Forest
Service

Sequoia National Forest and
Giant Sequoia National Monument

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FILE

File Code: 2520
Route To:

Date: SEP 0 2 2011

Subject: Lion Fire Burned-Area Report (BAER)

To: Regional Forester

Enclosed is the Lion Fire BAER report (2500-8), assessment and treatment recommendations. After review, please have the Regional Forester sign the document.

Also enclosed is a power point presentation of the Lion Fire BAER closeout presentation.

Nancy C. Ruthenbeck

for DEBRA L. WHITMAN
Acting Forest Supervisor

Enclosures

cc: Brent Roath, Fletcher Linton

USDA-FOREST SERVICE

FS-2500-8 (6/06)

Date of Report: 8/31/11

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

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

B. Type of Action

[x] 1. Initial Request (Best estimate of funds needed to complete eligible 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: Lion Fire

B. Fire Number: CA-SQF-002087

C. State: California

D. County: Tulare County

E. Region: 5

F. Forest: Sequoia National Forest

G. District: Western Divide Ranger District

H. Fire Incident Job Code: P5F7LZ

I. Date Fire Started: 7/08/11

J. Date Fire Contained: N/A Likely after lst rainfall/snowfall event – Fire acreage may change

K. Suppression Cost: $2,000,000

L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles): 2 (100%)
2. Fireline seeded (miles): 0
3. Other (identify):

M. Watershed Number: Upper Little Kern ; 180300010302

N. Total Acres Burned: 20,927
NFS Acres(19,628) Other Federal (1,021) State ( ) Private (278)

O. Vegetation Types: Mixed Conifer, Red Fir, Montane Chaparral, Sub-alpine Forest

P. Dominant Soils: Dome Chaix Rock Outcrop; Wolstalf Rock outcrop; Rock outcrop Totem Complex-Cagwin Complex.

Q. Geologic Types: Granitic and Metasedimentary

R. Miles of Stream Channels by Order or Class:

Stream Order	Miles
Order 1	19
Order 2	14
Order 3	11
Order 4	3

S. Transportation System

Trails: 20 miles Roads: 0 miles

PART III - WATERSHED CONDITION

A. Burn Severity (acres): 6,906 (32%) (low) 5,680 (27%) (moderate) 1, 461 (7%) (high) 7,211 (34%) (unburned)

B. Water-Repellent Soil (acres): 16,400 (These soils are naturally water repellent. The fire did not effect extent, only severity and depth.)

C. Soil Erosion Hazard Rating (acres):
7,144 (low) 10,233 (moderate) 3,850 (high)

D. Erosion Potential: 2.58 tons/acre

E. Sediment Potential: 0.88 tons/acre (Value includes unburned portion of watershed beyond fire perimeter.)

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 5-7

B. Design Chance of Success, (percent): 80%

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

D. Design Storm Duration, (hours): 6

E. Design Storm Magnitude, (inches): 2.2

F. Design Flow, (cubic feet / second/ square mile): 3.4

G. Estimated Reduction in Infiltration, (percent): 10%

H. Adjusted Design Flow, (cfs per square mile): 4.2

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:
Critical Values/Resources at risk include endemic populations of Little Kern golden trout (LKGT), the trail system accessing the Golden Trout Wilderness both as a resource and its potential effect flooding (loss of control of water) and sedimentation to critical Little Kern Golden Trout.

The watershed basin in which the fire is located is native habitat for the Little Kern golden trout, a federal threatened species. The Willow and Sheep Creek drainages represent two of the six populations considered to represent "pure" LKGT, Sheep, No Name, and Willow Creek drainages that have burned at high severity. These areas appear to be located upstream of habitat occupied by Little Kern golden trout, but represent potential negative effects to the species and its habitat. The Sequoia National Forest, the California Department of Fish and Game, and the US Fish and Wildlife Service are concerned about possible effects from the fire on Little Kern golden trout and its habitat.

The trail system accessing the Little Kern Trout Wilderness has been affected by the fire. Portions of the trail accessing the wilderness has been subjected to moderate and high severity burn while portions of the trail system are located in low and unburned areas of the fire. Sections of trail in areas associates with high and moderate soil burn severity either above or below the trail are areas of special concern as these trails have the potential to cause negative effects to LKGT through loss of control of water and accelerated sedimentation. The loss of the trail resource is an additional concern and a value at risk.

Trails affected by the fire include trails frequently and less frequently maintained. While those frequently maintained may pose less of a threat to the LKGT those trail with a lower maintenance schedule have a higher potential to add to resource problems. The trails in the eastern portion of the fire pose the highest level of concern as these areas are associated with Sheep, No Name, and Willow Creek drainages and their tributaries.

Watershed Characterization and response:

Soil Productivity and Hydrologic Function – General Discussion

Areas of high and moderate burn severity have impacted soil productivity by removing vegetative ground cover, the organic matter within the topsoil and on the forest floor, and to a lesser extent by creating water repellent conditions within the soils themselves. Consumption of the organic layer on the forest floor and severe heating of the upper layer of soil has degraded the seed bank stored in the soil. The most important soil physical characteristic that affects soil hydrologic function and soil stability is soil structure. The organic matter component, which provides for loose, granular structure, can be lost at relatively low temperatures. The loss of soil structure increases the bulk density of the soil and reduces its porosity, thereby reducing infiltration and soil productivity and making the soil more vulnerable to post-fire runoff and erosion. The soil structure appears intact in the high and moderate soil burn severity areas of the Lion fire. The BAER Team concluded that the soil was moist when the fire came through adsorbing the heat minimizing the damage to soil structure. Removal of the protective vegetative and organic layers combined with loss of soil structure and increased water repellency also increases erosion. Soil loss occurs through surface, rill, and gully erosion processes. Loss of the soil seed bank, loss of soil structure, and soil loss through erosion processes retards vegetative recovery which, in turn, further impairs soil productivity and watershed conditions.

