# SACATA FIRE BURNED-AREA REPORT
(Reference FSH 2509.13)

## PART I - TYPE OF REQUEST

The Sacata Fire 2018

**A. Type of Report**

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

**B. Type of Action**

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

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

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

## PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Sacata Fire

B. Fire Number: CA-SNF-002370

C. State: CA

D. County: FRESNO

E. Region: 5

F. Forest: Sierra

G. Districts: High Sierra Management Unit

H. Fire Incident Job Code: P5KR48

I. Date Fire Started: October 11, 2016

J. Date Fire Contained: June 25, 2015

K. Suppression Cost: 3.45 million

L. Fire Suppression Damages Repaired with Suppression Funds

Sacata 1. Dozerline repaired / waterbarred: 7 miles
2. Hand line repaired: 3 miles
3. Hand line still needing repair: 0 miles

M. Watershed Number and Name:

Sacata = 1803001008 Pine Flat Reservoir-Kings River

N. Total Acres Burned:

Sacata: 2,100

NFS Acres (2,100), Private (0)

O. **Vegetation Types:**
Tall dry grass, brush, oak (grass and understory) woodland.

P. **Dominant soils: Coarsegold and Auberry**

Q. **Geologic Types:** Schist: 2,092 acres and Granodiorite: 7 acres

R. **Miles of Stream Channels by Order or Class:**

172 miles of stream potentially impacted (perennial, intermittent, and ephemeral systems)
49 miles of stream (within fire perimeter) includes perennial, intermittent, and ephemeral systems)

S. **Transportation System:**

Sacata: Trails: 0 miles Roads: 2.07 FS miles

## PART III - WATERSHED CONDITION

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

| EHR | ACRES | % of the Burned area |
|---|---|---|
| Low | 7 | 0.33% |
| Moderate | 2,092 | 99.67% |

### Soils

Soils surveys are used to analyze various soil characteristics e.g., soil type, texture, and rock content. The Sierra National Forest Area Survey (CA750) (Ginger 1993). Within the burned area there are a total of 3 soil map units, see Table 1 for a complete list.

**Table 1: Sacata Fire BAER soil map units**

| Soil Map Unit | Soil Map Unit Name | Acres |
|---|---|---|
| 108 | Auberry Family, 35 to 65 Percent Slopes | 7 |
| 127 | Coarsegold-Auberry Families Association, 35 to 65 Percent Slopes | 1,904 |
| 128 | Coarsegold-Auberry Families-Rock Outcrop Association, 35 to 65 Percent Slopes | 188 |

The soils families in order of dominance within the burned area included the Coarsegold and Auberry soil families, see

Table 2. Soil survey data was compared with data collected within the burned area and site-specific observations to generate interpretations of fire effects upon known (visited) soils, and extrapolate interpretations for unvisited areas. This information provided basic soil characteristics for predicting post fire effects on soil productivity and erosion potential.

**Table 2: Sacata BAER top five dominant soil families**

| Soil Family | Acres | % Burned area |
|---|---|---|
| Coarsegold | 2,092 | 99.67% |
| Auberry | 7 | 0.33% |

## Soil Erosion Hazard Rating

In order to assess the potential risk of a given soil to erode, the erosion hazard rating system was developed within Region-5 of the United States Forest Service, Soil and Water Conservation Handbook (FSH 2505.22). The erosion hazard rating system is designed to assess the relative risk of accelerated sheet and rill erosion processes only, and was developed primarily for land use activities such as agriculture or logging. The rating system is based on soil texture, depth, clay content, infiltration, rock fragments, effective surface cover, slope gradient, and climate (USDA Forest Service 1990). Risk ratings range from low to very high, low ratings imply a low probability of surface erosion occurring. Moderate ratings indicate accelerated erosion is likely to occur in most years and water quality impacts may occur for the upper part of the moderate numerical range. High to very high ratings signify accelerated erosion is likely to occur in most years and that erosion control measures should be evaluated. For BAER purposes, fire induced changes to soil infiltration, ground cover, and runoff from adjacent areas can be factored in to determine changes in erosion hazard by soil burn severity classes. To develop the erosion hazard ratings for the soils in the burned area, soil map units were evaluated using information relevant to texture, rock content, slope gradient, and characteristics relating to infiltration, permeability, and depth of the soil. Erosion hazard ratings were calculated for each soil map unit with soil burn severity characteristics also factored in. Ratings thus represent a summary of soil physical characteristics, slope gradient, soil cover present, and level of hydrophobicity (water repellency) as observed in the field. Table 3 displays the erosion hazard ratings accessed within the burned area.

**Table 3: Sacata Fire BAER soil erosion hazard ratings**

| EHR | ACRES | % of the Burned area |
|---|---|---|
| Low | 7 | 0.33% |
| Moderate | 2,092 | 99.67% |

## Erosion Response Estimated

Hydrologic soil groups are a standard soil-survey index of potential runoff response and subsequent erosion, this grouping is designated regardless of fire effects of soil characteristic used to classify each group. The associated value is used to determine the associated runoff curve number and is used to make direct estimates of runoff from rainfall (see Hydrology Report for more information). Hydrologic soil Group A have high infiltration rates even when thoroughly wetted, consisting chiefly of deep, well to excessively drained sands and/or gravel. Group B soils have moderate infiltration rates when thoroughly wetted, consisting chiefly of moderately deep to deep, moderately well to well drained soils, with moderately fine to moderately coarse textures. Group C soils have slow infiltration rates when thoroughly wetted, consisting chiefly of soils with a layer that impedes the downward movement of water or soils with moderately fine to fine textures with a slow infiltration rate. Group D soils have very slow infiltrations rates when thoroughly wetted, consisting chiefly of shallow soils over nearly impervious materials. Determinations are not made for miscellaneous land types such as riverwash or rock outcrop. Table 4 displays the total number of acres for each group.

Photo 1: Low soil burn severity

Table 4: Sacata Fire BAER hydrologic soil groups

| Soil Hydrologic Group | Acres | % of Burned area |
|---|---|---|
| B | 7 | 0.33% |
| C | 2,092 | 99.67% |

## Post-Fire Condition Assessment

The need for rapid assessment and mapping of soil burn severity is essential to identifying areas of potential hazards caused by flooding or erosion to human and biological resources. Factors such as soil type, slope, and hydrologic characteristics are important components in identifying risk and risk management.

It should be understood that soil burn severity is NOT vegetative burn severity or mortality; vegetative burn severity is but one component taken into consideration. Soil burn severity goes beyond above-ground vegetation impacts to below-ground soil heating effects and associated impacts to soil. See Figure 1 for a visual representation showing the difference between above-ground and below-ground impacts. Hydrologic function, runoff, and erosion potential are influenced by pre-fire, fire, and post-fire environments. Soil burn severity includes careful consideration of factors such as, amount and condition of residual ground cover, viability of native seed banks, condition of residual fine roots, degree of fire-induced water-repellency, soil physical factors (texture, structural stability, porosity, restricted drainage), soil chemical factors (oxidation, altered nutrient status), and topography (slope gradient, length, and profile), and the length of time heat from the fire has been in contact with the soil (residence time). This differs from above-ground vegetation impacts as it is, more related to peak temperatures and fire behavior during the fire.
Understanding these factors that influence soil burn severity is an integral part in meeting the objectives of the BAER assessment. A high intensity fire (high flame lengths, rapid rate of spread, crown fire, etc.) in a stand-replacement event can result in a moderate (or even low) soil burn severity, if the residence time is short and soil characteristics are not altered significantly. Conversely, a slow-moving fire with long residence times and complete consumption of accumulated surface fuels can have negative consequences to soils and streams. Soil burn severity, used in this context, is a much better index of soil productivity, vegetative recovery, and overall watershed response in the post-fire environment.

