August 17, 2021

TAMARACK FIRE BURNED-AREA REPORT

PART I - TYPE OF REQUEST

A. Type of Report

☒ 1. Funding request for estimated emergency stabilization funds

☐ 2. No Treatment Recommendation

B. Type of Action

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

☐ 2. Interim Request #___

☐ Updating the initial funding request based on more accurate site data or design analysis

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Tamarack

B. Fire Number: NV-HTF-0030419

C. State: CA & NV

D. County: Alpine, Douglas

E. Region: 04 - Intermountain

F. Forest: 17 – Humboldt-Toiyabe National Forest

G. District: Carson and Bridgeport Ranger Districts

H. Fire Incident Job Code: P4N54E21 0417

I. Date Fire Started: July 4th, 2021

J. Date Fire Contained: 82% (as of 8/14/2021)

K. Suppression Cost: 32 million (as of 8/15/2021)

L. Fire Suppression Damages Repaired with Suppression Funds (estimates): as of 8/14/2021

Item	Unit	Amount Identified	Amount Repaired	No Repair Needed	Remaining
Mapped Dozer Line	Miles	32.8	30.2	1.6	1.0
Road as Control Line	Miles	5.8	2.0	3.1	0.7
Mapped Hand Line	Miles	17.1	6.6	4.3	6.2
Hand/Dozer Line	Miles	1.9	1.9	0.0	0.0
Spike Camps	Count	2	0	0	2
Drop Points	Count	14	0	6	8
Helispots	Count	25	0	6	19

M. Watershed Numbers:

Table 1: Acres Burned by Watershed

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
160502010202	Cottonwood Canyon-East Fork Carson River	15,740	11,814	75%
160503020401	Town of Holbrook Junction	10,779	6,901	64%
160502010107	Hot Springs Creek	18,276	9,570	52%
160502010203	Indian Creek	16,476	7,579	46%
160502010201	Leviathan Canyon	32,638	14,405	44%
160502010108	Markleeville Creek-East Fork Carson River	27,636	11,976	43%
160502010106	Pleasant Valley Creek	16,190	6,257	39%
160503020206	Topaz Lake	10,646	583	5%
160503020402	Antelope Valley-West Walker River	33,918	1,205	4%
160502010302	Middle West Fork Carson River	17,414	531	3%
160502010304	Lower West Fork Carson River	26,214	295	1%
160502010104	Silver Creek	19,671	8	<1%

N. Total Acres Burned: Based on 9 Aug Fire Perimeter

	Acres			
Ownership	**California**	**Nevada**	**Total**	**Percent**
NFS	34,463	1,275	35,738	0.52
BLM	9,399	560	9,959	0.15
BIA	530	10,550	11,080	0.16
State	536	0	536	<.01
Private	8834	2538	11372	0.17
Total	**53,762**	**14,924**	**68,685**	**100**

O. Vegetation Types: Vegetation types within the Tamarack fire include sagebrush/bitterbrush communities, eastside pine, Sierran mixed conifer, annual grassland, aspen, montane chaparral, pinyon-juniper, Jeffrey pine, eastside pine, and white fir; with smaller acreages of subalpine conifer which includes whitebark pine (FWS Proposed Threatened), montane riparian and wet meadow.

P. Dominant Soils:

The soils are primarily derived from two different parent materials. West of Grover Hot Springs, the soils are derived from granitic rock that was scoured and deposited by several glacial periods. These soils contain large amounts of rock which contributes to the high debris potential but the high sand content reduces the risk of erosion.

The soils east of Grove Hot Springs are derived from different volcanic deposits. This material is mostly a conglomerate of cobble and stone volcanic rock that is strongly welded. As this parent material weathers, it produces a sandy loam and loam soils. Because the soil has high rock content, erosion is generally limited to the surface. But because this the rock is imbedded into the soil surface and much of the soil is shallow to rock outcrop, surface water runoff can be rapid; especially in a fire altered landscape of little soil cover and increased water repellency.

Q. Geologic Types:

The Tamarack Fire occurred in the geologic province of the Eastern Sierra Nevada Mountains. Rock types consist of the Mesozoic granitic rocks of the Sierra Nevada batholith, Paleozoic and Mesozoic metamorphosed sedimentary and volcanic rocks, (metasediments and metavolcanics) associated with the Sierra Nevada uplift and Basin and Range geologic province processes, and Tertiary (Oligocene-Pliocene) volcanics comprised of andesite and basalt flows, rhyolite, flow breccias, lahars, and minor volcaniclastic sediments in the vicinity of Markleeville. Also influencing the geomorphic features within the Tamarack Fire area are a series of Quaternary glaciations, and the Quaternary seismic activity of the Walker Lane fault zone. Modern geomorphic processes of the Sierra Nevada Mountain Range interfacing with the Basin and Range geologic province result in a dynamic landscape characterized by steep slopes meeting valley floors, affected by seasonal monsoonal and atmospheric river rain events, resulting in debris flow and alluvial fan deposits.

R. Miles of Stream Channels by Order or Class:

Stream Type	Miles of Stream
Perennial	71
Intermittent	20
Ephemeral	131
Canal/Ditch	16

S. Transportation System:

Trails: *National Forest (miles):* 8.04 *Other (miles):* 12.75
Roads: *National Forest (miles):* 54.7 *Other (miles):* 35.71

Trail Name/ #	Burned Mileage Of Trail	Burned Mileage Requiring Treatment	Burn Severity
Charity Valley (21005)	4.31	1.54	Moderate/High
Burnside Lake (21006)	0.58	0.42	Low/Moderate/High
Thornburg Canyon (21007)	3.15	1.15 / 0.68 Wilderness	Low/Moderate/High

This includes the NFS roads/trails that are on private within the fire but not non-fs roads on private.