Hydrologic function within moderately and severely burned areas has also been impacted by loss of the vegetative canopy that intercepts some rainfall, by loss of the organic layer on the forest floor that absorbs some rainfall, by loss of soil structure which reduces infiltration and to a lesser extent by development of water repellent soils which also reduces infiltration. Reduced interception and absorption, and reduced infiltration increase runoff from a given rainfall event. Increased runoff increases erosion and the magnitude of peak flows expected from a watershed. The increased magnitude of peak flows represents an increased flood threat mostly to downstream property (Lion Meadow).
Increases in erosion can occur on both uplands and in channels. Rills and gullies can form in uplands and channels can scour and downcut. Sediment delivered to channels from rill and gully erosion and eroded from channel banks during scouring and incision processes can deposit in areas of lower energy. Sediment,

bedload, and debris deposits can adversely affect aquatic habitat, deposit on floodplains, terraces and other low lying areas a generally adversely affect infrastructure in downstream areas such as trail crossings.

Downcutting of stream channels can lower water tables in adjacent floodplain aquifers and result in drying of meadows and mortality of riparian vegetation. Downcutting of stream channels also separates the stream from its floodplain, alters the sediment transport characteristics of the channel, and causes erosion of the channel banks until the channel has widened sufficiently to permit development of a new floodplain at the lowered base level of the channel. The downcutting, widening and depositing processes can destabilize affected channels for many years.

Increases in runoff and erosion, changes in sediment transport characteristics, impacts to channels and floodplains, and impacts to water quality from ash, sediment, and temperature effects, combine to impair hydrologic function.

Impaired soil productivity and hydrologic function affect on the Lion Fire:

- A slight increase in the risk to human life and safety on or in close proximity to burned NFS lands through increased flood threats,
- Property and infrastructure on or in close proximity to burned NFS lands through increased flooding, erosion, and debris threats,
- Critical and occupied habitat for federally listed threatened or endangered terrestrial and aquatic animal species within and in close proximity to burned NFS lands through increased flooding and water quality impacts and through delayed vegetative recovery affects.

Damage to soil productivity and hydrologic function in areas of moderate burn severity with highly erosive soils and areas of high burn severity is very likely to occur, may be irreversible, and is at least of long term duration.

Specific Hydrologic Response:
The fire was divided into sub-watersheds established at the bottom of burned watersheds, or where values at risk were located. In most cases the pourpoints are located at the bottom of watersheds as they enter the Kern River. Watershed runoff response is referenced to these points.

Surface waters in the fire area will be bulked by ash, debris, and other floatable and transportable material during storm events. It is likely that stream flows from the first post-fire runoff producing rain events will see high concentrations of ash and fine sediment that will cause considerable turbidity and degradation of water quality and the beneficial uses of water.

Hydrologic design factors used to analyze the effects of the Lion Fire considered the vegetative recovery period to be 3 to 4 years; treatment chance of success as 90%. Storm recurrence interval of 2 years and 6-hours using NOAA isopluvial maps for 2-year 6-hour precipitation yielded a design storm magnitude of 2.2 inches of rainfall. Estimated reduction in infiltration was determined to be 10%. Pre-fire design flow was estimated at 3.4 cubic feet per second per square mile and post-fire design flow was estimated at 4.2 cubic feet per second per square mile. These values vary by watershed analysis and are described in detail along with the analysis method in the following section.

Stream bank erosion for the stream channels in the fire area were evaluated for increased bank erosion. In order to predict a change from pre-fire to post-fire stream bank erosion rates the same sites were analyzed assuming no surface vegetative protection using the BANCS Model. Vegetation protection was reduced in the analysis to closer represent post-fire conditions. This analysis post-fire yielded values that ranged from 0.05 to 0.052 tons/year/foot which is roughly a 1.00 to 13.1 times increase in stream bank erosion. (Appendix A in the Hydrology Report provides the results of the stream bank erosion analysis.)

The above threats will be the most acute during the first post-fire rain season from December through March and next summer thunder storms in July/August until burn areas experience new vegetative growth and stream banks stabilize. Post-fire watershed threat should be reduced measurably after two to three years with

favorable precipitation. Based on monitoring following the 2002 McNally Fire aquatic habitat conditions stabilized after five years. It is not expected for the effects of the Lion fire to continue beyond fire years.

Watershed Specific Assessment:

The Willow Creek 7th order watershed was divided into 3 sub-watersheds to provide a more accurate assessment of the post-fire hydrologic response on the Federally threatened Little Kern Golden Trout. The watersheds include: Upper Willow Creek, No Name Creek, and Sheep Creek.

Upper Willow Creek: This watershed has a drainage area of 2.48 square miles. The lower slopes of the drainage have a well developed floodplain which for the most part remained unburned with vegetation intact. These floodplains are capable of attenuating flood flows. These floodplains also allow for reduction in hill slope sediment available to the channel. East of where Willow Creek forks, the burn severity becomes moderate to high on the floodplain and near channel hill slopes. The ground cover has been nearly completely consumed with little potential for needle accumulation. In all high burn severity areas of the upper watersheds, there is very little ground cover and coarse woody debris situated across the landscape. In the short-term, large woody debris will remain deficient but the expected snag fall will add considerable future large woody debris. High burn severity areas of the watersheds consist of productive deep and moderately deep soils and therefore contain a considerable quantity of sediment available for transport directly into the channel. Hydrophobicity (soil repellency) is a soil property associated with the soils within the Golden Trout Wilderness, however, the severity and depth of hydrophobicity has significantly increased in the high and moderate burn severity. In the high to moderate burn severity, lack of ground cover in conjunction with repellant soils is likely to result in a very high watershed response and sediment delivery, particularly in the steeper slopes of the upper watershed. Forty-seven percent of the watershed has a burn severity of moderate/ high. Pre-fire discharge increased from 19.4 cfs to 106.5 cfs post-fire. Many of the pools within the drainage are wood formed and have an increased potential of failure due to the increased sediment and flow.