**Soil Burn Severity**

Soil burn severity indicators (Parsons et al 2010) were used to characterize the soil burn severity during the initial helicopter recon and at field data points. Since the fire was relatively small and most of the burned area appeared to have burned at a low soil burn severity, an initial BARC image wasn't acquired for this fire.

Only a low soil burn severity was observed throughout the burned area with sparse areas of higher severities not large enough to be properly mapped, see Photo 1 for a visual representation of the conditions observed in the field. Minimal evidence of significant soil heating was observed. Very little vegetative consumption occurred throughout the burned area leaving a charred look in patches, all of

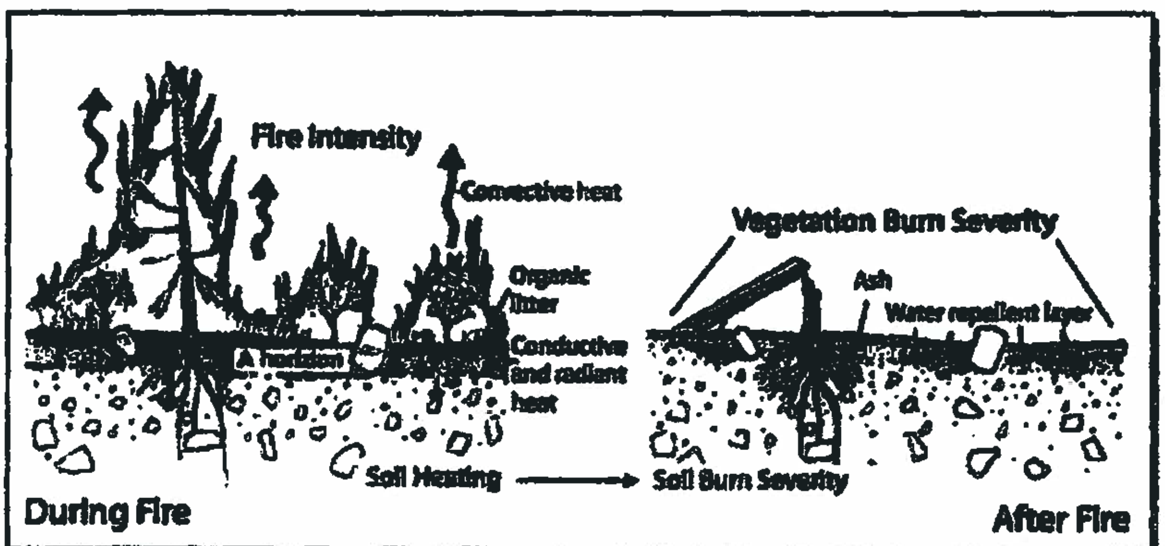


Figure 1: Effects of fire intensity on above-ground vegetation and below-ground soil properties (Parsons et al 2010)

the pre-fire canopy was still intact. Ground cover was recognizable with little to no effective cover loss. Ash was generally white to black in areas of total consumption. Very little organic matter was consumed resulting in an unaltered soil texture, very fine roots were still present in the upper soil profiles. Water repellency was low to non-existent. The seed source within these areas would still be present in most of the topsoil and natural understory revegetation is expected to progress without delay.

**Estimated Erosion Response**

Quantitative erosion figures were estimated using the Erosion Risk Management Tool (ERMiT) batch model. ERMiT is a Water Erosion Prediction Project (WEPP-based application developed by USFS Rocky Mountain Research Station USFS, RMRS-GTR-188, 2007) specifically for use with post-fire erosion modeling. The model estimates only sheet and rill erosion, which occurs when rainfall exceeds infiltration rates, and surface runoff entrains surface soil particles. The model does not account for shallow landslides or gullying, stream-bank erosion, road effects, or fire-line erosion and gullying, which could present large additional sources of sediment entering the fluvial systems.
ERMiT models erosion potential based on single hillslopes, single-storm "runoff events," and post-fire soil burn severity. Hillslopes include soil and topography inputs. Soil inputs include texture and matrix rock content, which was based upon soil map unit information and field verified in many areas of the fire as part of the assessment. Generalized hillslope gradients and profiles were developed in GIS by soil map unit, and soil burn severity class to account for fairly site specific differences in topography.
Various storm runoff-event magnitudes may be chosen in ERMiT for erosion response estimates; 2-year, 5-year, and 10-year events were run for this analysis. ERMiT uses the PRISM module to generate climatic input parameters; a customized climate interpolated for Fresno, CA was generated for the burned area to account for the variations in precipitation across the burned area.
Results of soil erosion modeling are reported for the entire burned area in both a burned and unburned condition, see Table 5. The reported values are in total tons and tons per acre for the entire burned area as a whole. To help picture what a 1,000 tons of sediment might look like consider roughly 120 standard 10 cubic yard dump trucks filled.

**Table 5: Sacata Fire BAER ERMiT batch results**

| Modeled Area | 2 Year Storm (50%) | | 5 Year Storm (20%) | | 10 Year Storm (10%) | |
|---|---|---|---|---|---|---|
| | Average Sediment Delivery (Tons/Acre) | Total Sediment (Tons) | Average Sediment Delivery (Tons/Acre) | Total Sediment (Tons) | Average Sediment Delivery (Tons/Acre) | Total Sediment (Tons) |
| Sacata Fire - Unburned | 0.04 | 69 | 0.14 | 233 | 0.22 | 332 |
| Sacata Fire - Burned | 1.88 | 3,861 | 3.86 | 8,524 | 5.06 | 11,050 |

A 2-year storm event was modeled in ERMiT to determine if the estimated soil erosion for the burned area would affect soil productivity. The modeled 2-year event (50% probability) produced 3,861 tons of sediment equivalent to 1.88 Tons/Acre or 872 Cubic Yards/Square Mile (using a conversion factor of 1.35 tons per cubic yard). The unburned, pre-fire conditions 2 year storm modeled a total of 69 tons of sediment equivalent to 0.04 Tons/Acre or 16 Cubic Yards/Square Mile. The stated accuracy of the model is +/- 50%.

## Values at Risk – Threats to Life, Property, and Cultural & Natural Resources

Based on the analysis done in this assessment for soil productivity the probability of damage or loss is considered to be likely, occurrence >50% to < 90%. The magnitude of consequence is considered minor; property damage is limited in economic value and/or too few investments; damage to natural or cultural resources resulting in minimal, recoverable, or localized effects. The combined probability of damage or loss and magnitude of consequence, results in a low risk for soil productivity. See **Error! Reference source not found.** the BAER Risk Assessment matrix within Appendix A.

## Emergency Determination and Treatments to Mitigate the Emergency

Specific to soil productivity for a 2-Year (50% probability storm), the burned area wide average erosion rates of 1.88 $^{Tons}/_{Acre}$ were predicted resulting in a low risk to soil productivity. Even though the burned area all burned at a low soil burn severity, there is a threat of minor sedimentation and rock fall affecting 10S69 (Dinkey Trimmer Road) due to the steep slopes found in this area. Pre-fire rock fall already occurred on the segment of road found within the burned area and now will be slightly exacerbated by the fire, monitoring the roadway during winter months and properly cleaning/maintaining the few drainage structures along this segment is recommended.

