Basin-Indians Fire

Basin Complex CA-LPF-001691
Indians Fire CA-LPF-001491

State Emergency Assessment Team (SEAT)
Report

DRAFT

Affecting Watersheds in Monterey County California

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STATE EMERGENCY ASSESSMENT TEAM (SEAT) REPORT

The scope of the assessment and the information contained in this report should not be construed to be either comprehensive or conclusive, or to address all possible impacts that might be ascribed to the fire effect. Post fire effects in each area are unique and subject to a variety of physical and climatic factors which cannot be accurately predicted. The information in this report was developed from cursory field examination by licensed resource professionals and should be viewed in conjunction with other relevant sources of information. Neither the State of California or any other Agency or Department participating as a member of the State Emergency Assessment Team (SEAT) makes any warranty, express or implied, nor assume any legal liability for the information disclosed herein.

EXECUTIVE SUMMARY

BASIN COMPLEX and INDIANS FIRE

CA-LPF-001649 and CA- LPF-001491

Affected watersheds in Monterey County California

Introduction

An initial State Emergency Assessment Team (SEAT) has been deployed to the Monterey County area to evaluate Values at Risk in the affected burn area of the Basin Complex and Indians Fire. The SEAT had three key objectives:

Rapid post-fire watershed assessment and recovery operations are conducted to:

- Identify on-site and downstream threats to public health or safety from landslides, mudslides, debris torrents, flooding, road hazards, and other public safety hazards from fire related effects.
- Identify threats to resources at risk, including: excessive erosion; impaired water quality; threats to wildlife, fisheries, botanical values; natural and cultural resources.
- Determine measures that may be used to prevent or mitigate identified threats.

The Basin Complex and Indians Fire burned approximately 240,000 acres in the Upper Carmel River, Arroyo Seco, San Antonia, Rat Creek, Big Sur and Little Sur watersheds. Hydrologic conditions vary significantly from the western Coastal Las Piedras Canyon Frontal and Partington Creek Frontal to the eastern watershed areas of Horse Creek-Arroyo Seco and San Antonio River-Mission Creek watersheds. Fires burned High to Moderate soil burn severity for 63,000 acres (33%) of the Arroyo Seco watershed, 45,200 acres (68%) San Antonio River-Mission Creek and Upper San Antonio watershed, 45,000 (76%) Danish Creek-Carmel River and Cachagua watershed, 7,700 acres (36%) Partington Creek Frontal, 31,400 acres (84%) of the Big Sur watershed, and 1000 acres (56%) of the Little Sur River upstream of confluence with South Fork Bridge

SEAT specialists conduct rapid surveys on burned areas to determine if emergency rehabilitation treatment is needed to minimize the risk of threats to human life safety or property. These surveys may be used in conjunction with other relevant, reliable

sources of information to assess if emergency rehabilitation treatment is needed to minimize or prevent deterioration of water quality, minimize loss of soil productivity due to erosion, minimize or prevent degradation of wildlife and botanical habitat, and minimize or prevent degradation of cultural and natural resources. These rapid surveys also facilitate identification of other potential values at risk, and determine if emergency rehabilitation treatment is needed.

The recommendations found in this report are to be used as a guideline for possible mitigation to decrease the possible damages to life and property. It is a rapid initial assessment to disclose Values at Risk. The treatments fall into one of two broad categories. Those treatments which can be considered temporary (short-term) measures designed to be quickly and relatively inexpensively implemented; and long-term treatments designed to facilitate the recovery of the watershed at an accelerated pace while concurrently minimizing the exposure of the values at risk to the threats identified.

The following information summarizes key findings contained in the initial Basin Complex and Indians Fire SEAT assessment.

Loss of Human Life and Property

The principal concern with the Basin Complex and Indians Fire is loss of human life and property due to an increase in the potential for in-channel floods, hyperconcentrated floods, debris torrents, mudsliding and debris flows. Houses and communities near or within stream channels near Big Sur, Tassajara Hot Springs, Arroyo Secco, Carmel Valley Coleman Canyon, and Piney Creek have been specifically identified where significant in-channel floods, hyperconcentrated floods, debris torrents, mudsliding rockfall and debris flows are possible. In addition, possible loss of life resulting from localized debris sliding, debris flows, and sediment laden floods onto individual homes beyond the areas described previously is also possible. For approximate locations of Values at Risk for human life and property see the Technical Specialist Reports and the Risk to Lives and Property Map (Appendix 5-19.)