No Name Creek: This watershed has a drainage area of 1.22 square miles. The lower slopes of the drainage have a well developed floodplain capable of attenuating flood flows. Forty-seven percent of the watershed has a burn severity of moderate/ high. This amount of moderate and high severity provides easy delivery of sediment to the channel. Pre-fire discharge increased 11.5 cfs to 77.9 cfs post-fire. No Name Creek has similar soil types and geomorphology and is expected to have a similar response to Upper Willow Creek.

Sheep Creek: This watershed has a drainage area of 1.10 square miles. The floodplain within the drainage is poorly developed, thus not allowing for attenuating flood flows or reducing sediment available to the channel. Forty-seven percent of the watershed has a burn severity of moderate/ high. This amount of moderate and high severity provides easy delivery of sediment to the channel. Pre-fire discharge increased from 10.6 cfs to 62.8 cfs post-fire. The upper headwater slopes of the drainage are characterized by steep exposed bedrock and small landslides. Headwater channels are primarily steep and bedrock controlled with few pools. Many of the pools within the drainage are wood formed. In general, the discussion for Upper Willow Creek and No Name Creek apply to Sheep Creek, however, there are reasons that increase the concern for Sheep Creek. The slopes are steeper above the slope break between alluvial depositional surface and the canyon. The increased slopes will increase sediment rates. There tends to be more rock outcrop in the headwaters of Sheep Creek than Willow and No Name. The watershed response from the outcrop increases overland flow over the soils and increases the rilling potential from precipitation. At least one recent small slope failure (approx 20yrs) was observed in Sheep Creek indicating that the watershed may be prone to slope instability and, consequently, higher risk of debris flow. Prior to the fire, the high burn severity had a component of brush which retained creep slope and eolian mineral material. Consumption of the shrubs has left weakly consolidated soil mounds which are easily transported. And lastly, the channel gradient is steeper and bedrock controlled allowing for high energy transport to the reaches of streams with wood dams and intact riparian vegetation.

Specific Hillslope Erosion Response:

The primary concern for soils within the fire area is erosion and the resulting reduction of soil productivity and sedimentation into creeks. In those areas that burned with high burn severity, nearly all surface organic material was combusted including both litter cover and large woody debris. The primary determinant of

erosion is soil cover. Also, because few needles remained unburned, there is low potential of needle cast contributing to surface cover until tree regeneration occurs. Surface cover will begin to recover with emergent shrub and herbaceous vegetation establishment. Moderate burn severity area generally has enough residual surface cover to help ameliorate erosion and there is enough potential needle cast to mitigate erosional processes within a year or two.

The soils in the fire are naturally water repellant but in both high and moderate burn severities, soil repellency increases appreciably with both intensity and depth. Soil repellancy impairs the ability of the soil to infiltrate rainfall. The watershed response and erosion potential is very high on steeper slopes with high water repellency and low soil cover.

The upper watersheds of Sheep, Willow, and No Name Creeks were determined by the BAER assessment team to be of high concern because of the habitat for the threatened Little Kern golden trout and the high risk of soil erosion and sedimentation into that habitat (see discussion above). In these drainages, the upper watersheds have a high proportion of high burn severity on very steep slopes of between 50 and 70 percent slopes. Also, much of the vegetation and soil cover in the upper drainages of these creeks have been completely burned reducing the function of the floodplain and stream banks.

Values at Risk

The following values were identified during the initial phase of the Lion Fire assessment process and validated throughout the assessment process at risk from threats as a result of post-fire effects. An interdisciplinary team (BAER Team) systematically went through the Values at Risk to determine the risk based on Probability of Damage and Consequences. The risk matrix below, Exhibit 2 of Interim Directive No.: **2520-2010-1**, was used to evaluate the Risk Level for each value identified during Assessment:

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

Threats to Human life and Safety:

Based on the remoteness and mosaic pattern of the Lion fire, the BAER Assessment team determined that there were few threats to Human life and safety as a result of the Lion Fire.

Risk Assessment – Private property – infrastructure and improvements – Lion Meadow

Probability of Damage or Loss: Possible. This determination is due to the minimal change in watershed response and the location of structures in relation to the stream channel and floodplain.

Magnitude of Consequences: Moderate. Some Infrastructure in Lion meadow is located in or adjacent to the stream channel. This includes bridges and a water intake system.

Risk Level: **Intermediate**

Risk Assessment – Private Property – infrastructure and improvements – Peck Meadow

Probability of Damage or Loss: Unlikely. This determination is due to the minimal to no change in watershed response and the location of structures in relation to the stream channel and floodplain.

Magnitude of Consequences: Minor. This determination is due to the minimal to no change in watershed response and the location of structures in relation to the stream channel and floodplain.

Risk Level: **Very Low**

Risk Assessment – Dispersed camping along Little Kern River

Probability of Damage or Loss: Possible. This determination is due to the minimal change in watershed response and the location of existing rock fire rings and camp spots in relation to the stream channel and floodplain.

Magnitude of Consequences: Moderate: Campers may encounter higher peak flows during summer thunderstorm events that would make camping along the River hazardous.

Risk Level: **Intermediate**

Forest Service Trails: Coyote Lakes Trail (32E05), Lion Trail (32E02), Newlywed Trail (31E23), Willow Trail (32E04)

The Team expects an increase in watershed response due to moderate (with highly erosive soils) and high burn severity found above certain sections of the trail. Storm runoff is likely to increase and concentrate onto the trail. Based on existing conditions of this trail from a trail survey, moderate to possibly severe trail damage and off-trail erosion/sediment delivery to channels is likely to occur along identified sections of the trail in vulnerable conditions. Trail incision and complete loss of trail tread could occur, possibly leading to significant repairs and costs to restore sections of trail. Once active gullies are developed, gullies will continue to erode during each storm event and contribute to downstream sedimentation and trail instability. These trails, among others, are also historic trails.