## Hydrology

Wildfires result in increased runoff and sediment yield commensurate with burn severity. Burn Area Emergency Response (BAER) teams use burn severity to estimate runoff and sediment increases resulting from fires. Adjusted design flow is the flow increase expected to occur as a result of decreased infiltration and interception following a wildfire. Sediment potential is the estimated potential sediment delivered to channels. Together these values are utilized to evaluate the need to provide an estimate of flooding and sedimentation potential to downstream values.

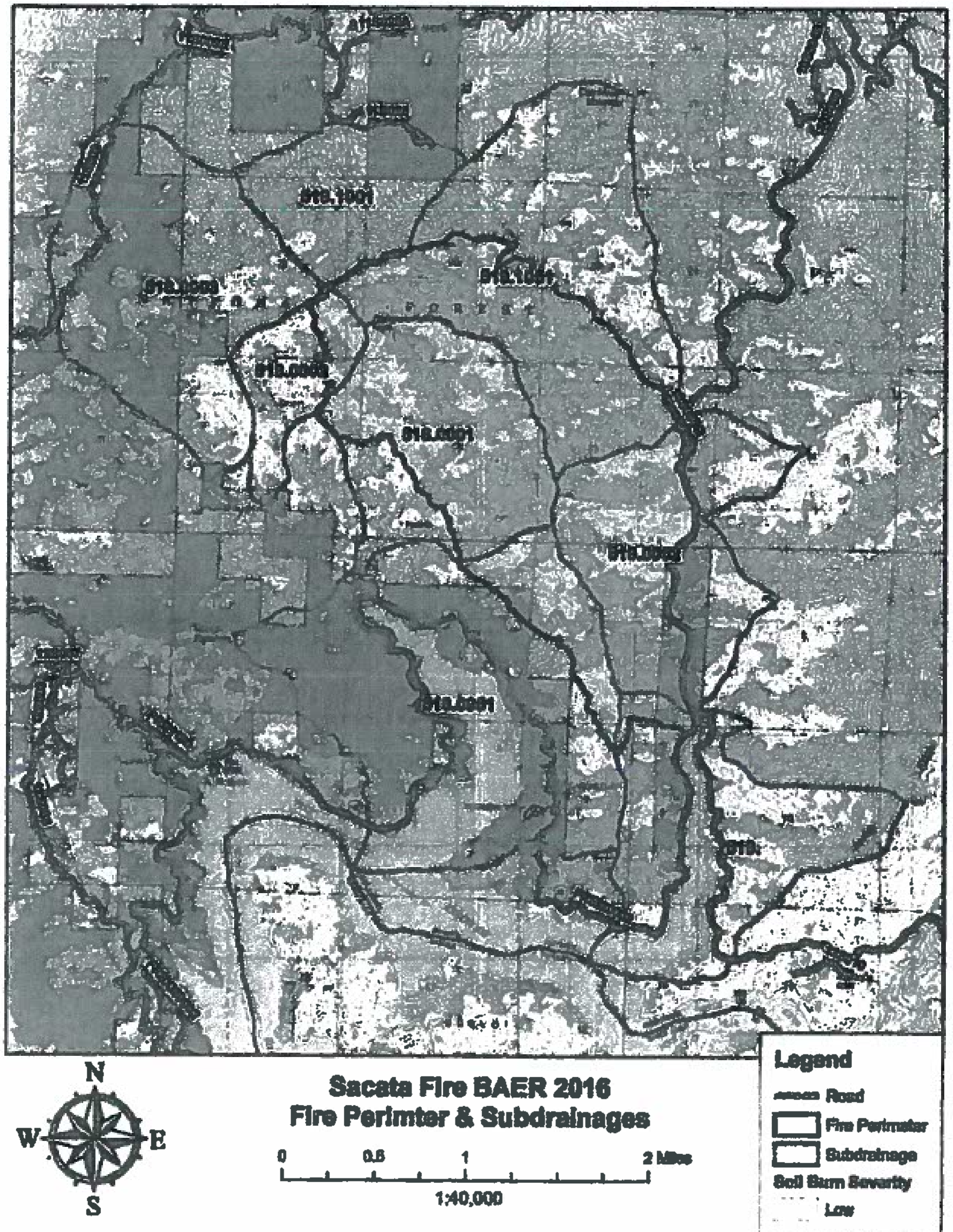
## Existing Conditions

The Sacata Fire burned within 8 subdrainages. Most stream channels are either intermittent or ephemeral flows. There are two perennial flowing channels known as Big Creek and Deep Creek, which were no longer flowing and completely dry. Only 6 subdrainages were burnt enough to potentially experience a hydrologic response. Minimal portions of the fire went beyond these 6 subdrainages. Where the fire burned beyond the 6 subdrainages, the change in flows would be insignificant and not a concern when calculating estimated flow increases. Therefore they have been dropped from the analysis. Table 1 displays each subdrainages acres and percent burned within the fire. Map 1 following the table is a visual representation of where the fire is located within the listed subdrainages.

**Table 1 – List of Subdrainages Affected by the Sacata Fire***

| Watershed Number | Unburned Acres | Burned Acres | Total Acres | Percent Burned |
|---|---|---|---|---|
| 518.0001 | 157 | 645 | 802 | 80 |
| 518.0002 | 205 | 66 | 271 | 24 |
| 518.0051 | 1492 | 231 | 1723 | 13 |
| 519.1051 | 736 | 626 | 1362 | 46 |
| 519.0052 | 370 | 481 | 851 | 56 |
| 519 | 880 | 42 | 922 | 5 |

* Acres and percent are approximate


N
W
E
S
Sacata Fire BAER 2016
Fire Perimter & Subdrainages
0 0.5 1 2 Miles
1:40,000
Legend
Road
Fire Perimeter
Subdrainage
Soil Burn Severity
Low

## Values at Risk

There are some potential values-at-risk within Forest Service land. Culverts and stream crossings associated with system road 10S69 are at risk of clogging with debris and higher flows. Potential values-at-risk exist downstream of Forest Service lands within Army Core of Engineers and private properties.

## Findings

Mapping burn severity was completed using on the ground and helicopter surveys. The BAER soil scientist finalized the soil burn severity map. Subdrainages were obtained using the Forest's HUC16 GIS layer. Table 2 lists each subdrainage, total acres, and acres by burn severity.

| Table 2 – Acres of Burn Severity from the Sacata Fire by Subdrainage* | | | | | |
|---|---|---|---|---|---|
| Subdrainage | Subwatershed Acres | Acres by Burn Severity | | | |
| | | Unburned | Low | Moderate | High |
| 518.0001 | 802 | 157 | 645 | 0 | 0 |
| 518.0002 | 271 | 205 | 66 | 0 | 0 |
| 518.0051 | 1723 | 1492 | 231 | 0 | 0 |
| 519.1051 | 1362 | 736 | 626 | 0 | 0 |
| 519.0052 | 851 | 370 | 481 | 0 | 0 |
| 519 | 922 | 880 | 42 | 0 | 0 |

Wildfires result in increased runoff with soil burn severity. The increases are calculated as adjusted design flow. Adjusted design flow is the flow increase expected to occur as a result of decreased infiltration and interception following a wildfire. The values also provide an estimate of flooding potential to near-by communities.