Watershed Evaluation

The Basin Complex and Indians Fire encroached upon numerous watersheds across approximately 240,000 acres. Where fires burned hot in upper portions of the Tassajara Creek, Arroyo Seco, Big Sur River, Little Sur River, and San Antonio River watersheds the reduction in interception and evapotranspiration from the lack of vegetation may be additionally affected by the development of hydrophobic soils within the fire perimeter. Waxy substances released by volatized plant materials during hot fires follow thermal gradients into the soil and congeal as continuous surfaces in areas of moderate to high soil burn severity. Various levels of hydrophobic solids were found in the high and moderate soil burn severity areas with expected frequency and distribution relative to the moderate and high ratings.

The principal concern with the Basin Complex and Indians Fire is an increase in the potential for in-channel floods, hyperconcentrated floods, debris torrents, mudsliding and debris flows. The primary mechanisms for this are the loss of mechanical support of hillslope materials that was provided by vegetation, and vegetative litter and the development of hydrophobic soils. The increase in runoff resulting from reductions in interception and infiltration, from the simplification of surficial runoff patterns, and from

the loss of mechanical support along stream channels where riparian vegetation was burned will increase the hydrologic response of the watershed contributing to the increase in the potential for in-channel floods, hyperconcentrated floods, debris torrents, mudsliding and debris flows.

It is our understanding that the USDA Forest Service, in concert with the US Geological Survey are developing models to assess the potential magnitudes of post-fire events. These tools and maps should be shared with the public and OES representatives and available online at www.oes.ca.gov but were not available at the time of this report.

Values at Risk

In general, as a result of the fire and the burn severity previously discussed there is an increased risk for storm events to result in flooding, debris torrents, mudsliding and debris flows. As storm intensity increases or as duration rises, there will be an increased elevation in risk for the storm event to trigger flooding, rockfall, debris torrents, mudsliding and debris flows.

A. Threats to Human Life, Property, and Infrastructure

As a result of the burn severity, reduction in vegetation, and development of hydrophobic soils, the impact to houses and the associated human occupancy, other property (e.g. campgrounds, barns, stables, water tanks, etc.) and infrastructure (e.g. roads, bridges, culverts) located within or adjacent to the fire perimeter are at an increased risk to the threat of flooding, mudsliding, debris torrents, rockfall, and debris flows. This threat includes the loss of life and property. This risk is greatest along the California Highway 1 corridor, Tassajara Hot Springs, Big Sur resort area, residential communities within Arroyo Secco, Piney Creek, Carmel Valley, Pico Blanco Scout Camp, Coleman Canyon, and Andrew Molero, Julia Pfeiffer, and Pfeiffer Burns State Parks.

B. Threats to Water Quality

As a result of the fire and the impacts from the loss of vegetation and soil burn severity evaluation of watersheds, reservoirs, streams, and other water resources located within or near the fire perimeter are at an increased risk to the threat of flooding, rockfall, debris torrents, mudsliding and debris flows, sedimentation, and chemical pollution. The risk is greatest to Tassajara Hot Springs, Big Sur, Arroyo Secco, Carmel Valley, Pico Blanco Scout Camp, Coleman Canyon and Piney Creek.

C. Threats to Recreational Resources

As a result of the fire and the impacts from the loss of vegetation and burn severity evaluation of watershed, recreational resources such as hiking and biking trails are at an increased risk to the threat of flooding, rockfall, debris torrents, mudsliding and debris flows. Additionally, the removal of vegetation due to the fire or the associated suppression activities may result in the creation of new, unofficial trails in the burn area. These new trails, if not monitored or prevented, or mitigated with erosion control measures, could result in increased erosion. This risk is greatest on County and State Park lands and other lands within the fire perimeter where public access is not controlled.

D. Threats to Wildlife, Botanical Values, and Fisheries

As a result of the fire and the impacts from the loss of vegetation and burn severity evaluation biological, botanical, and fisheries habitat is at an increased risk to the threat of flooding, debris torrents, mudsliding and debris flows, sedimentation, and chemical pollution. Suppression activities (e.g. “dozer lines”) have also contributed to the current risk to biological, botanical, and fisheries habitat. The risk is greatest for those areas of the Basin Complex and Indians Fire which contain habitat for state and federally listed rare, endangered, or threatened species, state species of special concern, and “covered species” identified the Technical Specialist Report.