Risk Assessment – Lion Trail (32E02), High use

Probability of Damage or Loss: Likely. This is based on the expected increase in watershed response due to post-fire effects. Storm runoff is likely to increase and concentrate on this trail causing damage as describe above.

Magnitude of Consequences: Moderate. There is approximately a 1 mile section of the trail that is at risk from the fire. Damage could be considerable in this section.

Risk Level: **High**

Risk Assessment – Newlywed Trail (31E23), Moderate use

Probability of Damage or Loss: Very Likely. This is based on the expected increase in watershed response due to post-fire effects. There are large polygons of high and moderate burn severity above this trail. Storm runoff is likely to increase and concentrate on this trail causing damage as describe above.

Magnitude of Consequences: Moderate. Approximately 4 miles of the trail are at risk from the fire. Damage could be considerable in this section leading to substantial property damage.

Risk Level: **Very High**

Risk Assessment – Coyote Lakes (32E05) Moderate use

Probability of Damage or Loss: Very Likely. This is based on the expected increase in watershed response due to post-fire effects. There are large polygons of high and moderate burn severity above this trail. Storm runoff is likely to increase and concentrate on this trail causing damage as describe above.

Magnitude of Consequences: Moderate. Approximately 2 miles of the trail are at risk from the fire. Damage could be considerable in this section leading to moderate property damage.

Risk Level: **High**

Risk Assessment – Willow Trail (32E04) Very Low use

Probability of Damage or Loss: Likely. This is based on the expected increase in watershed response due to post-fire effects. There Storm runoff is likely to increase and concentrate on this trail causing damage as describe above.

Magnitude of Consequences: Moderate. Approximately 200 yards of the trail are at risk from the fire. Damage could be considerable in this section leading to increased sedimentation to Willow Creek and negatively impacting soil productivity.

Risk Level: **High**

Water Quality: The most noticeable effects on water quality will be increased sediment and ash from the burned area into the Little Kern River, Willow, No-Name, Sheep, Soda Creeks and other waterbodies in and downstream of the burn area. During storm events this will increase turbidity and contribute to pool filling. Increased nitrogen may occur during the first year after the fire (see Hydrology Specialist Report, BAER Assessment Project File). Nitrogen levels to downstream water reservoirs are non-significant due to a small percentage of the total watershed burned. Power plant KR3 run by Southern California Edison (SCE) and the intake for drinking water for Kernville are both located downstream of the fire area.

Most damaging storms in the burn area come predominately in the form of summer thunderstorms occurring between July and September, with rarer occurrences into October. Winter rain and snow does occur between the months of November and April; events are often gentle in nature and do not often result in flooding. The majority of precipitation occurs during the winter. Occasionally the area is subject to a rain-on-snow event, resulting in extensive flooding. This is not however, an annual event. The last event of this nature occurred in January 1997. The climate is characterized by cool, dry winters followed by hot, dry summers. Stream channels in the burn area have the potential to flash flood. With vegetative recovery, the post-fire watershed threat should be reduced measurably after two to three years with favorable precipitation. However, a recent study in southern California (Kinoshita and Hogue, 2011) showed that in high burn severity areas across all aspects showed the slowest vegetative recovery by the end of the seven-year post-fire recovery period. They also noted that runoff is not back to pre-fire levels also.

Risk Assessment: - Water Quality – KR3 and intake for Kernville

Probability of Damage or loss: unlikely. This determination is due to the fire located far upstream of the identified values providing an opportunity for dilution and the relatively small size of the fire compared to the amount of watershed above the two values.

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

Risk Level: **Low**

Risk Assessment: - Water Quality – Lake Isabella

Probability of Damage or Loss: Unlikely. Lake Isabella (Proposed Impaired Water Body 303 (d)), for Dissolved Oxygen, Ph and Temperature. This determination is due to the fire located far upstream of the identified value providing an opportunity for dilution and the relatively small size of the fire compared to the amount of watershed above the value.

Magnitude of consequences: Minor. This determination is due to the expected change in watershed response and high dilution opportunity.

Risk Level: **Very Low**

Threats to Soil Productivity: The majority of the areas with high and moderate burn severity are on granitic derived soils. Accelerated erosion is expected in the high soil burn severity areas. Areas of moderate burn severity can also expected accelerated erosion though to a lesser extent these areas experienced less soil heating and can expect needle cast to provided limited soil cover. It was noted that soil structure was mostly intact, even in the high soil burn severity areas. The BAER Team concluded that given the above normal winter precipitation and snowpack the soil was moist and helped mitigate the effects of soil heating, retaining soil organic matter and soil structure. As vegetation recovers, erosion decreases and productivity is stabilized and starts to recover. Berg and Azuma (2010), concluded that for forested locations in the southern Sierra Nevada, hillslope riling should not be expected to extend more than 4 or 5 years after wildfires. See above for a discussion on recent research on post-fire vegetation recovery in southern California.

Probability of Damage or Loss: Soil productivity (High and Moderate soil burn severity areas) Likely. This is due to the expected soil loss and changes in off-site erosion potential.

Magnitude of Consequence: Moderate. This determination is due to the expected increases in off-site erosion in high (some moderate) soil burn severity areas leading to a long-term impact to soil productivity.

Risk Level: **High**

Threatened and Endangered Species:

Impacts to Little Kern Golden Trout habitat and individuals: The area affected by the Lion Fire supports important habitats and occurrences of federally threatened Little Kern golden trout along with their designated critical habitat. Emergency conditions exist for the Little Kern golden trout and their habitat as a result of anticipated post-fire results. For aquatic species, post-fire impacts will include compromised water quality and changes in water chemistry due to ash delivery and hazardous materials, changes in water temperature from loss of canopy shading, scouring of riparian/aquatic vegetation and changes in streambed/pool habitat due to debris flows and sediment delivery and flushing of species during flood events downstream. These combined impacts may lead to a temporary loss or reduction of suitable stream habitat and localized extirpation of special status species populations.

