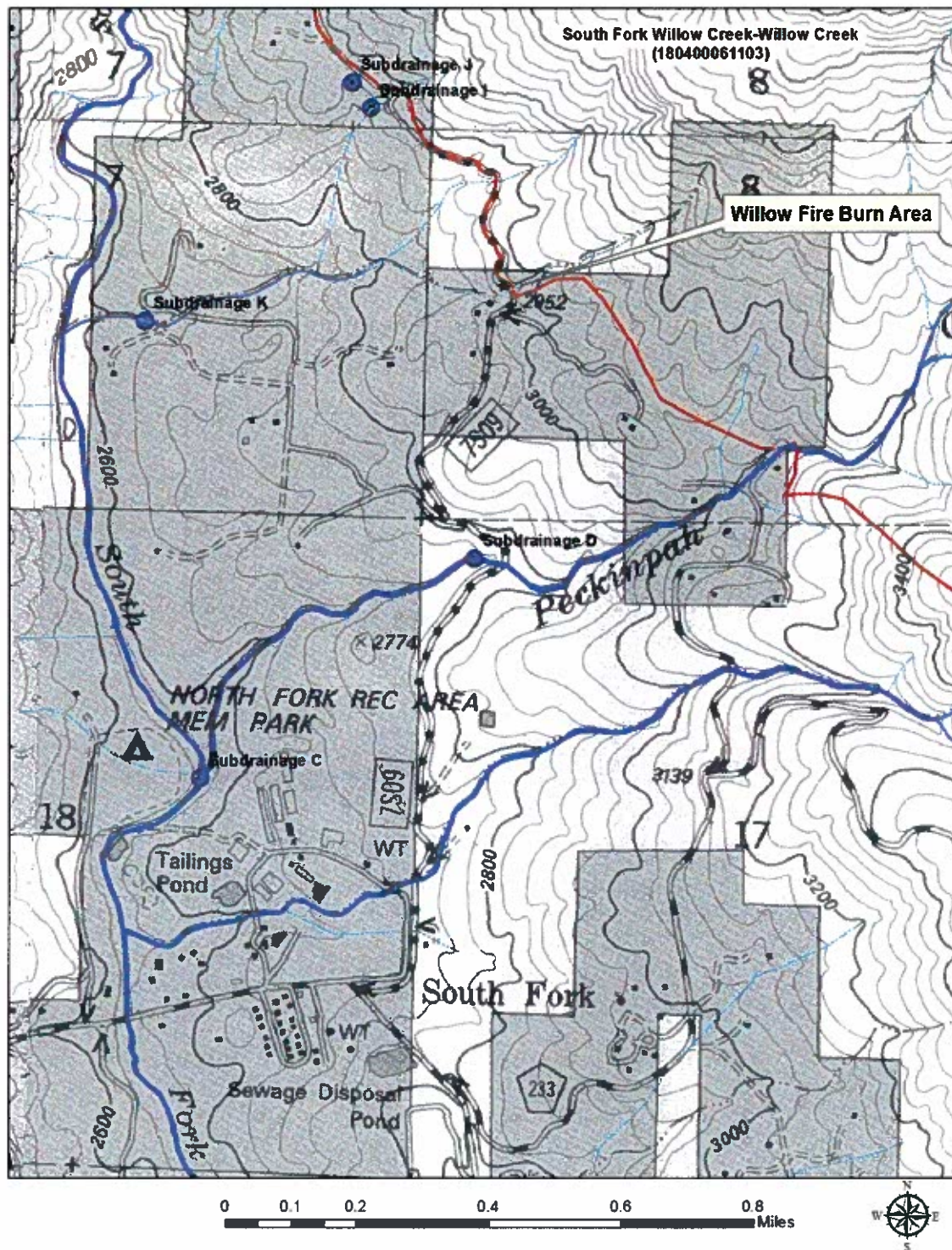


Figure 9: Subdrainage K at Private Road Crossing

Summary of Potential Values at Risk (VAR) Assessment-Willow Fire

12th HUC 18040061103 South Fork Willow Creek

Value (Life/Property/Resources)	Value At Risk	Probability of Damage or Loss	Magnitude of Consequences	Risk	Treatment
<ul style="list-style-type: none"> Life and Safety, injury to humans by use of road during storms and possible loss of access. Road investment. 	Road 7509 stability	<ul style="list-style-type: none"> Possible for most culverts by flooding. Likely for under size culverts and loss of access. 	Major	High	Storm inspection and response.
					Restore drainage functions including brushing by cleaning culvert inlet and outlet, catch basin, and along road-way ditch line.
					Install BAER warning sings.
					Install critical dip w/ rock armoring at fill slope.
					Inlet culvert modifications (vertical risers & metal end sections).
					Up-grade one 12" culvert to 18" currently undersize for potential storm based on hydrology modeling.
<ul style="list-style-type: none"> Life and safety, injury to humans by use of roads during storms. Road investment. 	8509 8528 (Storm inspection and response only)	<ul style="list-style-type: none"> Likely, loss of road investment Likely, road users 	Major	High	Storm inspection and response.
					Restore Drainage Functions Including Brushing by Cleaning Culvert Inlet and Outlet, Catch Basin, and Along Road-way Ditch Line.
					Install BAER warning sings.
					Install Critical Dip w/ Rock Armoring at Fill Slope.
					Inlet culvert modifications (vertical risers & metal end sections).
Resources	Native vegetation within fire area; near western perimeter.	Very Likely	Moderate	Very High	Surveys of dozer lines, areas of disturbance, EDRR noxious weeds.
Resources	Native vegetation within fire area; west to south part of fire.	Likely	Moderate	High	Surveys of dozer lines and areas of disturbance, EDRR noxious weeds.
Resources	Native vegetation in the central part of fire area.	Possible	Moderate	Intermediate	Surveys of dozer lines and areas of disturbance, EDRR noxious weeds.
Resources	24 archaeological or historic-era sites with scientific and cultural value	Possible	Major	Low	None recommended.

Resources	Fire damaged range improvements at Peckinpah Meadow (fencing) threat to soil and vegetation recovery from uncontrolled grazing.				Advise range program of concerns of impacts to post-fire recovery. VAR is not within the scope of BAER.