Adjusted design flow is calculated using the same relationships as design flow. However, runoff response is estimated by assuming an increased runoff commensurate with soil burn severity in terms of recurrence interval. This recurrence interval estimates the response of the newly burnt landscape to an average annual storm. The Sacata Fire is expected to respond to an average rainfall event, an event usually associated with the 1.2 to 1.5-year storm, differently for the low, moderate, and high severity soil burned areas. It is expected the landscape would respond as if the discharge were associated with a 2, 5, and 10-year event, respectively. This is similar to findings discovered in the neighboring Sequoia National Forest on the Kern River draiange (Kaplan-Henry, 2007). The unburned lands within the fire would respond as the unburned lands outside the fire and would have a discharge associated with the 1.2 to 1.5-year return interval. Increases in discharge associated with predicted recurrence intervals are prorated across watersheds by soil burn severity to yield post-fire discharge or the adjusted design flow. Table 3 displays estimated increases in flow by subdrainage in cubic feet per second using locally developed flood frequency discharge curves for the Kings River drainage[1].

[1] Developed using USGS gaging stations throughout the Kings River watershed. Gage stations regulating discharge were excluded due to unnatural flows (e.g. reservoir releases and maintenance flows).

| Table 3 – Estimated Increased Flow from the Sacata Fire* | | | | |
|---|---|---|---|---|
| Subdrainage | Subdrainage Acres | Pre-Fire Flows (CFS) | Post Fire Flows (CFS) | Percent Increase in Flow |
| 518.0001 | 802 | 10.6 | 18.9 | 78 |
| 518.0002 | 271 | 3.6 | 4.6 | 27 |
| 518.0051 | 1723 | 22.6 | 25.9 | 14 |
| 519.1051 | 1362 | 17.9 | 26.0 | 45 |
| 519.0052 | 851 | 11.2 | 17.6 | 57 |
| 519 | 922 | 12.6 | 12.8 | 14 |

* Acres and CFS are approximate

Table 3 is essentially stating a typical year, the annual average storm, is predicted to respond similar to a 2 year storm for low burn severity. Stream channels are expected to accommodate 2 to 5 years flows within their existing floodplains. However, increased debris flows in conjunction with stream flows could influence the flows to move out of the flood plain where applicable. If a larger and above average storm, such as a 5 year storm, arrived over the fire area, stream flows are predicted to respond more like a 10 year storm. This is an estimate based on professional judgment in conjunction with the local developed flood frequency discharge curves for the Kings River. A copy of the discharge curves has been included in the reference section of this report.

## Discussion

Post-fire runoff is expected to increase flows within and downstream of the Sacata Fire. Flows are expected to increase approximately between 14% to 78% for the 6 analyzed subdrainages. The increased CFS is calculated at the "outlet" or "bottom" each subdrainage. The other 2 subdrainages, 518.0003 and 519.1001, were not analyzed. These subdrainages were insignificantly impacted by the fire and are expected to experience minimal to no increase in CFS from the fire.

The Sacata Fire burned in an ecosystem comprising mostly of annual grasses and oak woodlands. Depending on the amount and duration of rainfall, annual grasses are expected to return within the first year. This assume normal average rainfall conditions. The result would quickly reduce the recovery time, hydrologically, of post-fire runoff from 5 years to 2 years. Due to the drought conditions, this may not occur and could still take up to 5 years to recover.

The Sacata Fire will create increase flows within and downstream of Forest Service lands by 14% to 78%. Values-at-risk identified were associated with Forest Service road 10S69. Stream channels are expected to contain the increase flows assuming a normal average storm. Therefore, no emergency treatments within Forest Service lands are recommended at this time. However, there are two recommendations to consider.

1. Informing NRCS and Army Core of Engineers regarding the predicted post-fire runoff is recommended.
2. Inform the public of potential hazards when entering into the area for up to 5 years by posting warning signs/flyers or something similar.

**Geology**

The Forest bedrock coverage shows that Coarsgold and Auberry soil families occupy all of the fire area.

## PART IV - HYDROLOGIC DESIGN FACTORS

| | |
|---|---|
| A. Estimated Vegetative Recovery Period, (years): | 2 |
| B. Design Chance of Success, (percent): | 99 |
| C. Equivalent Design Recurrence Interval, (years): | 2 |
| D. Design Storm Duration, (hours): | 6 |
| E. Design Storm Magnitude, (inches): | 0.16 |
| F. Design Flow, (cubic feet / second/ square mile): | 16.6 |
| G. Estimated Reduction in Infiltration, (percent): | 40 |
| H. Adjusted Design Flow, (cfs per square mile): | 130 |

## PART V - SUMMARY OF ANALYSIS

### A. Describe Critical Values/Resources and Threats:

**Values at Risk:**

The risk matrix below, was used to evaluate the Risk Level for each value identified during Assessment:

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

**Forest Service Roads**

Life: As a result of the burned watershed risks to life and safety of Forest visitors and personnel entering certain areas of the burn are likely and pose a moderate risk, due to potential of debris flow along roadway.

Property: Based on the hydrology and soils repords, the BAER Assessment team determined that 10S69 Road is at low/moderate risk as a result of the Sacata Fire.

Risk Assessment – Forest Service roads

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

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

**Sensitive and Invasive Plants**

Vegetation Types: Vegetation types within the Sacate burn perimiter are predominantly annual grassland, foothill chaparral, and foothill woodland (dominated by interior live oak and/or blue oak and foothill pine). South-facing slopes are dominated by herbaceaous plants. The majority of the biomass in these areas and the understory throughout the burn is composed of non-native annual grasses, though a network of diverse native species persists within this grassland. The non-native biomass is made up primarily of wild oats (*Avena* spp.) bromes (*Bromus hordeaceous, B. diandrus, B. madritensis* var. *rubens, B. tectorum*) annual fescue (*Festuca myuros*), filaree (*Erodium* spp.), and others. In the Sacate Ridge RNA, directly across Big Creek from the Sacata Fire, sampling in 1993 of similar annual grassland vegetation showed that the invasive weed tocalote (*Centaurea* melitensis) made up an average of 6 percent cover. It may be higher now in the general area, and is a weed that the Forest doesn't usually treat as it is too abundant and not as harmful as the similar yellow starthistle. In addition, Italian thistle (*Carduus* pycnocephalus) has spread dramatically within the lower Kings River canyon in the last 20 years, so both of these non-native invasives would have been present in at least part of the Sacata Fire area prior to the burn. The native species contributing most to cover in the transects were *Plagiobothrys nothofulvus, Agoseris heterophylla*, and *Amsinckia eastwoodiae*, however there are many more native herbs present in this vegetation type. Ground cover in the 3 annual grassland transects in Sacate Ridge RNA averaged 97 percent herbaceous vegetation, 2 percent bare rock, and 1 percent bare soil.

On north facing and west-facing slopes and in sheltered drainages, oak / foothill pine woodland or savannah is found in addition to foothill chaparral. All of these vegetation types have evolved with periodic fire, and especially in the chaparral there is a soil seed bank of species that only emerge after fire: either their seeds need smoke, heat, or leachate of rainwater mixed with combustion compounds to germinate. These temporally unique plants often emerge in great numbers after fire, attracting abundant and diverse pollinators, and producing large quanitites of seeds that again lie in the soil until the next fire (remaining viable for up to a century in many cases). These fire followers of of great ecological importance, providing a pulse of biological diversity that must be maintained over the long term. This phenomenon is risk when abundance non-native weeds compete with fire followers for water, nutrients, and sunlight. Over time if this continues, these fire-following plant species will be lost.