PART III - WATERSHED CONDITION

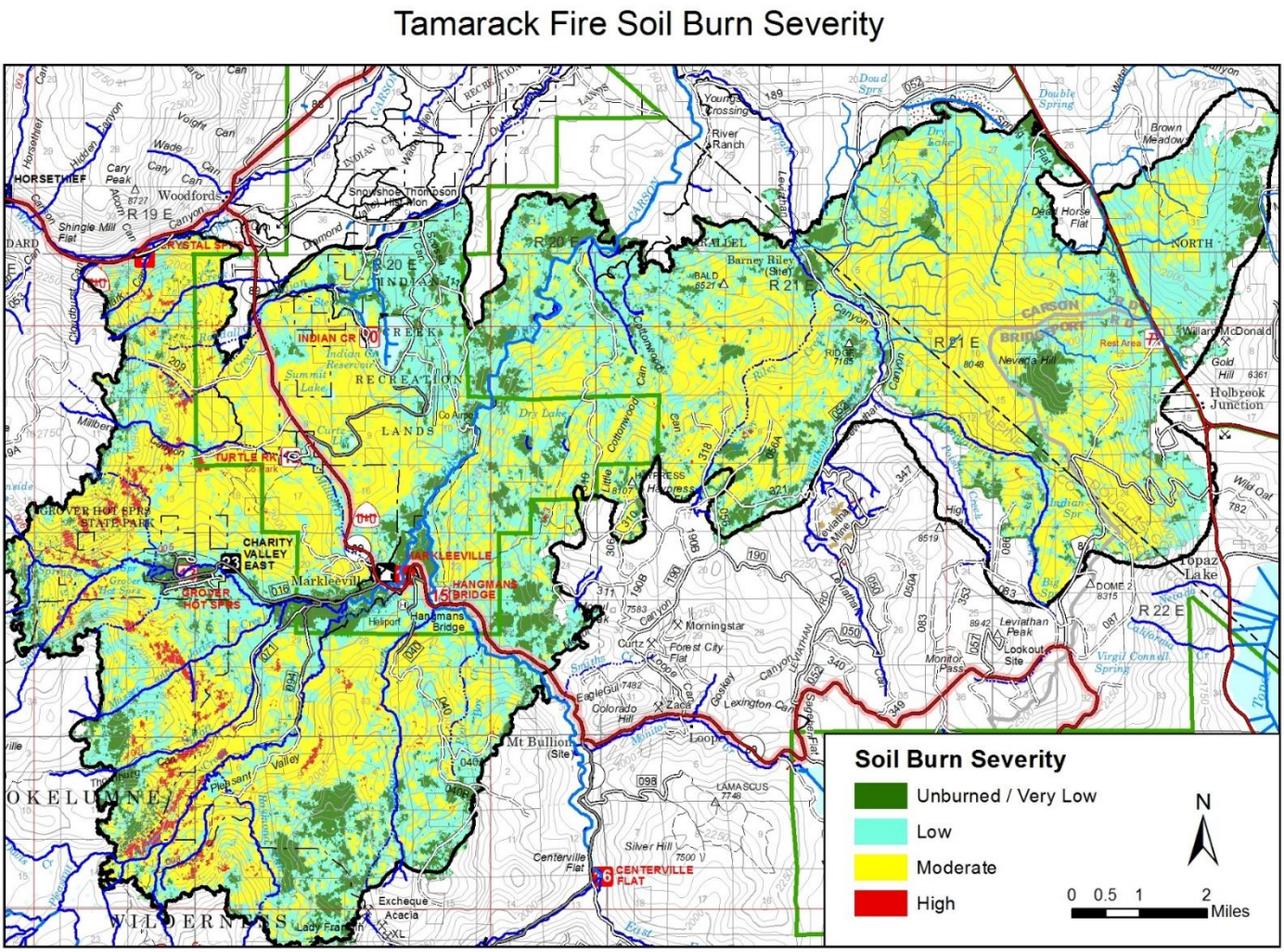
A. Burn Severity (acres):

The analysis boundary used by the watershed group differs from the incident data by approximately 3,000 acres. There are three primary reasons for this. First, the BAER team included the East Fork Fire which burnt adjacent to the Tamarack Fire. Because the East Fork Fire occurred earlier this summer, we felt it was important to include the Soil Burn Severity from this fire because it affects watersheds that are affected by the Tamarack Fire. Also, the burn boundary BAER uses is created during the process of BARC creation. Because the BAER boundary is created using the same satellite imagery as the BARC, it includes very low burn signatures perhaps not identified by incident mappers. Lastly, the BAER boundary tends to include excluded unburned islands and smooths out deeply convoluted boundaries. Regardless, the intention of the BAER analysis boundary is for watershed analysis, not for public acreage reporting. It is important that we include all burned areas.

Soil Burn Severity:

Soil Burn Severity*	State	NFS	BLM	State	BIA	Private	Total	Percent
Unburned	CA	5097	979	173	166	1,502	7,917	12
	NV	145	233	0	734	435	1,547	3
	Combined	**5,242**	**1,212**	**173**	**900**	**1,937**	**9,464**	**14**
Low	CA	13,418	4,132	138	193	2,950	20,831	30
	NV	562	372	0	4,065	1,314	2620	9
	Combined	**13,980**	**4,504**	**138**	**4,258**	**4,264**	**23,451**	**39**
Moderate	CA	16,884	4,328	246	171	4,613	26,242	37
	NV	575	27	0	5832	847	1,476	11
	Combined	**17,459**	**4,355**	**246**	**6,003**	**5,460**	**27,718**	**48**
High	CA	843	19	7	0	119	988	2
	NV	0	0	0	1	0	0	1
	Combined	**843**	**19**	**7**	**1**	**119**	**988**	**2**
Total	CA	36,242	9,458	564	530	9184	55,978	79
	NV	1,282	632	0	10,632	2596	10,342	22
	Combined	**37,524**	**10,090**	**564**	**11,162**	**11,780**	**71,120**	

*The interpretations provided by the BARC map was used for the Burn Severity determinations.



Soil Burn Severity for the Tamarack Fire.

C. Water-Repellent Soil (acres): 75% of the fire area. Strong water repellency was found throughout the fire area. Even though water repellency is a natural soil property, the fire both increased the severity and removed soil cover that ameliorates the tendency of water repellent soils to rapidly shed water.

D. Soil Erosion Hazard Rating: ERMiT modelling used in Section E was used to estimate erosion hazard potential and provide a surrogate for soil erosion hazard rating.

E. Erosion Potential: Erosion rates are relatively low, however this metric does not accurately reflect runoff potential on the fire's water repellent soils. Erosion rates were broken down by key watersheds and the fire perimeter.

	Erosion Rate by Watershed, Tons/Acre	
Watershed	**2 Year Event**	**5 Year Event**
Barney_Riley	0.05	0.72
Indian_South	0.04	0.64
Mark_Canyon	0.14	1.12
Millberry	0.03	0.52
Mountaineer	0.09	0.78
Musser_Jarvis	0.07	0.79
Scott	0.08	0.80
Shay	0.13	1.21
Spratt_Thornburg	0.03	0.48
Fire Perimeter	**0.14**	**0.85**

F. Sediment Potential: Modelling for this fire does not accurately measure sediment potential however a conservative estimate is that there is at least a 75% delivery ratio compared to the erosion rates.