The Little Kern golden trout have been identified as being at risk of experiencing extirpation of small isolated occurrences. Extirpation of these occurrences is a critical risk that could result in a threat to viability of this species. Also, post-fire events may facilitate the spread of non-native aquatic species into previously unoccupied habitats. In the Lion Fire riparian areas generally burned at low or moderate severity, but some isolated areas within headwater tributaries such as Sheep Creek, No Name Creek and Willow Creek were burned more severely and in some instances were completely denuded of vegetation. Due to the steepness of the slopes, there are no treatments that would effectively reduce the potential for increased sediment and ash, or debris flows into the occupied habitat lower in the watershed. A separate biological assessment will be completed as part of future emergency consultation.

Risk Assessment: Little Kern Golden Trout habitat and individuals

Probability of Damage or Loss: Likely. Based on fire severity, increased runoff and sediment will occur.

Magnitude of Consequence: Moderate. The Lion fire will cause damage to individual fish and habitat, resulting in considerable long-term effects on this Federally threatened species.

Risk Level: **High**. Recovery of the Little Kern Golden Trout will be impacted negatively by the effects of the Lion fire.

Native Vegetation Recovery:
The potential values at risk, in relation to invasive noxious weeds are the ecological stability of native plant communities and the degradation of Region 5 Sensitive plant habitat. The Lion impacted a great variety of different plant communities and environments. It burned from Ponderosa pine to subalpine Forest. The major plant communities found within the fire area are:

- Ponderosa Pine Forest
- Mixed Conifer Forest
- White Fir Forest
- Red Fir Forest
- Montane Chaparral
- Montane Meadow

The R5 Sensitive and Watchlist Plants with potential to be affected by noxious weeds are:

- Purple Mountain Parsley (*Oreonana purpurascens*)
- Little Kern milkvetch (*Astragalus shevockii*)

Additionally, the South Mountaineer Creek Research Natural Area occurs just south of the fire, within the Golden Trout Wilderness. This Research Natural Area has good examples of Red Fir forest, sub-alpine forest, and Sierra wet meadows.

The noxious weed species with populations near the Lion fire area are:

- Yellow star-thistle
- Perennial pepperweed
- Italian Thistle
- Tocolote
- Velvet grass

The fire area within the Golden Trout Wilderness is relatively pristine, and for the most part free of noxious weeds. The unknowing introduction of invasive noxious weeds into areas disturbed by the Lion fire suppression activities has the potential to establish persistent weed populations. These persistent populations could affect the structure and habitat function of plant communities within the burn area. Forest Service direction is to minimize the establishment of non-native invasive species to prevent unacceptable degradation of the burned area. Consequently, delayed assessment of trails used as pack train supply routes and spike camps is necessary to detect the spread and introduction of weeds in the first year after fire. Assessing the establishment of weeds and treating small outlying populations before they expand, will prevent the weeds from becoming serious threats to the recovery of native plants.

Risk Assessment: Native Vegetation Recovery – Invasive/Noxious weeds

Probability of Damage or Loss: Possible. Invasive/Noxious weeds can negatively alter native plant recovery. This rating is based on post-fire surveys and known occurrences of invasive/noxious weed species.

Magnitude of Consequence: Moderate. The Lion Fire, coupled with noxious weeds could cause damage to critical natural resources. This effect is considerable and potentially long term.

Risk Level: **Intermediate**. This risk can increase over time if noxious/invasive weeds are not treated in a timely manner.

Threats to Heritage Resources

Walker Cabin (05135200004, CA-TUL-2017H) The Walker cabin is an historic era log cabin located near trail 32E23. Construction of the cabin was consistent with hunter/trapper era with hand-hewn logs, and gabled roof. The cabin was completely consumed by the Lion Fire. Only a stone chimney, stone stove and glass and metal artifacts remain visible on the surface. The items include pots, bottles, cans, nails, and various types of sheet metal. Fire severity was high.

Artifacts are at risk to displacement or destruction due to increased sediment/water movement in the area of this site. It is felt that the potential increased sediment/water flow will cause artifacts to be moved from their original context resulting in the loss of important scientific and cultural information. The increase flow will be diverted, due to the loss of vegetation, especially at a large root burn pit and where a large burn log crosses the cabin will accelerate its destruction.

Due to the intensity of fire that swept through the site area this site has been exposed to public viewing. High visibility sites are susceptible to looting by hikers, hunters, etc. If the natural regeneration is hampered due to soil movement or loss of seed bank, the archaeological site will maintain its present visibility and most certainly be subjected to vandalism, an event which has occurred to it in the past. The vandalism will most certainly result in the loss of important scientific and cultural information.

Risk Assessment – Walker Cabin

Probability of Damage or Loss: Very Likely. This determination is due to the change in hillslope condition above the cabin and the change in post-fire cabin structure.

Magnitude of Consequences: Major. This determination was made based on exposure of the site and the risk of irreversible damage to the site.

Risk assessment: **Very High**

Historic trails

Field reconnaissance indicated that some sections of historic trail bed are already obscured by thick ash as such all proposed trail work shall have a archaeological monitor who will assist the trail crew leader in determining where the historic travel route was and try to maintain that route to the greatest extent possible.

Historic trails within the Lion Burn are at risk from accelerated erosion and runoff and at risk of the historic alignment being obscured and lost. There is a risk to determine if the trail through the fire area can be followed by visitors both for safety and to keep user created trails from becoming predominant and leading to the loss of the historic travel corridor. The following is a list of the ten historic trails impacted by the Lion Fire: Trail 31E23 Trail 31E14 Trail 31E12 Trail 31E11 Trail 31E13 Historic Trail (Pecks to trail 31E14) Trail 32E02 Trail 32E05 Trail 32E06, Trail 32E04 (Willow trail).