All of these vegetation types will recover promptly after a low-intensity fire: stump-sprouting shrubs like elderberry, live oak, poison oak, yerba santa, mountain mahogany; will sprout within a few weeks of being burned in many cases. Some of the common shrubs only regenerate from seed after fire: abundant seedlings of Mariposa manzanita, buck brush, chaparral whitethorn, redbud, and others to show up by early spring. Herbaceous cover will be well on its way to helping cover the soil by early spring, which is when the first survey for invasives must occur.

In summary, the vegetation in the Sacate Fire area will recover rapidly, some fire-following species are likely to respond by germinating in response to smoke or heat in great numbers, and other species should abound that are not found only after fire but respond vigorously to burning with enormous numbers of flowers (e.g tufted poppies famous for their orange displays, monkeyflowers, clarkias). The need for invasive weed surveys and control of any new invaders is urgent to conserve the integrity of functioning native vegetation, which provides habitat for wildlife, pollinating insects, fungi, and many culturally important plants as well.

There is an emergency related to native vegetation recovery and native plant diversity should invasive weeds have been introduced during fire suppression within the burned area and along fire lines outside of it. Native vegetation was identified as a Critical Value by the BAER team, as the native vegetation was largely intact and functioning prior to the fire (in the case of foothill vegetation this does include non-native annual grasses and forbs that are not invasive/noxious).

Because the vegetation of the burned area evolved with fire, and many plants benefit from fire, the concern is not that the native vegetation won't recover on its own after a low intensity fire. Rather, the concern for native vegetation recovery is that non-native weeds introduced during suppression could gain a foothold and alter the natural revegetation process that makes foothill plant communities resilient to fire (affecting future watershed and soil integrity). In summary, without impedence by newly introduced aggressive weeds, the plants of the area (which are likely already germinating and sprouting within a week of the fire) will quickly re-occupy the burned soil, along with an additional flush of plants that germinate only after fire or respond vigorously to fire from seeds or bulbs.

**Fire followers:** If invasive weeds reduce or eliminate the presence of fire-following plants like whispering bells, golden eardrops, bush poppy (which are cued to germinate by smoke), the future resilience of the vegetation in this area would be compromised. The Sacate Fire created conditions conducive to the establishment and rapid spread of invasive weeds should seeds have been introduced on fire fighting equipment, gear, vehicles, etc. As such, though the soil burn intensity was low throughout the fire; the Sacate Fire area is at risk of an irreversible impact to native vegetation recovery.

This BAER emergency for native vegetation recovery can be mitigated by surveying for, and promptly detecting and treating any newly established infestations to dramatically limit fire-related population growth. The first year is the most vulnerable, when the native plants have not yet formed full ground cover and the burned soil presents a perfect seedbed for invasive non-native weeds.

B. Emergency Treatment Objectives:

The objective of early detection surveys and immediate treatment is to reduce the potential for expansion of invasive weeds by detecting plants early in the invasion stages. Prompt eradication of new infestations allows for optimal native vegetation recovery by minimizing competition from invasive species.

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

Land __80__ % Channel __0__ % Roads __95__ % Other __90__ %

Late fall and winter precipitation would occur prior to invasive plant surveys for the most part – the optimal time for detection is spring and summer of 2017. One fall survey is possible if a warm spell follows the current storm systems moving through the area. To the extent possible, surveys and removal would be conducted before plants have the opportunity to produce seeds.

D. Probability of Treatment Success

E. Cost of No-Action (Including Loss)

If no action is taken to detect and stop the spread of invasive weeds inadvertently introduced during fire suppression, invasive weeds could establish and spread rapidly in the burned area. It is well documented that newly burned foothill slopes present ideal growing conditions for opportunistic invasive weeds. Without surveys and Early Detection / Rapid Response (EDRR) for weeds, monocultures of highly aggressive invasive plants could ultimately establish and reduce native biodiversity, reducing habitat for wildlife, reducing pollinators, and resulting in reduced soil stability and watershed integrity (some invasive weeds such as knapweeds actually make slopes more erodible that they were prior to invasion). Unlimited spread of yellow starthistle, medusahead, broom (species known to occur in the surrounding area) could alter natural fire regimes and hydrological processes, and ultimately have a substantial economic effect. Taking no action could result in future costs of tens of thousands of dollars should NEPA for herbicides be required (plus implementation costs) to remove invasive weeds that could be stopped from spreading during EDRR surveys in 2016 with a relatively small budget.

F. Cost of Selected Alternative (Including Loss)

The recommended treatment is to conduct early detection / rapid response surveys on 8.2 miles of dozer line, drop points and staging areas. In addition, surveys would be done along a sampling of about 20% of hand lines, 20% of burned stream courses, and areas with high concentrations of livestock where past and future ground disturbance is expected to be higher.

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.)

Land Treatments: Detection surveys for invasive weeds would be conducted in spring (or as soon as the weed species are identifiable) to detect and control early season invasive weeds and in the summer to detect and control late season invasive weeds. Infestations will be mapped with GPS, photographed, and flagged with invasive weed tape if necessary. Single plants or small isolated infestations would be manually removed during survey and mapping (EDRR). For most invasive non-native species that have just germinated, hand pulling consists of pulling the plant up by the roots and bagging for disposal if flowers or seed heads are present.

Surveys and treatments would be conducted by a two-person crew, making two trips to dozer lines and one trip to a sampling of hand lines. The Forest Botanist would accompany the crew in the beginning for training and may conduct a fall or early spring survey prior to crew hiring. 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 Army Corps of Engineers, Fresno County, or other partners.

**Sacata Fire BAER**
**Botany Treatments for 2016-2017**
**Estimated Cost for Invasive / Noxious Weed Surveys and Control**