F. Estimated Vegetative Recovery Period (years): 1-5 years for grass and forb components, 5-10 years for shrub components, much longer for tree species.

G. Estimated Hydrologic Response (brief description): The primary watershed responses of the Tamarack fire are expected to include: 1) an initial flush of ash and debris, 2) rill and gully erosion on steep slopes within the burned area, and 3) potential flash floods and debris flows during short duration high intensity summer monsoonal precipitation events and during long duration winter atmospheric river precipitation events. Due to the steepness of the topography in drainages with large areas now devoid of vegetation and groundcover after the fire, storms will likely create increased surface flow that could trigger floods or debris flows with very high sediment volumes and large amounts of floatable debris. These responses are expected to be most pronounced during the first 1- 3 years after the fire and will become less evident as vegetation and soil-hydrologic function recover.

Post-fire runoff modeling was conducted on nine analysis watersheds across the Tamarack fire. The WEPPcloud model was used to predict post-fire flows for 2, 5, 10-year flood events. Milberry Creek, Indian Creek South, Shay Creek, and Musser and Jarvis Creek analysis watersheds have the most significant increases in magnitude (see Table below.) Although this model predicts water runoff, a significant degree of flow bulking from sediment and debris is likely to occur in the watersheds affected by the Tamarack Fire over the next few years. These elevated post-fire flows and bulking could lead to plugged culverts, damage to road infrastructure, damage to utility infrastructure, damage to buildings, impacts to water quality, decreased soil productivity and hydrologic function, as well as threats to human life and safety.

Modeled increases in post-fire flood discharge

Analysis Watershed	Percent Increase in 2-year Flood Event Discharge	Percent Increase in 5-year Flood Event Discharge	Percent Increase in 10-year Flood Event Discharge
Millberry Creek	150%	169%	141%
Indian Creek South	164%	150%	127%
Shay Creek	52%	71%	83%
Musser and Jarvis Creek	53%	63%	67%
Thornburg/Spratt Creek	40%	27%	33%
Mark Canyon	10%	23%	30%
Mountaineer Creek	2%	8%	19%
Scott Creek	10%	<1%	18%
Barney Riley Creek	24%	19%	8%

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The Tamarack Fire started on July 4, 2021 from a lightning strick within the Mokelumne Wilderness in Alpine County. On July 16th, the fire pushed out of natural barriers during a high wind event. Approximately 2,500 people were evacuated and approximately 500 structures were threatened. As of the report date, the fire is 82% contained at 68,685 acres. A BAER assessment team began field reconnisance of the burned area on July 24 to begin burn severity mapping, hydrologic response, and to identify geoglogic hazards. Forest Service BAER closely collaborated with the BIA BAER team which evaluated BIA lands in Nevada. In addition, interagency coordination began with interested representatives in both Douglas and Alpine Counties, and State and Federal Agencies.

A. Describe Critical Values/Resources and Threats (narrative):

Critical Value Matrix

Probability of Damage or Loss: *The following descriptions provide a framework to estimate the relative probability that damage or loss would occur within 1 to 3 years (depending on the resource):*
Very likely*. Nearly certain occurrences (90% - 100%)*
Likely*, Likely occurrence (50% - 89%)*
Possible*. Possible occurrence (10% - 49%)*
Unlikely*. Unlikely occurrence (0% - 9%)*

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

Magnitude of Consequences:
Major*. Loss of life or injury to humans; substantial property damage; damage to critical natural or cultural resources*
Moderate*. Injury or illness to humans; moderate property damage; damage to critical natural or cultural resources resulting in considerable or long-term effects.*
Minor*. Property damage is limited in economic value and/or too few investments; damage to critical natural or cultural resources resulting in minimal, recoverable or localized effects.*

1. Human Life and Safety:

- *Forest Visitors Safety:*
  The BAER team identified potential threats to Forest visitors/recreating public, and agency personnel (visiting or post-fire treatments) that are within or downstream/downslope of burned slopes, especially those with a moderate-high burn severity, from flooding and debris flows, hazard trees, loss of ingress and egress along/at roads, trails, and permitted sites. The probability of damage or loss is **possible or likely**, resulting from hazard trees along travel routes within the burn area have not been mitigated. Likewise, there are numerous road-stream crossings within the burn area or directly below moderate/high burn severity that are now at risk from flooding, debris flows, and rockfall. The magnitude of consequences is **major**, as a tree strike or entrapment could lead to serious injury or loss of life. As such, the risk is considered **high/very high.**

  - BAER funds are requested to treat these risks (*Treatments PS-1*).

BAER recommends that human health and safety concerns on adjacent lands managed by the BLM, BIA, California and Nevada state, Douglas and Alpine Counties also be evaluated for risk from flooding and debris flows, hazard trees.

- *Campgrounds:*
  There are two campgrounds (Crystal Springs and Markeeville) in the burn area. There is a human health and safety risk to visitors of both campgrounds due to flooding and debris flow. The probability of damage or loss is **likely** for Crystal Springs Campground and **possible** for Markeeville campground, because increased post-fire runoff from areas of moderate and high SBS could restrict egress and could cover the campground. The magnitude of consequences is **major**, as loss of life is possible. The campgrounds are maintained on a yearly basis and receive frequent use. The resulting risk is **High and Very High.**

  - BAER funds are requested to treat these risks (*Treatments PS-2*).

  BAER recommends the Forest close the camping sites in the Markleeville close to the river to camping (day use only) until hazards are reassessed.

2. Property:

- *NFS Roads (31071 - Spratt Creek, 31094 - Pleasant Valley, 31040 - Indian Creek, 31040A - Poor Boy, 31310 - Cottonwood Canyon, 31052 - Leviathan Road, 31052 - Leviathan Road, 42784 - Electronic Site)*

  There is a threat to the NFS road prisms from increased runoff, erosion, and debris flows. Undersized and inadequate drainage structures are not expected to convey the expected increase in post-fire runoff and erosion and may damage Forest Service road infrastructure. The probability of damage or loss is **possible or likely**, because the identified NFS road prisms are expected to receive increased overland flow and accelerated erosion concentrating on route segments downslope from areas burned at moderate and high severity. The magnitude of consequences is **moderate or major**. Increased runoff could lead to failure of these road segments, which could constitute a loss of Forest Service infrastructure and increased sediment delivery to streams downslope. However, due to the relatively low angle of the burned slopes and short slope lengths, the magnitude is expected to be moderate. The resulting risk is **high or very high.**

  - BAER funds are requested to treat these risks (*Treatment RD-1*).

  BAER recommends that roads on adjacent lands managed by the BLM, California and Nevada State, Alpine and Douglas counties also be evaluated for risk from flooding and debris flows, and hazard trees.