Property/Resources	Motorized Trail 23E273	Unlikely	Low	Low	Pre-fire severe erosion condition on section of trail. It is not expected that post-fire influences will worsen existing condition. Not a VAR by BAER standards. No treatment recommended.
Life	Motorized Trail 23E273	Possible. Increased threat to safety of public who enter fire area 1 st year following fire, from hazard trees and flooding.	Moderate	Intermediate	<ul style="list-style-type: none"> Implement a temporary closure of trail to public for one year then re-assess conditions. Install closure/warning signs and gates at entry points to fire area (2). Conduct closure effectiveness monitoring.
Property	Pacific Gas and Electric (PG+E) Dam	Unlikely	Moderate to Major	Low to Intermediate	Consult with PG+E
Property	North Fork Recreation Area (Private)	Unlikely	Moderate to Major	Low to Intermediate	Consult with Madera County
Property	FS RD 8s26, crossing at the toe of meadow	Unlikely	Minor	Low	Storm Patrol monitoring
Property/Life	Private homes South Fork Willow Creek	Unlikely	Major	Intermediate	<ul style="list-style-type: none"> Inform NRCS of potential threat. Press release to notify home owners.
Life	Trail 23E07 Trail 23E276	Possible	Major	High	Install BAER warning signs
Resources	Peckinpah Meadow	Likely. Gully risk likely due to poor vegetative recovery; susceptible to non-native weeds.	Moderate	High	<ul style="list-style-type: none"> Sod plugs transplanted from adjacent areas in Peckinpah Meadow. Conduct effectiveness monitoring.
Resources	Soil Productivity	Possible	Minor	Low	No Treatment
Resources	Western Pond Turtle habitat in the South Fork Willow Creek, debris flow threat, known occupied habitat (Forest Service Sensitive spp.)	Possible	Moderate	Intermediate	Surveys – Storm Patrol. Trigger points for surveys if debris flows occur.

Resources	Pacific fisher den site and 700-acre den buffer centered on Brown's Creek (Proposed Threatened spp.)	Unlikely to Possible	Moderate	Low to Intermediate	Fish and Wildlife conferencing; PSW survey/monitoring, potential scat-detector dog surveys
Resources	T+E SNYLF (E) northern corner of fire east fork of Sand Creek	Unlikely to Possible	Moderate	Low to Intermediate	Fish and Wildlife consultation
Resources	Yosemite Toad (T) non-breeding terrestrial upland habitat	Unlikely to Possible	Moderate	Low to Intermediate	Fish and Wildlife consultation