B. Emergency Treatment Objectives:

- Minimize the potential for sedimentation and loss of control of water from trail system in high and moderate soil burn severity areas to affect LKGT and aquatic habitat.
- Minimize the potential for loss of trail system in Golden Trout Wilderness.
- Provide an emergency assessment of the Lion Fire to California Department of Fish and Game and US Fish and Wildlife Service for evaluation of potential risk of Lion Fire to LKGT and aquatic habitat.

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

Land **90** % Channel **N/A** % Roads/Trails **85** % Protection/Safety **90** %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	95	95	95
Channel	N/A	N/A	N/A
Roads/Trails	85	85	85
Protection/Safety	90	90	90

E. Cost of No-Action (Including Loss): **See VAR spreadsheets in the appendix**

F. Cost of Selected Alternative (Including Loss):

G. Skills Represented on Burned-Area Survey Team:

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

Team Leader: Terry Kaplan-Henry; Todd Ellsworth

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H. **Treatment Narrative:**

Land Treatments:

Noxious weed Detection Survey:

Inspect/monitor pack trails (18.6 miles) and spike camps and for newly established weed occurrences. Monitoring will include documentation and hand pulling small new weed occurrences at the time of inspection. New weed occurrences will be pulled to root depth, placed in sealed plastics bags, and properly disposed. Data will be entered into FACTS.

Treatment Cost

GS –11 Botanist	$387/day x 2 days =	$774
GS – 7 Bio Tech Crew Leader	$230/day x 1 pay periods (10 days) =	$2,300
GS – 5 Bio Tech	$200/day x 1 pay periods (10 days) =	$2,000
Mileage:	200 miles @ 0.44/mile =	$88
Per Diem:	$61/day x 16 days	$976
Data Entry - FACTS	2 Days GS-05	$400
	Total Cost Estimate for FY 2012	**$6,538**

Walker Cabin – Stabilization and Assessment

Complete a Site Record Amendment and re-record site to Office of Historic Preservation standards if additional features are discovered, or if site conditions have changed since the date of original recording. This includes detailed mapping of the site and completion of the site record to current standards including photographing, mapping, and inventory/catalog all surface visible artifacts.

Stabilize the root burn and log burn pits that could potentially destabilize subsurface archaeological deposits. Complete a detailed sketch of the chimney and hearth. Consult with affected agencies, tribes, and interested parties as required under Section 106 of the National Historic Preservation Act; 36 CFR 800.

Walker Cabin Stabilization and Assessment

Item	Unit	Unit Cost	# of Units	Cost
Heritage Resources (GS-11)	Day	$320	6	$1,920
Heritage Resources (GS-9)	Day	$240	10	$2,400
Vehicle	mileage	$1	550	$275
Per Diem	each	$61.00	4	$244
Total Request				$4,839

Known Heritage site assessment

Complete a field inspection of three previously recorded cultural resource sites in September to assess impacts by fire. The fire impact assessment will enable the Sequoia National Forest Program Manager to determine if any of the sites are threatened by erosion or other threats to site integrity, and make preservation treatment recommendations as necessary. The site inspections began during suppression and BAER, but were not completed due to time limitations.
The Forest proposes to:

- Visit each site and complete a Post-Fire Site Inspection Record. Photo-document, map, and GPS all site features damaged by fire.
- Complete a Site Record Amendment and re-record site to Office of Historic Preservation standards if additional features are discovered, or if site conditions have changed since the date of original recording and;
- Prepare treatment plans appropriate to the significance of the resource and level of disturbance or damage, and level of erosion or other degradation consequent to fire effects.

This treatment is intended to enable the Sequoia National Forest to determine cultural resource impacts and determine appropriate management actions. This action is necessary to comply with Section 106 of the National Historic Preservation Act; 36 CFR 800. If unacceptable risks are found and interim BAER report may be submitted to request stabilization funding.

Additional Heritage Assessment – known sites

Item	Unit	Unit Cost	# of Units	Cost
Heritage Resources (GS-11)	Day	$320	2	$640
Heritage Resources (GS-9)	Day	$240	6	$1,440
Heritage Resources (GS-7)	Day	$160	7	$1,120
Vehicle	mileage	$1	375	$188
Per Diem	each	$61.00	10	$610
Total Request				$3,998

Channel Treatments:
N/A

Roads and Trail Treatments:

Trail Stabilization: Coyote Lakes Trail (32E05), Lion Trail (32E02), Newlywed Trail (31E23), Willow Trail (32E04)

In the identified treatment areas all existing water control features such as waterbars, grade stabilizers, etc. should be maintained and repaired to meet Best Management Objectives (BMPs). Additional water bars and grade stabilizers will be installed along steep, mostly straight trail sections where concentrated runoff is likely to occur and where incised (concave) sections of trail exist that will likely channel flow. Approximately 7 miles of trail will need stabilization. This includes sections of the Coyote Lakes Trail (32E05), Lion Trail (32E02), Newlywed Trail (31E23), Willow Trail (32E04)

Objectives of the trail treatments are to minimize trail degradation and off-trail erosion and reduce the potential loss of trail tread that could cause loss of trail recreational use along with expensive trail rebuilding costs. If treatments are not implemented, the trail tread will likely sustain damage that would require repair costs that would likely significantly exceed stabilization costs. In addition, the trails are likely to cause increased watershed efficiency leading to additional stream sedimentation.

Water bar treatments consist of installing both log and rock (rolling dip or berm) structures and rock or log grade stabilizers (checks). Logs will be utilized at the majority of sites from burned trees. Rock and soil will be collected from adjacent sources near work sites (some rock is available). Clear stream channel crossings of debris to increase channel capacity at crossing to allow stream flow to bypass trail and not divert onto trail.