- *NFS Trails*
  There is a threat to approximately 8 miles of trail prism on three system trails (Charity Valley, Burnside Like, and Thornburg Canyon). The probability of damage or loss is **likely**, because increased post-fire runoff from areas of moderate and high SBS could damage trail prisms. The magnitude of consequences is **moderate**. The trail system is maintained on a yearly basis, contributing to a substantial investment. Increased runoff could lead to erosion of the trail prism. Due to the relatively low angle of the burned slopes and short slope lengths, the magnitude is expected to be moderate. The resulting risk is **high.**

  - BAER funds are requested to treat these risks (*Treatment TR-1, PS-2*).

- *NFS Campgrounds*
  There are threats to two campgrounds (Crystal Springs and Markleeville) in the burn area. The probability of damage or loss is **likely** for Crystal Springs Campground and **possible** for Markleeville campground. The increased post-fire runoff from areas of moderate and high SBS could damage campground infrastructure. The possible effects of flooding, sedimentation, and debris flow caused by increased post-fire runoff could cause additional losses to campground facilities. The magnitude of consequences is **moderate**. The campgrounds are maintained on a yearly basis, contributing to a substantial investment. Increased runoff could lead to erosion of camping infrastructure. Due to the relatively low angle of the burned slopes and short slope lengths, the magnitude is expected to be moderate. The resulting risk is **intermediate** for Markleeville, and **high** for Crystal Spring.

  - BAER funds are requested to treat Crystal Springs Campground (*Treatment CG-1*).
  - No BAER property treatments are requested for Markleeville Campground.

3. Natural Resources: Native and naturalized plant communities, including Bi-State Sage Grouse habitat, where invasive noxious weeds were absent or in trace amounts.

- *Fire Suppression Activities*
  High likelihood of spread and introduction of invasive and noxious weeds into areas disturbed by suppression impacts (dozer lines, hand lines, drop points, helispots, etc.) which pose a threat to native and naturalized plant communities. The probability of damage or loss is **likely**, because areas of exposed soil due to fire suppression activities are susceptible to weed invasion and spread. There are several small weed infestations known along access roads. No weed washing stations were

established for the first two weeks of fire incident. Increased fire traffic during suppression may have brought vehicles and equipment in contact with known weed infestations and spread them into the burned areas. The magnitude of consequences is **moderate.** Introduction and expansion of weeds can suppress native vegetation recovery and lead to a loss of native and naturalized plant communities. Vegetation type conversion to annual grasslands and expansion of weeds into areas disturbed by fire suppression and within the burned area are likely; potentially increasing fire frequency. The resulting risk is **high.**

- BAER funds are requested to treat these risks (*Treatments LD-1*).

- *Non-Suppression Activities (BAER-Specific)*
  There is a threat of spread of weeds due to fire especially in high and moderate soil burn severity areas near known infestations and adjacent to transportation system within the burned area. The probability of damage or loss is considered **likely**, as the fire has rendered approximately 49% (moderate-high severity) of the habitat vulnerable to introduction of new weeds and expansion of existing weeds. There are several small infestations within burned areas; most of them along roads. There was frequent use of roads within the burned area by fire vehicles and equipment. Vehicles and equipment were not washed prior to entry. The magnitude of consequences is **moderate.** Most of the fire area was weed-free prior to the fire. Aggressive weeds can rapidly colonize areas within the fire area and suppress natural recovery. Loss of native and naturalized plant communities to annual grasslands and expansion of weeds into the burn area can reduce ecological integrity and increase fire frequency. There is a risk of spread and introduction of noxious weeds within the burned area. Forest Service direction seeks to minimize the establishment of non-native invasive species to prevent unacceptable habitat degradation of burned areas, while allowing for the recovery of the native plant community. The resulting risk is **high.**

  - BAER funds are requested to treat these risks (*Treatments LD-2 and LD-3*).

- *Natural Resources Soil and Water*
  There is a threat of impacts to water quality, and agriculture water supply from NFS lands, from increased sediment/nutrient loading following high intensity rain events. Likewise, there is the threat of the loss of soil productivity and reduced hydrological function. The probability of damage or loss is considered **possible or likely**, as erosion and transport of sediment, ash, and nutrients are expected to occur. The magnitude of consequences is **minor**, as soil damage is expected to be recoverable and localized. The resulting risk is **low.**

  - BAER funds are NOT requested to treat these risks. Natural Recovery is recommended.

  - BAER recommends the Forest works with the Markleeville Water Company, CalOES and Army Corps of Engineers to identify solutions to the water intake infrastructure located on NFS from threats related to soil erosion, debris flow, and flooding originating from NFS. This intake supplies 90% of the water for the town of Markleeville.

  - BAER recommends the Forest works with Alpine County, Army Corps of Engineers, CalOES, BLM, and collaboratives to implement landscape treatments that would promote increasing the soil cover. The objective is to get as much ground contact with organic material as possible with a goal of 70% cover. Soil cover is the most important soil property that would promote conditions favorable for restoration actions, and regulating speed and volume of water runoff, and subsequently, the intensity of flooding and potentially the intensity of debris flows. These treatments could facilitate recovery and stability of these watersheds and decrease long-term post-fire erosion.

- *Threatened and Endangered Species, whitebark pine (Proposed Threatened)*

There is approximately 12 acres of whitebark pine (*Pinus albicaulis*) habitat within the burned area. The probability of damage or loss is considered **possible**, as the seed bank and existing trees may have been affected. The magnitude of consequences is **minor**, this represents approximately 3% of the total known acreage of the whitebark pine stand within that area, there are no known invasive plant infestations, and the fire severity through this habitat type was primarily very low to unburned. Natural recovery of whitebark pine habitat is expected. The resulting risk is **low.**

- BAER funds are NOT requested to treat these risks. Natural Recovery is recommended.

- *Threatened and Endangered Species, (Lahontan Cutthroat Trout)*
  Potential impacts to LCT populations include habitat degradation in the East and West Fork of the Carson River from increased sedimentation and erosion into occupied habitat. The probability of damage or loss is **possible**, because much of the riparian vegetation along the East Fork LCT occupied stretch of river was burned leaving minimal riparian buffer between the burn area and the Carson river. Potential for sediment flow is high. West Fork occupied populations had some unburned riparian buffer between the burn area and the occupied habitat which may help reduce effects from erosion. Nevertheless, increase in sedimentation, flooding, and debris flows is expected. The magnitude of consequences is **moderate.** Approximately 0.78 miles of occupied LCT habitat occurs within the East Fork of the Carson River. Burn severity along this stretch was mostly moderate. Approximately 0.078 miles of occupied LCT habitat occurs within the West fork of the Carson River. Burn severity along this stretch is mostly low. Local impacts include reduced habitat quality for LCT from increased sediment flow directly into the river as well as from tributaries affected by the fire. The resulting risk is **low.**
  - BAER funds are NOT requested to treat these risks. Natural Recovery is recommended.