E. Threats to Cultural Resources

As a result of the fire and the impacts from the loss of vegetation and burn severity evaluation of watersheds natural and cultural resources are at an increased risk to the threat of flooding, rockfall, debris torrents, mudsliding and debris flows. Additionally, there is an increased risk of the exposure of cultural sites as a result of the fire or the associated suppression activities removing protective vegetative cover. Pre-field work assessment and research revealed the greatest risk from the fire is to those cultural sites that have been exposed as a result of the fire or the associated suppression activities that could be vandalized or otherwise compromised.

Area Burned

The 162,818 acre Basin complex started as the result of lightning strikes near Big Sur, in Monterey County on June 21, 2008, and was declared 100% contained on July 27. The 76,554 acre Indians Fire started as the result of human cause northwest of Fort Hunter-Liggett Military Base, also in Monterey County, on June 8, 2008, and was declared 100% contained on July 10, 2008. The two fires eventually converged along the southeast end of the Basin Complex to form the Basin Complex and Indians Fire, totaling 239,372 acres to date, the third largest fire event in California history.

Landowners affected by the fire complex include:

Los Padres National Forest, California State Parks, City, County, or Regional Park/Open Space, California State Lands Commission, California Dept. of Fish and Game, Bureau of Land Management, Department of Defense, Private Lands

Soil Burn Severity

Soil burn severity does not depict a value but rather describes a continuum from an unburned forest floor to one in which fire has appreciably altered the physical and biological conditions of the forest floor. Soil Burn Severity on the Basin Complex and Indians Fire has been determined to be as follows:

High:	23%	55,056 ac
Moderate:	37%	88,568 ac
Low to unburned:	39%	93,355 ac

High Severity

a. Hydrophobicity—soils are strongly water repellant; they will repel water for greater than 40 seconds. Very strongly hydrophobic soils may repel water for several minutes or longer. Hydrophobicity may be from the soil surface downward, from about 1/8 of an inch in depth to many inches, or it may begin below surface.
b. Organic Ground Cover Density—less than 20% cover of litter, duff, or woody debris remains. Often fully consumed in very high severity burns.
c. Vegetation—Trees: crowns fully burned, no needles or leaves remaining. Some or many branches may be consumed. Brush: crowns partially or fully volatilized; no leaves remaining. Herbaceous plants: usually fully consumed, often including roots and sometimes, residual seed.

Moderate Severity

a. Hydrophobicity—soil will repel water for 10-40 seconds. Longer than that is strong hydrophobicity; less than that is weakly hydrophobic.
b. Organic Ground Cover Density—Approximately 20-50% density.
c. Vegetation—Trees: crowns remain but needles/leaves are singed to the extent that more than 50% of the crown is discolored (i.e., the crown of a pine tree has more than half to all the needles browned by fire). Brush: crowns remaining but leaves mostly discolored by burn. Herbaceous plants: mostly consumed, but patches remain.

Low Severity

a. Hydrophobicity—soil will repel water for less than 10 seconds. Often water will infiltrate within a second or two.
b. Organic Ground Cover Density—greater than 50% density. Often the fire will consume only fine woody debris and scorch the surface of a duff layer.
c. Vegetation—Trees: crowns remain. Fire will often only scorch the tree bole and perhaps a few lower branches on smaller trees. All or nearly all the crown will remain green. Shrubs: mostly unburned, but some scorching may be present on lower parts. Herbaceous plants: usually singed or partially burned, but will recover.

Derived from **(FRAZIER 1989).** (See Parsons (2003) for more detailed descriptions.)

Summary

The fire and the resultant impact to the values at risk previously discussed have a increase risk for storm events to result in flooding, rockfall, debris torrents, mudslides and debris flows. As storm intensity or duration rises, there will be an associated increased elevation in risk for the storm event to trigger flooding, mudslides, rockfall, debris torrents, debris flows, and sedimentation. The threat posed by flooding, mudslides, debris torrents, and debris flows includes the loss of life and property. All values at risk identified could be adversely affected.