Trail Stabilization Treatment

Item	Unit	Unit Cost	# of Units	Cost
Trail Crew	Day	$3,058	12	$36,696
Heritage monitor/documentation	Day	$460	16	$7,360
Packers	Day	$800	4	$3,200
tree fallers	Day	$500	5	$2,500
Vehicle	mileage	$1	4000	$2,000
Tools and Supplies	each	$1,500.00	1	$1,500
Meals	each	$2,000.00	1	$2,000
Total Request				$55,256

Trail Assessment:

- The BAER team did not visit trail segments in the Northwestern part of the fire area due to time constraints and logistics. There are approximately 7 miles of trails not assessed. A small crew would visit trails in high and moderate burn severity area and storm proof the trail by implementing the following actions:
    - Clear stream channel crossings of debris and increase channel capacity at crossing to allow stream flow to bypass trail and not divert onto trail.
    - Install additional waterbars and grade stabilizers on sections of trail where there is a lack of adequate water controls, using logs, local rock or earthen berms.

Trail Assessment Treatment

Item	Unit	Unit Cost	# of Units	Cost
Trail Crew	Day	$680	4	$2,720
Heritage monitor/documentation	Day	$240	4	$960
Packers	Day	$800	2	$1,600
Vehicle	mileage	$1	250	$125
Tools and Supplies	each	$450.00	1	$450
Meals	each	$250.00	1	$250
Total Request				$6,105

Protection/Safety Treatments:

Hazard signs at trailheads: Install informational/hazard signs at key access points into the fire area. Signs should describe that Forest users are entering a burned area and additional hazards such as rock fall, flooding and trees falling exist. Access points include:

- Summit Trail
- Clicks Creek
- Jerkey Meadow
- Shake Camp
- Lewis Camp

Hazard sign costs

Item	Unit	Unit Cost	# of Units	Cost
GS-5 installer	days	$200	4	$800
Warning Sign Minor (Small 1'x2')	each	$200	5	$1,000
Total Request				$1,800

Interagency Coordination/Implementation Lead: Interagency coordination with Tulare County NRCS (Private Residences in the fire area, primarily Lion Meadow), Funding is requested for agency coordination, BAER Implementation Team lead, and for the Forest BAER Coordinator to ensure continued coordination with cooperating agencies, prompt implementation, and tracking of BAER treatments. The facilitation may include: phone calls, meetings and logistical support for the trail work.

Interagency Coordination/Implementation Lead Costs

Item	Unit	Unit Cost	# of Units	Cost
Interagency Coordinator/Implementation Team Leader	Day	$370	10	$3,700
Total Request				$3,700

I. **Monitoring Narrative:**

Trails

Trail stabilization treatments will be monitored for effectivness in the Spring and Summer of 2012, following the winter and summer storm seasons. Work will be accomplished by walking and documunting the effects of damaging storms on the trail resource.

Heritage

The objective of this plan is to monitor the effectiveness of the emergency treatment measures implemented to protect those cultural resource values at Walker Cabin which were determined to be at risk due to the deteriorated watershed resulting from the Lion Fire on the Sequoia National Forest.

Due to the culturally sensitive nature of the cultural resource values, it is imperative that if the measures do not achieve the desired results, then other measures be implemented at once.

The basis of the monitoring plan will be verification visits utilizing a photo-monitoring program. A minimum of two visits will be utilized. The first visit will be prior to the installation of the structures at which time photographs will be taken from designated points to establish a baseline site condition.

The next visit will occur after the first measurable precipitation event that would be expected to affect those values at risk. Another set of photographs will be taken from the same points, essentially duplicating the first set of photographs. These two sets will be compared to identify any changes in the site condition. The emergency structures will be examined for integrity and effectiveness.

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

			NFS Lands				Other Lands				All
		Unit	# of		Other	# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	BAER $	Initial Assessment	units	$	Units	$	$
				H5BAER	WGD5X4					
A. Land Treatments										
noxious weed detection	EA	6538	1	$6,538	$0		$0		$0	$6,538
Walker Cabin	EA	4,839	1	$4,839	$0		$0		$0	$4,839
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Land Treatments				$11,377	$0		$0		$0	$11,377
B. Channel Treatments										
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Channel Treat.				$0	$0		$0		$0	$0
C. Road and Trails										
Trail stabilization and storm proofing	mi	7,898	7	$55,286	$0		$0		$0	$55,286
Trail assessment	mi	872	7	$6,104	$0		$0		$0	$6,104
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road & Trails				$61,390	$0		$0		$0	$61,390
D. Protection/Safety										
Hazard signs	ea	360	5	$1,800	$0		$0		$0	$1,800
Implementation lead/interagency coordination	day	370	10	$3,700	$0		$0		$0	$3,700
Heritage Sites assessment	ea	1339	3	$4,017	$0		$0		$0	$4,017
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Structures				$9,517	$0		$0		$0	$9,517
E. BAER Evaluation										
Assessment Team	ea	74,364	1	---			$0		$0	$0
Insert new items above this line!				---	$0		$0		$0	$0
Subtotal Evaluation				---	$0		$0		$0	$0
F. Monitoring										
Initial Assessment				$0	$5,000		$0		$0	$5,000
Trails	ea	3,545	2	$7,090						$7,090
Heritage Sites	ea	1586	1	$1,586			$0		$0	$1,586
Subtotal Monitoring				$8,676	$0		$0		$0	$13,676
G. Totals				$90,960	$0		**$0**		**$0**	**$95,960**
Previously approved										
Total for this request				**$90,960**						