- *Threatened and Endangered Species,* (*Sierra Nevada yellow-legged frog*)
  Potential impacts to Sierra Nevada yellow-legged frog (SNYLF) include degradation to designated critical habitat. Approximately 68 acres of critical habitat for SNYLF burned in the Tamarack Fire. Most of the acres burned at low to moderate intensity. The probability of damage or loss is **possible** due to fire burning through a mosaic of vegetation types at varying intensities within designated critical habitat. The magnitude of consequence is **low.** No known occupied habitat was burned**.** The majority of acres burned at low to moderate intensity with 10 of the 68 acres remaining unburned. This area represents a very small percentage of the 49,625 acres of critical habitat that occurs on the Humboldt Toiyabe National Forest and does not pose a threat to the viability of local populations while the habitat recovers. The resulting risk is **low**.
  - BAER funds are NOT requested to treat these risks. Natural Recovery is recommended.

- *Threatened and Endangered Species, (Sierra Nevada Red Fox)*
  The Sierra Nevada Distinct Population Segment (DPS) of the Sierra Nevada red fox was recently listed as an endangered species under the Endangered Species Act. The official listing will take effect on Sept 2, 2021. Impacts from the fire to the Sierra Nevada red fox (SNRF) likely include some direct impacts to the species and indirect impacts to habitat. The probability of damage or loss is **possible** as it is assumed that some level of disruption to dispersal, foraging and possibly range expansion will occur until vegetation recovers. The magnitude of consequences is **moderate.** Approximately 15,282 acres of habitat within the known distributional range of the SNRF (Sierra Nevada DPS) occurs within the fire perimeter. The majority of acres burned at low to moderate intensity. Acres burned at moderate and high intensities may result in longer term impacts to foraging capabilities for the SNRF, particularly at the higher elevation habitats which SNRF typically prefer. Soil stabilization treatments such as lop and scattering of tree and brush debris may improve habitat for rodents resulting in increased foraging opportunities for SNRF. The resulting risk is **low**.
  - BAER funds are NOT requested to treat these risks. Natural Recovery is recommended.

4. Cultural and Heritage Resources:

- *Unauthorized artifact collection.* There is a threat of loss of historic context and contents due to unauthorized artifact collection at cultural resources eligible or potentially eligible for listing in the National Register of Historic Places (NRHP). The probability of damage or loss is **possible**, because archaeological and historic sites are vulnerable to metal detectorists and artifact collectors in the area. The fire has exposed several known significant historic sites and 63 other known cultural sites. This exposure makes artifacts and features susceptible to damage from unauthorized collection. The magnitude of consequences is **moderate**. In most cases, damage to cultural resource sites represents an irretrievable loss of traces of the past. Cultural resources are non-renewable. Removed artifacts from historic contexts degrade the meaning of historic sites and features and their potential to provide important information about the past to this and future generations. The nature of unauthorized collection means that impacts resulting in total irretrievable loss of a site or feature are expected but unpredictable and also are likely to occur over time. A moderate consequence rating appropriately addresses the likelihood of these types of damage based on their nature and potential for significant impact. The resulting risk is **Intermediate.**

    - BAER funds are requested to treat these risks (*Treatments CR-1 and CR-2*).

- *Erosion and sedimentation.* There is a threat to the cultural resources eligible or potentially eligible from listing in the NRHP from increased runoff, erosion, and debris flows. The probability of damage or loss is **likely**. Field observation and burn severity models reflect many areas within the fire perimeter are at risk of erosion/sedimentation due to vegetation loss and landscape position. Landscape variables and observed past erosion support the likely probability (50-89%) of damage to cultural resources that, while it may not result in large scale obliteration of all sites within the fire area, could damage certain features and destroy the context of certain site types. The magnitude of consequences is **moderate**. In most cases, damage to cultural resource sites represents an irretrievable loss of traces of the past. Cultural resources are non-renewable. The remaining integrity of cultural resources is at risk from increased post-fire erosion and would represent damage to critical resources with considerable and long-term effects. The resulting risk is **high.**

    - BAER funds are requested to treat these risks (*Treatments CR-2*).

BAER recommendations include that cultural resources on adjacent lands managed by the BLM, BIA, and California State Parks.

B. Emergency Treatment Objectives:

- Mitigate and protect, to the extent possible, threats to personal injury or human life of forest visitors and Forest Service employees by raising awareness through posting hazard warning signs on roads and trails, reinforcing road and trail tread, improving road and trail drainage and stream crossings, and communicate hazard of flooding, and debris flows. Communicate to cooperating agencies and community groups.

- Protect or minimize damage to NFS investments in roads and trail infrastructure by installing drainage features capable of withstanding potential increased stream flows and/or debris flows. Minimize damage to key NFS travel routes.

- Protect or mitigate potential post-fire impacts to critical cultural resources within the burned area.

- Treat invasive plants that are a threat to native and naturalized ecosystems by minimizing the expansion of existing populations in the burned area and control of expected invasion of noxious weeds within and adjacent to the area where soils/vegetation was disturbed as a result of the fire and fire suppression activities.

- Assist cooperators, other local, State, and Federal agencies with the interpretation of the assessment findings to identify potential post-fire impacts to communities and residences, domestic water supplies, public utilities and other infrastructure.

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

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

*EDRR treatments would be conducted in the spring/summer 2022.

D. Probability of Treatment Success

Probability of Treatment Success

	1 year after treatment	3 years after treatment	5 years after treatment
Land	80	50	35
Channel	N/A	N/A	N/A
Roads/Trails	75	90	100
Protection/Safety	85	95	100

E. Cost of No-Action (Including Loss):

Human Health and Safety: Human Life and Safety do not have a market value, but an injury would exceed $1,000,000, providing a substantial benefit/cost ratio.

Property: The cost to rebuild sections of the road after they are washed out, eroded, or buried includes estimates to bring in material to build up the damaged roads. The cost of not restoring the proposed 35.2 miles of road is approximately $736,069, providing at least a 2.8 benefit/cost ratio. This does not include the lost value to project management, fire suppression, and recreation.