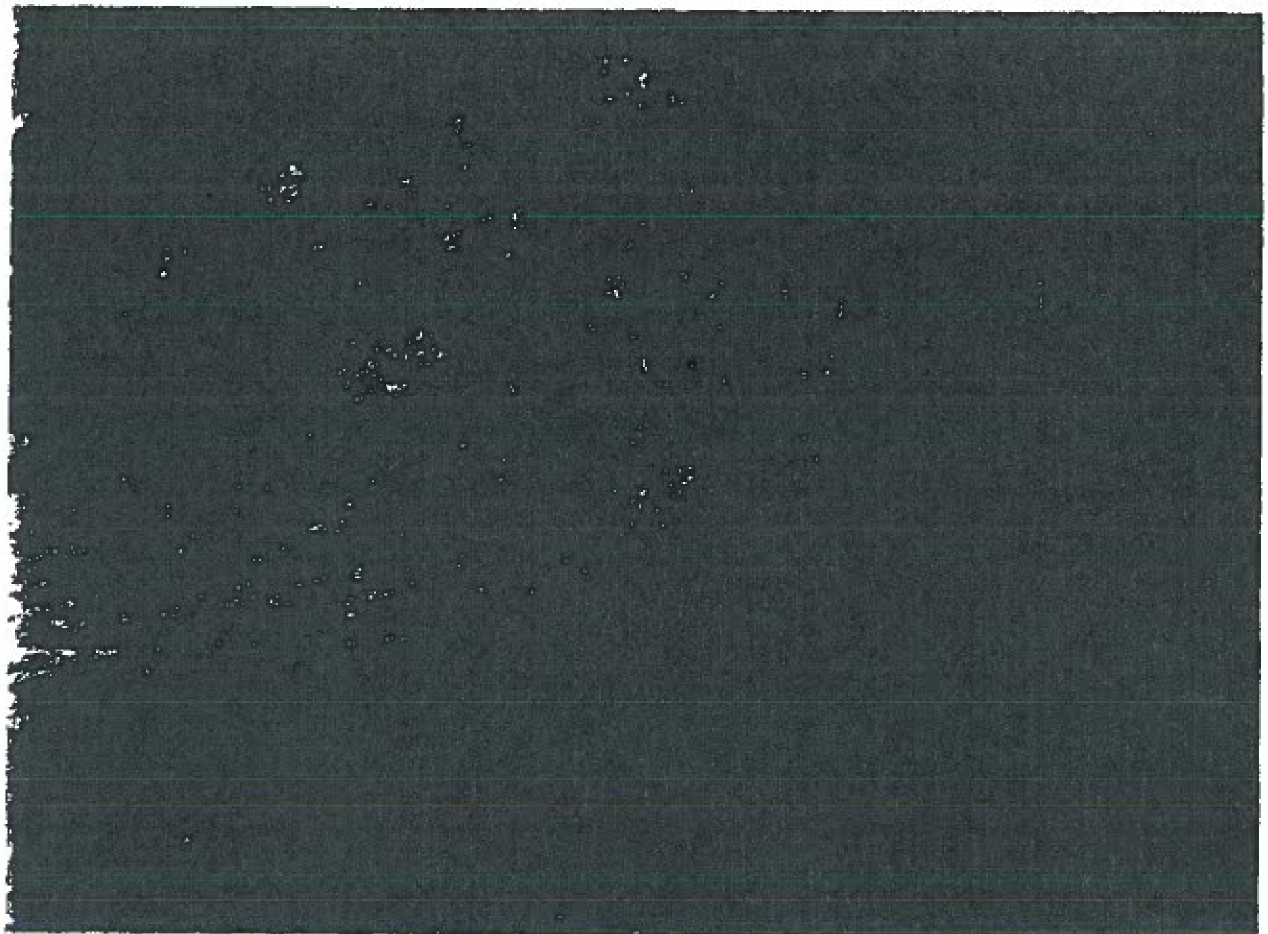
| Item | Daily Rate | # Days (8 hr/day) | Total |
|---|---|---|---|
| **Invasive Species Survey and Treatments** | | | |
| **Personnel** | | | |
| GS-11 Botanist (1) (hiring, surveying, training, supervision, reporting) | $398.00 | 8 | $3,184.00 |
| GS-7 Biological Technician (Plants) - Survey, mapping, and treatments | $164.00 | 12 | $1,968.00 |
| GS-5- Biological Technical (Plants) - Survey, mapping, and treatments | $135.00 | 12 | $1,620.00 |
| **Personnel Subtotal** | | 32 | **$6,772.00** |
| **Field rate for camping near work site** | | | |
| Field rate per diem for camping at or near work site for 4 day/3-night trips for GS-11 | $46.00 | 4 | $184.00 |
| Field rate per diem for camping at or near work site for two 4 day/3-night trips for GS-7 | $46.00 | 8 | $368.00 |
| Field rate per diem for camping at or near work site for two 4 day/3 night trips for GS-5 | $46.00 | 8 | $368.00 |
| **Camping / per diem subtotal** | | | **$920.00** |
| **Supplies and fleet** | | | |
| Vehicle Mileage (survey and treament) | $0.55 | 1,000 | $550.00 |
| Supplies & Materials (trash bags, gloves, safety items; etc.) | | | $600.00 |
| FOR for one month for a 4WD holdover vehicle with room for 3 | | | $400.00 |
| **Supplies and fleet subtotal** | | | **$1,550.00** |
| **Total for Invasive Weed Surveys and Treatment** | | | **$9,342.00** |

Channel Treatments: Channels that correspond to the risk areas described above would be surveyed as described in the Land Treatment section.

Roads and Trail Treatments: EDRR surveys as described above would be conducted on fire lines, including road prisms, (59.7 miles) and equipment concentration points (20.2 acres) using methods described in the Land Treatment section.

Structures: N/A

**Heritage Resources**



Picture 1: From 10S69, view of the burned area showing the grassy fuel type

## I. Potential Values at Risk (identified prior to field survey)

Critical Values: Cultural Resources which are listed on or potentially eligible for listing on the National Register of Historic Places, Traditional Cultural Properties, or Indian Sacred Sites.

Resource Setting: Prior to initiating BAER field review of known cultural resource sites, a record search was conducted of SNF Heritage GIS data and Site Records by the author in order to identify heritage resources that might be at risk from impacts of the Sacata Fire and any subsequent mitigative treatments. The SNF Tribal Relations Program Manager also spoke to members of Cold Springs Rancheria and Haslett Basin Traditional Committee about culturally important places associated with the fire location. SNF Heritage GIS data show that very little of the Sacata Fire area had been previously surveyed for cultural resources, likely due to the very steep slopes and difficult terrain. About 1,450 acres, or 69% of the burned area, is over 35% slope. The previous surveys were limited to Army Corps of Engineers (ACOE) land around Pine Flat reservoir, some survey of grazing land, and fire lines from past wildfires, as documented in four previous different survey reports (Kardash 1980; Stangl 1985; Meighan at al. 1988; Planas 1995). Only 98 acres, or 4.5% of the burned area, had ever had some form of archaeological survey.

The Sacata Fire area also has a history of wildfire. SNF fire history GIS data shows that the south half previously burned in a 1921 fire, and again in the 1986 Sycamore Fire. The north half previously burned in a 1961 fire, and a portion burned in the 2007 Trimmer Fire. The entire Sacata Fire area also previously burned in the 1951 Sycamore Fire. An assessment of the Sacata Fire by the SNF soil scientist indicated that the entire 2100 acres burned with a low soil burn severity, primarily due to the light fuels of grass and scattered brush.

SNF Heritage data indicated that there were no historic-era and archaeological cultural resource sites in the fire area. Some prehistoric archaeological sites are in the Big Creek drainage outside of the perimeter of the burned area, but no known site was subjected to wildfire.

The SNF is aware of watershed study structures, consisting of concrete dams and features built in the late 1930s by the Forest Service Region 5 research program (Munson 1938), that are located on what is now ACOE land around Pine Flat. At least four of these structures are within the burned area. Also, a dirt road parallels to road 10S69 through the burned area, and this road may be the original Big Creek Road. It has dry-laid rock retaining walls in the drainages, but the road has not been recorded as a historic property to date. Additionally, there are archaeological sites in the Bob's Flat area near the dozer contingency suppression lines; these sites are not included in this analysis as they were not subject to fire effects.

By no means should this be considered a complete list of cultural resource sites in the fire area, as it is very likely that others exist and more may be identified following the fire. Although steep and unroaded, the fire area has potential for historic mining, historic livestock use, and prehistoric archaeological properties. However, there are no known cultural resource critical values in the burned area.

<u>Findings of the On-The-Ground Survey:</u>

During the condensed BAER assessment period, the field review strategy was to review the known and potential cultural resources along Road 10S69. Due to the low soil burn severity and previous wildfire history, the likelihood of adverse effects from the Sacata Fire was low.