PART VII - APPROVALS

1. for Nancy C. Ruthenbeck — Forest Supervisor (signature) — Date 9/1/11

2. for Jeanne Wade Evans — Regional Forester (signature) — Date 9/8/11

Values at Risk Analyses

Fire Name	Lion
Location	Sequioa N.F.
Date	8/27/2011

EACH MAP ZONE REPRESENTS A SYSTEM OF LINKED TREATMENTS AND ASSOCIATED VALUES AT RISK

MAP ZONE A - VALUES AT RISK (VAR)

Map link #	*Life and Safety*	Description

PLEASE NOTE: IF PUBLIC SAFETY IS A FACTOR, B/C RATIO SHOULD NOT BE RELEVANT AND SHOULD STRICTLY BE AN ACCOUNTING EXERCISE

Map link #	*Non-Market: Cultural Values*	Description

Map link #	*Non-Market: Ecological*	Description

Map link #	*Market Values: Direct*	Description	Total
	Lion, Coyote, Newlywed, Willow Trails	Based on cost to replace in-kind if lost	$ 85,000
	Additional Trail assessment	Based on cost to replace in-kind if lost	$ 30,000
			$ -

Map link #	*Market Values: Loss-of-Use*	Description	
			$ -
			$ -
			$ -

Probability of experiencing the loss with no treatment (enter as decimal)	0.80
Source of loss probability with no treatment: Select Source...	
Market Resource Value	$ 115,000

TREATMENT DESCRIPTION

Map link #	*Proposed treatment*	Total
	Waterbars, checks on 7 miles	$ 55,286
	Assess and do touch up work on trails not visited by BAER Team	$ 6,100
		$ -

Probability of experiencing loss if treatment occurs (enter as decimal)	
Source of loss probability with treatment: Select Source...	
Total Treatment Cost	$ 61,386

VAR CALCULATION RESULTS

REDUCTION IN PROBABILITY OF LOSS	0.80
EXPECTED BENEFIT OF TREATMENT	$ 92,000
Expected Benefit/Cost ratio of treatment for market resources only (economically justified if > 1.0)	1.5
IMPLIED MINIMUM VALUE OF PROTECTING NON-MARKET RESOURCE VALUES	$

Comments: These trails are also historic in nature and the treatment will protect and enhance the historic alignment of the trail tread.

Non-Market Values Literature — View Literature

Fire Name	Lion
Location	Sequoa N.F.
Date	8/28/2011

EACH MAP ZONE REPRESENTS A SYSTEM OF LINKED TREATMENTS AND ASSOCIATED VALUES AT RISK

MAP ZONE B - VALUES AT RISK (VAR)

Map link #	*Life and Safety*	Description

PLEASE NOTE: IF PUBLIC SAFETY IS A FACTOR, B/C RATIO SHOULD NOT BE RELEVANT AND SHOULD STRICTLY BE AN ACCOUNTING EXERCISE

Map link #	*Non-Market: Cultural Values*	Description

Map link #	*Non-Market: Ecological*	Description
	Noxious Weeds	Increased noxious weeds decreasing natural vegatative recovery

Map link #	*Market Values: Direct*	Description	Total
			$ -
			$ -
			$ -

Map link #	*Market Values: Loss-of-Use*	Description	
			$ -
			$ -
			$ -

Probability of experiencing the loss with no treatment (enter as decimal)	0.85
Source of loss probability with no treatment: Select Source...	
Market Resource Value	$ -

TREATMENT DESCRIPTION

Map link #	*Proposed treatment*	Total
	noxious weed detection surveys	$ 6,538
		$ -
		$ -

Probability of experiencing loss if treatment occurs (enter as decimal)	0.15
Source of loss probability with treatment: Expert Opinion	
Total Treatment Cost	$ 6,538

VAR CALCULATION RESULTS

REDUCTION IN PROBABILITY OF LOSS	0.70
EXPECTED BENEFIT OF TREATMENT	$ -
Expected Benefit/Cost ratio of treatment for market resources only (economically justified if > 1.0)	
IMPLIED MINIMUM VALUE OF PROTECTING NON-MARKET RESOURCE VALUES	**$ 9,340**

Comments	

Non-Market Values Literature View Literature

Fire Name	Lion
Location	Sequioa N.F.
Date	8/28/2011

EACH MAP ZONE REPRESENTS A SYSTEM OF LINKED TREATMENTS AND ASSOCIATED VALUES AT RISK

MAP ZONE C - VALUES AT RISK (VAR)

Map link #	*Life and Safety*	Description

PLEASE NOTE: IF PUBLIC SAFETY IS A FACTOR, B/C RATIO SHOULD NOT BE RELEVANT AND SHOULD STRICTLY BE AN ACCOUNTING EXERCISE

Map link #	*Non-Market: Cultural Values*	Description
	Walker Cabin	flooding and looting of exposed cultural features
	re-assess known cultural sites	Potential flooding and looting of cultural features

Map link #	*Non-Market: Ecological*	Description

Map link #	*Market Values: Direct*	Description	Total
			$ -
			$ -
			$ -

Map link #	*Market Values: Loss-of-Use*	Description	
			$ -
			$ -
			$ -

Probability of experiencing the loss with no treatment (enter as decimal)	0.90
Source of loss probability with no treatment: Expert Opinion	
Market Resource Value	$ -

TREATMENT DESCRIPTION

Map link #	*Proposed treatment*	Total
	Stabilize root wade and record data from the site	$ 4,839
	Assess post-fire condition of known sites	$ 3,998
		$ -

Probability of experiencing loss if treatment occurs (enter as decimal)	
Source of loss probability with treatment: Select Source...	
Total Treatment Cost	$ 8,837

VAR CALCULATION RESULTS

REDUCTION IN PROBABILITY OF LOSS	0.90
EXPECTED BENEFIT OF TREATMENT	$ -
Expected Benefit/Cost ratio of treatment for market resources only (economically justified if > 1.0)	
IMPLIED MINIMUM VALUE OF PROTECTING NON-MARKET RESOURCE VALUES	$ 9,819

Comments	

Non-Market Values Literature — View Literature