Likewise, there has been substantial investment into the trail network damaged by the Fire. The Forest maintains the trail network annually, and the recreation economy is a big driver for Alpine County. The cost of not fixing the proposed 3.79 miles of trail is 120,500 (including 25% loss, value is 90,375), representing at least 7% benefit/cost ratio.

Infrastructure would be protected at 19 camp sites in Crystal Spring Campground. The campground is well maintained hosting $13,1600 infrastructure. Assuming a 50% loss, the resulting value is 65,800 resulting in 23% saving in implementing stabilization actions.

Land Treatments - Native and Naturalized Plant Communities: Approximately $549,321. As such, the benefit/cost ratio exceeds 17%, (considering loss).

Cultural and Heritage Resources: Economic values can not be placed on the loss of cultural and heritage resources. The cultural or historic resource at risk is eligible, or potentially eligible, for listing on the National Register of Historic Places (NRHP). Delaying emergency treatment could permanently remove the cultural significance of sites.

F. Cost of Selected Alternative (Including Loss):

Human Health and Safety Treatments:

"Entering Burned Area" signs are needed to alert the public of possible threats to their life and safety that exist within or downstream of a burned area. The signs contain language specifying items to be aware of when entering a burn area such as falling trees and limbs, rolling rocks, and flash floods. Signs are placed in entry points that are expected to receive high use, either around residential areas or popular roads used for recreation.

PS-1 Hazard Warning Signs Cost Estimate.

Item	Unit	Unit cost	# of units	Total Cost
Hazard Warning Signs (Roads)	Each	$11	18	$198
Hazard Warning Signs (Trails)	Each	$11	4	$44
T-Posts and Hardware	Each	$10	22	220
Materials and Supplies		$50	1	50
GS 09 Rec. Specialist OT wage	Day	$338	3	1,014
Vehicle mileage	Mile	$0.60	200	120
Total Cost:				**$1,646**

PS-2 Campground Mitigations

Item	Unit	Unit cost	# of units	Total Cost
Hazard Warning Signs (Included in PS-1)		$0	0	**$0**
Place Boulders at side of Gates to restrict vehicle access.	Boulders	750	2	**1,500**
Total Cost:				**$1,500**

PS-3 Hazard Tree Removal at Trail and Work Areas Cost Estimate

Item	Unit	Unit cost	# of units	Total Cost
Hazard Tree Falling Crew	days	$1000	4	**$4,000**

Property:

NFS Road Treatments

RD-1 Road Treatments for Property			Storm Proofing	Storm Inspection and Response	Excavate Catch Basin	Drainage Dip	Culvert Removal	Armored Relief/Critical/Drain Dip	Fill Slope Armoring	
NFSR	Total Cost	Miles	mi	mi	ea	ea	ea	ea	ea	Cost/Mile
31071 - Spratt Creek	$ 16,645	1.9	1.9	1.9		13		1	2	$ 8,761
31094 - Pleasant Valley	$ 16,230	1.8	1.8	1.8	8	6		3		$ 9,017
31040 - Indian Creek	$ 18,339	2.4	2.4	2.4	2	19				$ 7,705
31040A - Poor Boy	$ 750	1.5					1			$ 517
31310 - Cottonwood Canyon	$ 19,850	8.3				30				$ 2,403
31052 - Leviathan Road	$ 19,050	14.9	5.8	5.8	17					$ 1,277
42784 - Electronic Site	$ 35,203	4.5	4.5	4.5	17	21		3		$ 7,893
		35.2	**16.3**	**16.3**	**44**	**89**	**1**	**7**	**2**	
Roads Treatment TOTAL (Property Only)	$ 123,267.00									
Implementation		Days	Cost							
GS-9 Overtime (Engineer)	$ 490.00	10.0	$ 4,900.00							
GS-11 Overtime (Engineer)	$ 560.00	5.0	$ 2,800.00							
GS-11 Overtime (Arch) for Section 106 (e.g., consultation, reporting, etc.).	$500.00	4.0	$2,000.00							
GS-09 Overtime (Arch) for Section 106 (e.g., consultation, reporting, etc.).	$350.00	5.0	$1,750.00							
Salary Total			$ 11,450.00							
Road Treatments Grand TOTAL			**$ 134,717.00**							

TR-1 NFS Trail Treatments

Item	Unit	Unit cost	# of units	Total Cost

5 Person Trail Crew	Day	$875	12	**$10,500**
GS 09 Rec. Specialist OT wage	Day	$338	6	$**2028**
Vehicle mileage	Mile	$0.60	540	$324
One GS-11 @ $500/day (OT Rate) x 1 days for Section 106 (e.g., consultation, reporting, etc.).	Day	$500	1	$500
One GS-9 (Archaeologist) @ $350/day (OT Rate) x 2 days for Section 106 (e.g., reporting, data entry, implementation monitoring, etc.).	Day	$350	2	$700
Total Cost:				**$14,052**

CG-1 Campgrounds Stabilization

Item	Unit	Unit cost	# of units	Total Cost
Remove Campground Infrastructure (Tables and Bear Boxes)	sites	335	19	**$5,016**
Install K-Rails around bathrooms	2	4500	2	**$9,000**
GS 09 Rec. Specialist OT wage	Day	$338	4	$**1352**
Vehicle mileage	Mile	$0.60	100	**$144**
Total Cost:				**$15,512**

Project Implementation (Roads, Trails and Campgrounds)- Through Incident

Item	Unit	Unit cost	# of units	Total Cost
Implementation Lead (Salary, OT &Travel)	Days	$1,286	14	**$18,000**
Engineer (Salary, OT &Travel)	Days	$1,286	14	**$18,000**
Engineer (Salary, OT &Travel)	Days	$1,000	14	**$14,000**
Total Cost:				**$50,000**

Native and Naturalized Plant Communities:

Total cost of treating 45 acres of dozer lines, hand lines, drop point, spike camps, and helispots related to suppression repair activities is $5,785.72. Costs associated with EDRR on 188 acres of moderate-to-high severity burn areas near known vector corridors and existing infestations is $24,214.32. Costs associated with the installation of Boot Brush Stations at two trailheads within the burned area to minimize weed introduction is $2,304.40, for a total cost of **$32,304**.