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Introduction

The State Emergency Assessment Team (SEAT) objectives have been to take appropriate action to ensure the protection of life, property, environment, natural, and cultural resources within the State Responsible Areas (SRA) of California. Through maintaining communication and partnering with multiple State agencies across California, SEAT has developed mitigations and recommendations to address the needs of communities, local cooperators, home owner associations, city and county municipalities. In an unprecedented effort to protect life, property, environment, natural and cultural resources within the State due to wildfires for the 2008 fire season a SEAT report has been developed to disclose the findings of the SEAT assessment.

Geology

I. Resource Condition Assessment:

A. Resource Setting

The Basin Complex and Indians Fires comprised an approximately 240,000 acre burn area located within the Coast Ranges geomorphic province. The area contains several major bedrock units in two main structural blocks, both of which are situated west of the San Andreas Fault (Jennings and Strand, 1958, Appendix 1). The Salinian block, which lies between the San Andreas Fault and the Sur-Nacimiento fault, is composed of Paleozoic metamorphic rocks (Sur Series), and Mesozoic granitic rocks. West of the Salinian block is an unnamed block containing rocks of the Franciscan Complex. The Franciscan Complex is locally comprised of predominately greywacke and minor amounts of volcanic rocks which have been metamorphosed to varying degrees. All bedrocks units are overlain by tertiary sedimentary rocks and quaternary deposits. A description of the geologic units within the Basin Complex and Indian fire area is included in the legend to the Geologic Index Map (Figure 1)

B. Findings

The principal concern with the Basin Complex and Indians Fires is the resulting increase in the potential for in-channel floods, hyperconcentrated floods, debris torrents, and debris flows. The primary mechanisms for this are the loss of mechanical support of hillslope materials that was provided by vegetation and vegetative litter. The increase in runoff resulting from reductions in interception and infiltration, from the simplification of surficial runoff patterns, and from the loss of mechanical support along stream channels where riparian vegetation was burned. Where fires burn hot, such as in upper portions of the Tassajara, Arroyo Seco, Big Sur, Little Sur, and San Antonio watersheds the reduction in interception may be affected by the development of hydrophobic soils where waxy substances released by plant materials during hot fires follow thermal gradients into the soil and congeal as continuous surfaces in areas of moderate to high soil burn severity..

The communities of Sleepy Hollow, Camp Stephaney, Robles Del Rio Along the River, Garza Baroda, Carmel Valley Ranch, Robinson Canyon, Schulty Bridge, Valley Greens, Rancho San Carlos are downstream from the 30,000 acres of the Carmel River watershed. Although the Los Padres and San Clemente Dams separate these communities from much of the burn area, it is understood that Los Padres dam has lost roughly half of its capacity from previous flooding, and

that San Clemente Dam is filled with sediment and is structurally impaired. The communities of Greenfield and Salinas lie below the burned portion of the Arroyo Seco drainage (approximately 106,037 acres burned). Fort Hunter Liggett is downstream from the 30,000 acres of the San Antonio watershed that burned. Tassajara Hot Springs and Monastery, residential communities along Arroyo Seco River and Piney Creek, and resort areas along the Big Sur River drainage (including Highway 1 itself) appear to be in positions where sudden hyperconcentrated floods, debris torrents, debris flows, and rock fall pose a significant risk to lives. Because most of these areas are inhabited year-round, we believe these areas constitute an exigency, **a sudden crisis involving a high risk to life that requires immediate action.** We believe that inaction may and can lead to the loss of life on the order of many tens in these areas. The magnitude of post-fire damage will be determined by the intensity and duration of storms that impact the area.

In addition to the near-channel sites described above, Geology team members inspected houses, State Parks, campgrounds, businesses, and other sites within and down slope from the burn area to evaluate potential risks from near-site (localized) debris flow, rock fall, floods, and other geologic hazards that may not be identified in the regional evaluation. Over two hundred at-risk sites, some with multiple homes, identified as having potential risks to lives or property are identified and listed in Appendix 1 of the Technical Specialist Report.

II. Emergency Determination

The values at risk considered in this assessment include the possible loss of life and property due to landsliding, debris flow, rockfall, debris torrents, and flooding from increased surface water runoff. In general, the risk from landslides, debris flows and rock falls are possible where roads, residences or other development are located within and/or adjacent to canyon stream channels or on alluvial fans, colluvial, footslopes and debris flow deposits. It should be noted that these hazards are part of the natural processes in this environment, and that these risks were present under pre-fire conditions. Many existing structures in the burn area have been and will continue to be at risk from these hazards.