On October 21, the author visited the dams/watershed study structures and the old roadbed along Road 10S69 on the east side of the fire.

Consequences of the fire on values at risk: None of the properties was at risk for adverse effects from the fire and post-fire erosion events, or any other actions, due to the low intensity of the burn and the limited potential for damaging post-fire erosion. The watershed structures are somewhat more exposed to the public, increasing the potential for vandalism, but their existence is in the public domain, as there are published photographs of them available via Google Earth and other websites. The old roadbed above and parallel to 10S69 appears stable, although parts have washed out where it crosses drainages. Within the fire perimeter are 2 previously recorded prehistoric related archaeological sites. Only one site, a lithic scatter camp, was damaged by suppression activity.

1930s-era Watershed structures along 10S69

Rock retaining walls on old road above 10S69.

**II. Risk Assessment:**

**Emergency Determination – No emergencies were identified for cultural resources.**

Treatments to Mitigate the Emergency: The following treatments will be proposed by the BAER team to mitigate emergencies to other resources. These treatments have been reviewed under the stipulations of the 2013 Programmatic Agreement Among the USDA Forest Service, Pacific Southwest Region (Region 5), California State Historic Preservation Officer, Nevada State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding the Processes for Compliance with Section 106 of the National Historic Preservation Act for Management of Historic Properties by the National Forests of the Pacific Southwest Region. All treatments described below have been screened by the author per Stipulation 7.2 of the PA, and do not pose a potential adverse effect to historic properties, as described below in Table 1. Any other proposed treatments will need heritage program review. Implementation teams should coordinate with the High Sierra District Archaeologist during planning:

*Table 1: Regional PA Compliance Review*

| Description of Emergency Undertaking/Treatments | 2013 Heritage Programmatic Agreement Screened Uncertaking, Stipulation 7.2, Appendix D. |
|---|---|
| Treatment for FS System roads, particularly Road 10S69. The undertaking will include:<br>1. Curvert cleaning and extending the catch basin of two curverts.<br>2. Monitoring the condition of he road following storms.<br>3. Posting of signs warning of potential rock fall and other hazards. | • 2.3(n): Routine road maintenance and resurfacing where work is confined to previously maintained surfaces, ditches, culverts, and cut and fill slopes with road prism, where there are no known historic properties.<br>• 1.3(f): Removal of log jams and debris jams within waterways using hand labor or small hand-hid equipment.<br>• 2.3(t): for signs, activities that involve less then one cubic meter of gournd disturbance per acre. |

## II. Discussion/Summary/Recommendations

Although no emergency exists for cultural resources, the High Sierra Heritage Staff should use the opportunity provided by the fire to update Site Records and SNF Heritage GIS data, particularly of sites in the Bob's Flat area. Many of the Site Records are decades old, and locational information needs updating. Also, staff should coordinate with ACOE to identify and document the watershed structures as potential historic properties.

Risk Assessment – These sites were burned over, but appeared to have received minimal thermal damage. This was due to the rapid spread of this fire burning through relatively light fuels. Temperatures were high, but not sustained which did not significantly harm artifacts. However, any organic cultural material, leather, or wood were destroyed if they were on the ground surface.

Probability of Damage or Loss: Possible. The removal of vegetation by the fire has exposed artifacts leaving these sites vulnerable to looting.

Magnitude of Consequence: Major. A major risk to these sites is illegal collecting of artifacts.

Risk Level: High. A major risk to these sites is illegal collecting of artifacts. The removal of vegetation by the fire has exposed artifacts leaving these sites vulnerable to looting. Second major risk is water erosion since no vegetation is left on these sites.

## B. Emergency Treatment Objectives:

To allow safe passage of water to protect infrastructures, watersheds, cultural sites, and fish habitat from accelerated sheet and rill erosion. Also to protect watersheds from the spread of noxious weeds.

Risk determination is dependent on the design storm selected and downstream values at risk. By using a set of average storms (2, 5, and 10-year events) emergency planning measures can be designed to mitigate and minumize anticipated risks. Using a 2-year design storm the values at risk can be evaluated to determine if an emergency exists for a typical winter storm.

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

Land 80 % Channel n/a % Roads/Trails 95 % Protection/Safety 90 %

**D. Probability of Treatment Success**

| | Years after Treatment | | |
|---|---|---|---|
| | 1 | 3 | 5 |
| Land | 90% | 85% | 80% |
| | | | |
| Channel | n/a | n/a | n/a |
| | | | |
| Roads/Trails | 95% | 90% | 85% |
| | | | |
| Protection/Safety | 95% | 90% | 85% |

**E. Cost of No-Action (Including Loss): $150,000**

**F. Cost of proposed treatments: $20,992**

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

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

Team Leader: Antonio Cabrera

Email: acabrera02@fs.fed.us Phone: 559-297-0706 ext.4842 FAX: 559-779-1590

**H. Treatment Narrative for Forest Service:**

**Land Treatments:**

Each unit cost per mile includes cost to government, supplies, vehicle, and travel costs for two people. Surveys will encompass all the handlines, dozerlines, drop-points, staging areas, and perimeter of the fire.

With approximately 3 miles of dozer lines and hand lines, numerous drop points, and staging areas in the fire it is expected that new and expanding invasive plant infestations will proliferate along these vectors and if left unchecked may eventually lead to vegetation type conversion. Surveys and rapid response eradication treatments will begin in 2017 during the flowering periods of invasive plant species.

**Roads Treatments:**

FS Roads goal of restoring overall drainage function will control water and debris flow from moving off site reducing the risk to adjacent resources along 10S69 road.

A. Treatments Type: will include culvert cleaning and increase catch basin.

B. Treatment Objective: Provide safe travel on the public transportation system and to mitigate future damage to the transportation system.

C. Treatment Descriptions and Costs:

| Treatment | Quantity | Unit Cost | Estimated Cost | Justification |
|---|---|---|---|---|
| 10S69 –clean culverts | 5 | $150 | $750 | Minimaze damage to the road surface. |
| 10S69 – increase catch basin | 3 | $300 | $900 | Increase the capacity of catch basing and minimize the probability of the culvert getting plugged |
| 10S69 – Install BAER warning signs. | 2 | $250 | $500 | Inform/alert the public of potential dangers of falling rolling rocks. |
| | | Total Cost | $2,150 | |

**Protection/Safety Treatments:** Burned area road signs.

Safety: Installation of warning signs within burned areas is recommended to inform/alert the public of the potential danger of debris flow in the fire area and storm patrol to assess impacts during winter 2016-17.

## I. Monitoring Narrative:

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

See Appendix B below for road monitoring.