LD 1 - Suppression Repair EDRR

Item	Unit	Unit Cost	# of Units	Cost
Botany / Weeds Technician (Salary, OT & Travel)	days	$1,071.43	2.46	$2,640
Botany / Weeds Technician (Salary, OT & Travel)	days	$1,071.43	2.46	$2,640
Total Treatment Costs:				**$5,280**

LD 2- BAER-Specific EDRR

Item	Unit	Unit Cost	# of Units	Cost
Botany / Weeds Technician (Salary, OT & Travel)	days	$1,071.43	11.54	$12,364
Botany / Weeds Technician (Salary, OT & Travel)	days	$1,071.43	11.54	$12,364
Total Treatment Costs:				**$24,728**

LD 3- Boot brushes at two trailheads

Item	Unit	Unit Cost	# of Units	Cost
Boot Brush Station w/ Interpretive Panel	station	$625	2	$1,250
Wooden posts, bases and hardware	installation	$60	2	$120
GS-5 Recreation Technician Overtime	day	$200	2	$400
GS-5 Recreation Technician Overtime	day	$200	2	$400
Vehicle mileage	mile	$0.60	224	$134
Total Treatment Costs:				**$2,304**

Cultural and Heritage Resources:

Total Cultural and Heritage Resource Protection Costs: **$10,500**

CR-1 Heritage Protection Signs

Personnel Services:	**Cost**
One GS-09 @ $350/day (OT Rate) x 3 days	$1,050
Materials and Supplies:	
Staple gun, and staples, for up to 20 signs	$70
Travel Cost:	
Use Rate of $0.44/mile @ 500 miles	$ 220
Total Treatment Costs:	**$1,340**

CR-2 Cultural Resource Inspections/Patrols

Personnel Services:	**Cost**
One GS-11 (Archaeologist) @ $500/day (OT Rate) x 5 days	$5,000
One GS-9 (Arch.) @ $350/day (OT Rate) x 10 days	$3,500
Travel Cost:	
Use Rate of $0.44/mile @ 1500 miles (150 miles/day)	$660
Total Treatment Costs:	**$9,160**

F. Skills Represented on Burned-Area Survey Team:

☒ Soils ☒ Hydrology ☒ Engineering ☒ GIS ☒ Archaeology
☒ Weeds ☒ Recreation/Trails ☒ Fisheries ☒ Wildlife
☒ Interagency Coordination

Team Leader(s): Kendal Young & Brian Hansen
Email: kendal.young@usda.gov **Phone(s)** Cell: 775-276-4659
Email: brian.c.hansen@usda.gov **Phone(s)** Cell: 775-224-9960

Forest BAER Coordinator: Dirk Netz
Email: dirk.netz@usda.gov **Phone(s):** 775-340-8505

Team Members: *BAER Team Members by Skill*

Skill	Team Member Name
Team Lead(s)	Kendal Young Brian Hansen
Soils	Eric Nicita
Hydrology	Brendan Waterman
Geology	Rebecca Biglow
Engineering	Aaron Lamp
GIS	Allison Bruner, Mariah Blackhorse
Archaeology	Kalie Crews
Botany/Weeds	Tim Kellison, Sierra Sampson (T)
Recreation	Garret Nuzo-Jones (T)
Wildlife	Maureen Easton
Interagency Coordinating	Annabelle Monti, Karen Kuentz, Dirk Netz

Treatment Narrative:

Human Health and Safety:

Entering Burn Area Warning Signs (22)

"Entering Burned Area" signs are needed to alert the public of possible threats to their life and safety that exist within or downstream of a burned area. The signs contain language specifying items to be aware of when entering a burn area such as falling trees and limbs, rolling rocks, and flash floods. Signs are placed in entry points that are expected to receive high use, either around residential areas or popular roads used for recreation. Signs will be attached to t-posts and removed once hazards are mitigated.

Hazard Trees Removal

For trail and road treatments, remove hazard trees/logs within treatment work areas associated with erosion stabilization and at trailheads.

Campground Treatments: (Crystal Springs and Markleeville).

Crystal Springs will be closed by closing the entry gate into the campground. Boulders may be placed on the side of the posts to ensure motorized traffic does not drive around the gate. Warning signs will also be posted. Sites close to the flood plain in Markleeville campground will be posted as Day Use Only.

Property:

Roads Treatments:

Treatments considered for the transportation system include natural recovery, road closures, road drainage structures, reshaping the crown of the road, preparing ditches for increased runoff, culvert cleaning, and fillslope armoring. Road treatments are recommended for *NFSR 31071 Spratt Creek, 31094 Pleasant Valley, 31040 Indian Creek, 31040A Poor Boy, 31052 Leviathan, 31310 Cottonwood Canyon, 42784 Electronic Site.* Natural recovery is used as a treatment the remainder of roads.

Trail Treatments: Storm proof trail system in high and moderate burn severity classes where slopes can concentrate runoff onto the trail prism. Storm proofing includes creating run off ditches, water bars and removing side bars where needed.

Campground Treatments: Removing tables and bear boxes at 19 camp sites and placing temporary concrete barriers around the bathrooms to protect them from rockfall.

Land Treatments:

Native and Naturalized Plant Communities: EDRR surveys on 233 acres of HTNF lands based on values at risk, current infestation sizes, and areas that were disturbed by suppression activities, resulting in unacceptable risks to

natural resources. The weed risk to native plant community recovery can be mitigated at low cost by implementing EDRR within the first year after the fire. New, small weed infestations located during EDRR surveys will be manually treated upon discovery. Existing infestations found to be expanding due to the fire or fire suppression activities would be re-mapped and evaluated for treatment. Installation of two Boot Brush Stations, one at Thornburg Canyon Trailhead and one at Charity Valley East Trailhead, both of which are located within the fire perimeter and provide trail access into areas affected by the fire. These Boot Brush Stations will reduce the potential for recreational users and FS personnel of transporting weeds into burned areas where the recently disturbed habitat is highly susceptible to weed invasion; moreover, these stations will reinforce the effectiveness of the proposed EDRR surveys.