III. Treatments/Recommendations

a) The site-specific observations included with the Technical Specialist review should be considered in any emergency response plan developed by emergency agencies. Monterey County, Monterey County Water Resources Agency, Department of Public Works, Sherriff's Department, Fire Department, and Office of Emergency Services; Police, Fire, Public Works, and Emergency Services Departments for cities that could be affected by post-fire floods and debris flows; the Natural Resources Conservation Service, and any other responsible party should be made aware of the potential hazard to lives and property in and downstream from the fire area, especially downstream of the Arroyo Seco, Piney Creek, Carmel Valley River, Tassajara, and Big Sur watersheds. Emergency response plans, including early warning systems and evacuation plans, should be developed by responsible agencies. Modeling being conducted by the U.S.D.A. Forest Service and the US Geological Survey, and the site-specific observation included with this review should be considered in any emergency response plan develop by emergency agencies.

b) Post-fire flooding potential information being developed by the U.S.D.A. Forest Service should be used to evaluate risks to lives and properties near stream channels in and near the Basin Complex and Indians Fires burn area.

c) The existing county road drainage systems should be inspected by the appropriate controlling agency to evaluate potential impacts from floods, hyperconcentrated floods, debris torrents, debris flows and sedimentation resulting from winter rains. It is understood that Carmel Valley Road, Arroyo Seco Road, and Tassajara Hot Springs access road are all roads controlled by Monterey County.

d) Campgrounds and hiking trails should be signed and seasonal use should be restricted as needed by the responsible agencies and/or private organizations to protect campers and hikers and potential risks should be disclosed.

e) The sites identified in Appendix 1 of the Technical Specialist Geology review should be evaluated by Professional Geologists or Professional Engineers with experience in slope stability and debris flow hazard identification and mitigation to fully document the scope of the problems at each site.

Discussion: There are two main risks to lives from a geologic perspective; 1. possible loss of life resulting from catastrophic debris flows onto communities built at the bottom of large drainages (Tassajara Creek, Arroyo Seco, Big Sur River, Little Sur River, Carmel Valley River, and San Antonio watersheds), and 2. possible loss of life resulting from localized debris sliding, debris flows, and sediment laden floods onto individual homes identified in Appendix 1 of the Technical Specialist Geology review. Risks to property and infrastructure include county roads, State Highways, water systems, and residential property. The primary recommendation to mitigate these risks is to inform and educate the individual homeowners, affected communities, local emergency agencies (Monterey County), and policy makers of the risks at hand. Mitigations such as evacuation procedures, warning systems, and site specific mitigations can then be developed and implemented.

References – See attached Geology Tech. Report

Hydrology

Resource Condition Assessment

I. Resource Setting

The Basin Complex and Indians Fire burned approximately 240,000 acres in the Upper Carmel River, Arroyo Seco, San Antonia, Rat Creek, Big Sur and Little Sur watersheds. Hydrologic conditions vary significantly from the western Coastal Las Piedras Canyon Frontal and Partington Creek Frontal to the eastern watershed areas of Horse Creek-Arroyo Seco and San Antonio River-Mission Creek. Recorded annual rainfall rates and durations for the coastal frontal and Big Sur areas are generally more intense and shorter duration inside than the eastern burned areas in the Arroyo Seco and San Antonio watersheds. Elevations range from 200 feet above sea level around the coastal frontal to the inner area to Cone Peak at 5100 feet. A rain on snow events is unlikely within the burn perimeter. Big Sur and the Coastal Frontals have no known record of snow events while higher areas around the peaks may accumulate snow and

typically melt within in a few days. Slopes vary from 50% to 90% throughout the watersheds to the most severe slopes of 80 to 100% along the Coastal Frontal ranges. Fires burned High to Moderate burn severity for 63,000 acres (33%) of the Arroyo Seco watershed, 45,200 acres (68%) San Antonio River-Mission Creek and Upper San Antonio watershed, 45,000 (76%) Danish Creek-Carmel River and Cachagua watershed, 7,700 acres (36%) Partington Creek Frontal, 31,400 acres (84%) of the Big Sur watershed, and 1000 acres (56%) of the Little Sur River upstream of confluence with South Fork Bridge.