**Part VI – Emergency Stabilization Treatments and Source of Funds** | **Initial Request**

| | Line Items | Units | Unit Cost | # of Units | BEAR Funds |
|---|---|---|---|---|---|
| 10S69 Road | | | | | |
| | Install BEAR Warning Signs | EA | $ 250.00 | 2 | $ 500 |
| | Increase Catch Basin | EA | $ 300 | 3 | $ 900 |
| | Clean Culverts | EA | $ 150 | 5 | $ 750 |
| Invasive Species Survey and Treatments | | | | | |
| | Personnel | LS | $ 6,772.00 | 1 | $ 6,772 |
| | Field expenses | LS | $ 920 | 1 | $ 920 |
| | Supplies and fleet | LS | $ 1,550 | 1 | $ 1,550 |
| | | | TOTAL Estimate | | $ 11,392 |

## PART VII - APPROVALS

1. ______________________ 11/20/16

Sierra National Forest Supervisor (signature) Date

2. ______________________ 11/28/16

Regional Forester (signature) Date

**APPENDICES: Supporting Information:**

## Appendix A: Sacata Fire BAER Team:

| Position | Name | Cell Phone | Work Phone |
|---|---|---|---|
| Team Leader | Antonio Cabrera | 559-779-1590 | 559-297-0706 ext.4842 |
| Hydrology | Joshua Courter | | 559-855-5355 ext.3358 |
| Soils | Kellen Takenaka | | 559-297-0706 ext.4936 |
| Archaeology | Steve Marsh | | 559-855-5355 ext. 3309 |
| Botany | Joanna Clines | | 559-877-2218 ext.3150 |
| Geology | Kellen Takenaka | | 559-297-0706 ext.4936 |
| Roads | Antonio Cabrera | | 559-297-0706 ext.4842 |

## Appendix B: Monitoring Protocols:

**Sacata Fire**

Road Effectiveness Monitoring

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

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

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

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

4. Analysis, evaluation, and reporting techniques

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

Road Inspection Checklist

Date:__________________ Inspector__________________

Time:__________________ Forest Road__________________

Describe locations reviewed during inspection:____________________________

Was there road damage?

Was culvert plugged?____________________.

GPS ________________________________________________________

Describe damage and cost to repair? (GPS)_______________________________

Photo taken of road damage_______________________________________

Recommended actions to repair:__________________________________________________

## Appendix C: Summary of Cost-Risk Analysis

| | Line Items | Units | Unit Cost | # of Units | BEAR Funds |
|---|---|---|---|---|---|
| 10S69 Road | | | | | |
| | Install BEAR Warning Signs | EA | $ 250.00 | 2 | $ 500 |
| | Storm Inspection and Response | Day | $ 3,200.00 | 3 | $ 9,600 |
| | Clean Culverts | EA | $ 150 | 5 | $ 750 |
| Invasive Species Survey and Treatments | | | | | |
| | Personnel | LS | $ 6,772.00 | 1 | $ 6,772 |
| | Field expenses | LS | $ 920 | 1 | $ 920 |
| | Supplies and fleet | LS | $ 1,550 | 1 | $ 1,550 |
| | | | TOTAL Estimate | | $ 11,39[illegible] |

## Appendix D

Table 6: BAER risk assessment

| Probability of Damage or Loss | Magnitude of Consequences | | |
|---|---|---|---|
| | Major | Moderate | Minor |
| | Risk | | |
| Very Likely | Very High | High | Low |
| Likely | Very High | High | Low |
| Possible | High | Intermediate | Low |
| Unlikely | Intermediate | Low | Very Low |

**Probability of Damage or Loss**

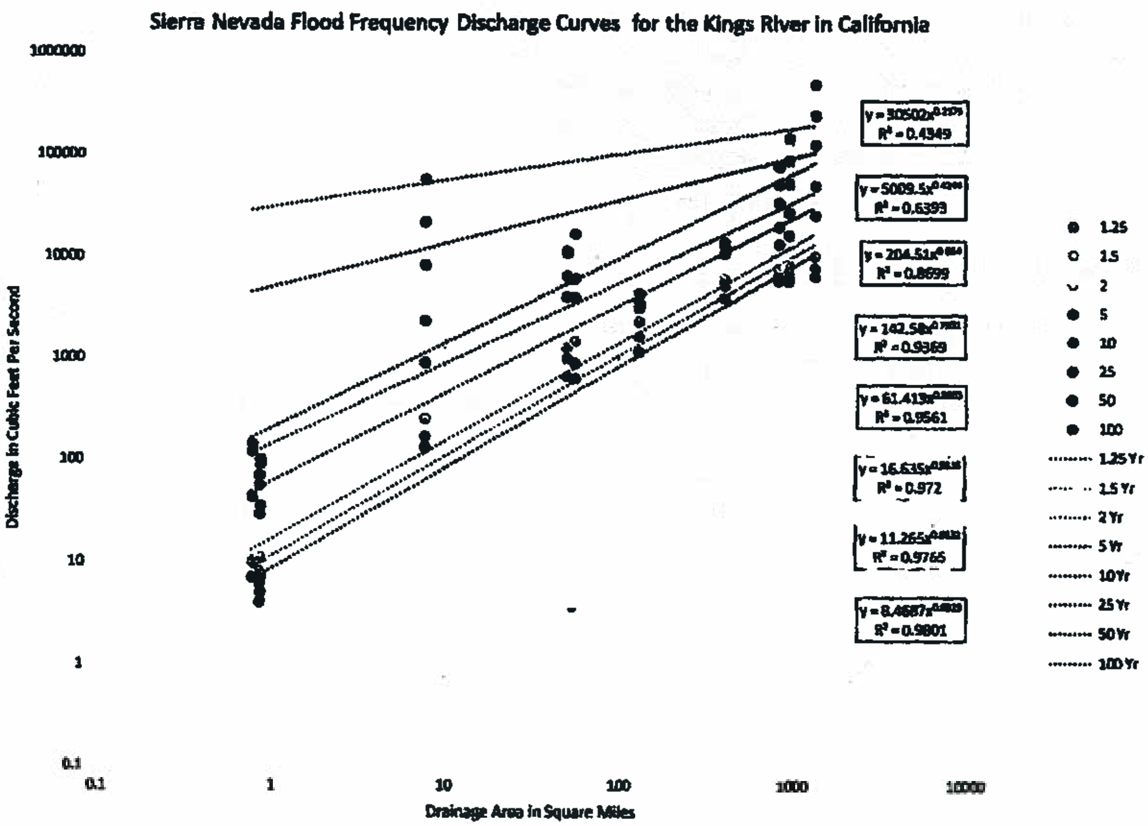
The following descriptions provide a framework to estimate the relative probability that damage or loss would occur within one to three years (depending on the resource):

- Very likely- nearly certain occurrence (>90%)
- Likely- likely occurrence (>50% to < 90%)
- Possible- possible occurrence (>10% to <50%)
- Unlikely- unlikely occurrence (<10%)

**Magnitude of Consequences**

- Major- Loss of life or injury to humans; substantial property damage; irreversible 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 natural or cultural resources resulting in minimal, recoverable, or localized effects.

**Appendix E**


Sierra Nevada Flood Frequency Discharge Curves for the Kings River in California
Discharge in Cubic Feet Per Second
1000000
100000
10000
1000
100
10
1
0.1
0.1
1
10
100
1000
10000
Drainage Area in Square Miles
y = 30502x
R² = 0.4349
y = 5009.5x
R² = 0.6393
y = 204.51x
R² = 0.8699
y = 142.58x
R² = 0.9369
y = 61.413x
R² = 0.9561
y = 16.635x
R² = 0.972
y = 11.265x
R² = 0.9765
y = 8.4687x
R² = 0.9801
1.25
1.5
2
5
10
25
50
100
1.25 Yr
1.5 Yr
2 Yr
5 Yr
10 Yr
25 Yr
50 Yr
100 Yr

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Sierra National Forest Heritage Resource data, including GIS-derived survey and site location data, Site Records, and Survey Reports.

2013 Programmatic Agreement Among the USDA Forest Service, Pacific Southwest Region (Region 5), California State Historic Preservation Officer, Nevada State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding the Processes for Compliance with Section 106 of the National Historic Preservation Act.