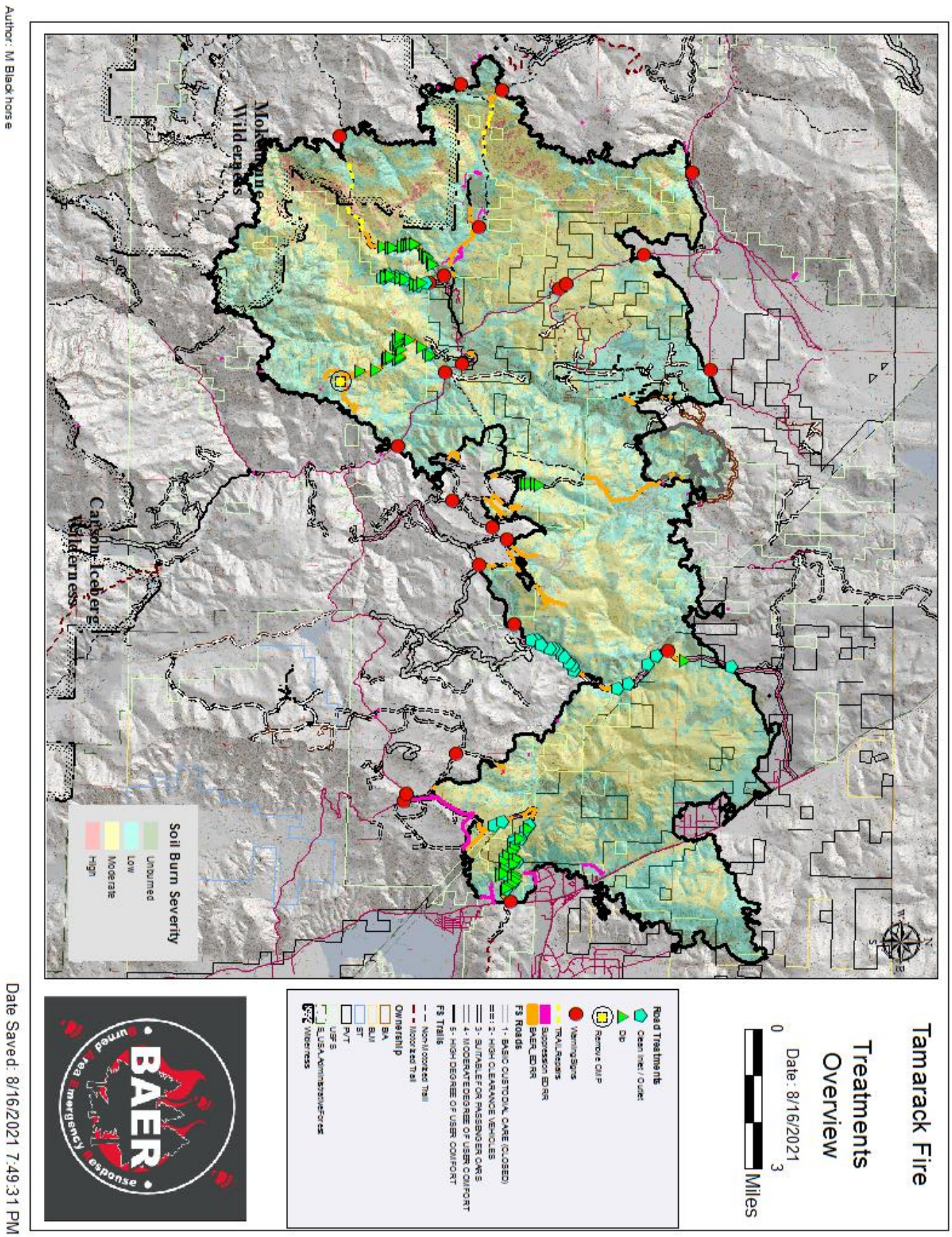
Cultural Resource Stabilization: Place heritage protection signs near locally known cultural sites to mitigate adverse effects to cultural resources. Signs may be fiberglass, ground driven posts with 3x4 decals. Cultural resources of particular concern are the 10 sites specifically addressed in this assessment; however, there are numerous other cultural resources potentially eligible for listing in the NRHP within the fire area. Site visits would occur to document changes to the site in terms of artifact and feature composition that indicate archaeological looting, runoff, and flash flooding is occurring and could affect site integrity. The results of visits will be used to determine if additional management action is required to protect these sites. These visits may be designed to incorporate tribal consultation to address specific tribal values in the fire area. Emergency stabilization activities implemented to manage risk to any BAER Critical Values require consideration, avoidance or mitigation of potential effects to cultural resources prior to implementation (FSM 2523.2.2.d; Section 106 of the National Historic Preservation Act (NHPA) as implemented with programmatic agreements or standard procedures under 36CFR800). BAER treatments are not exempt from Section 106 of NHPA. One of the first requirements for BAER team Heritage personnel is to address the provisions of 36CFR800.12. These provisions are designed to enable NHPA compliance to proceed and be completed in an expedited fashion.

The costs for compliance with Section 106 of the National Historic Preservation Act can be covered for all authorized treatments. Section 106 compliance includes the minimum required documentation to implement the approved treatments. Although BAER treatments are considered “emergency undertakings” according to the provisions of the National Historic Preservation Act [36CFR800.12(d)], a reasonable effort shall be made to inventory ground-disturbing project areas for previously unknown cultural resources. Impacts to cultural resources shall be avoided whenever possible.

Channel Treatments: None

I. Monitoring Narrative: N/A

Tamarack BAER Treatment Map



PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

			NFS Lands			Other Lands				All
		Unit	# of		Other	# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	BAER $	$	units	$	Units	$	$
A. Land Treatments										
LD-1 EDRR - Suppression	Project			5,280	0		0		0	$ 5,280
LD-2 EDRR- Non-Suppression	Project			24,728	0		0		0	$ 24,728
LD-3 Boot Brushes (Wilderness)	Project			2,304	0		0		0	$ 2,304
CR-1 Heritage Protection Signs	Project			1,340	0		0		0	$ 1,340
CR-2 Cultural Site Inspection	Project			9,160	0		0		0	$ 9,160
					0		0		0	$ -
Subtotal Land Treatments				42,812	0		0		0	$ 42,812
B. Channel Treatments										
				-	0		0		0	$0
Subtotal Channel Treatments				-	0		0		0	$0
C. Road and Trails										
RD-1 Road Stabilization	Project		1	134,717	0		0		0	$134,717
CG-1 Campground Stabilization	Project		1	15,512						
TR-1 Trail Stabilization	Project		3	14,052	0		0		0	$14,052
Project Implementation				50,000						
Subtotal Road and Trails				214,281	0		0		0	$148,769
D. Protection/Safety										
PS-1 Hazard Warning (R&T)	Project			1,646	0		0		0	$1,646
PS-2 Campground Mitigations	Project			1,500	0		0		0	$1,500
PS-3 Hazard Tree Removal	Project			4,000	0		0		0	$4,000
Subtotal Protection/Safety				7,146	0		0		0	$7,146
E. BAER Evaluation										
Initial Assessment	Report			127,990	0		0		0	$127,990
Subtotal Evaluation				127,990	0		0		0	$127,990
F. Monitoring										
Subtotal Monitoring				-	0		0		0	$0
G. Totals				264,239	0		**0**		**0**	**$198,727**
Previously approved										

PART VII - APPROVALS

1. WILLIAM DUNKELBERGER Digitally signed by WILLIAM DUNKELBERGER Date: 2021.08.18 17:17:18 -07'00'

Forest Supervisor Date