II. Findings of the On-The-Ground Survey

Fires consumed multiple watersheds with large areas of High to Moderate burn intensities consuming large areas of vegetative material and large woody debris. These high to moderate burns the SEAT team performed multiple tests validating the formation of a strong hydrophobic layer depicted by the Burned Area Reflectance Map. Past burns were described in detail by local residences and provided photos and anecdotal evidence validating past burn events and the potential for severe flooding, debris flows.

Values at Risk

Multiple threats to life and property vary from high to low in or around the burned areas from flash floods, severe flooding, and debris flows. Private and municipal water systems, pumping structures, water intakes, and motors are a significant risk of damage from debris, sediments, and severe flooding. Multiple structures including private and commercial buildings, bridges, culverts, communication lines, and farm equipment situated within the potential high water mark for severe flooding. County and State road systems around or in burned areas are or may be damaged from dry ravel, overtopping, and destruction by severe flooding. County ALERT systems have sustained significant damage by the fire and are likely unable to detect significant rainfall events that may trigger severe flooding events.

Emergency Determination

The possibility and likelihood of increased runoff and debris flow during rain events puts all resources at risk. Immediate preventive action should be taken to prevent possible risk to life and property.

Treatments to Mitigate the Emergency

Treatment Type

ALERT Early warning systems/Evacuation plans.

Special consideration for state agencies and private property owners for rapid approval of in-stream alteration permits required for vegetation thinning and/or preventive maintenance in areas above constrictions, culverts, narrow stream channel, bridges, or other areas that flooding may be restricted and/or potentially cause damage to surrounding life and property.

Coordination between state and local officials to develop an emergency action plan for severe flooding in the areas of Arroyo Seco, Carmel, Partington Creek Frontal, Big Sur, and San Antonio areas.

Treatment Objective

Protect life, property, and natural and cultural resources

Discussion/Summary/Recommendations

Expect higher than normal flows with possible debris flow in all rain events. The higher the rainfall intensity the higher the risk for significant severe flooding and debris flow throughout all burned areas and potentially miles downstream damaged watersheds.

References – See attached Hydrology/Engineering Tech. Report

Soils

Resource Condition Assessment

I. Resource Setting

The 162,818 acre Basin Complex and 76,554 acre Indians Fires burned federal, state, and private lands.

II. Observations

Evaluations for Big Sur Coast from Andrew Molera State Park south to Dolan Canyon and Arroyo Seco include

- Multiple home sites businesses, structures, fish and amphibian passage are threatened by apparent debris flows, mud slides, flooding, and rock fall.

- The agricultural lands on the Arroyo Seco Creek alluvial fan at the base of the Santa Lucia Mountains may be at risk from debris flow and mud slides.

III. Recommendations

- Structures downstream of areas threatened by debris flow, mud flows, rock fall, flooding, and any other type of landslide should not be occupied during storm events. Individual emergency plans and local evacuation plans are needed. Please refer to the Geological Technical Report included in the compiled SEAT report.

- Locations assessed as high risk to human life and safety should be followed up with site-specific investigations by the appropriate licensed professionals.

References – See attached Soils Tech. Report

Wildlife

I. Resource Condition Assessment

A. Resource Setting

The area burned by the Basin Complex and Indians Fires contains habitat for several Federal and State listed endangered or threatened species, state species of special concern, and many common wildlife species.

B. Findings of the On-The-Ground Survey

Many wildlife species, including endangered species, have been significantly impacted by the fires, but most of the native wildlife in the area (including the endangered species) has evolved to live in a fire-adapted ecosystem and over time they are likely to recover.

Emergency Determination

Emergency actions are not recommended for wildlife habitat and species recovery at this time, but recommendations have been made for treatments and monitoring that may be conducted to improve endangered species habitat and to document the effects of the fires on wildlife.

Treatments to Mitigate the Emergency

- Habitat restoration
- Population surveys and monitoring
- Coordinate with local wildlife experts/agencies on treatments

Treatment Objective

- The treatments objectives are to monitor wildlife populations effected by the fire to identify potential decline in populations and encourage adaptive management.

Treatment Description

- Survey and monitor impacted wildlife populations
- Restore native habitats when and where appropriate

References – See attached Wildlife Tech. Report

Botany

I. Resource Condition Assessment

Resource Setting

The Basin Complex and Indians Fires burned shrubland, forest, woodland, and grassland in Monterey County from the Big Sur coast to the western edge of the Salinas Valley.

Findings of the On-The-Ground Survey

Values At Risk

Botanical values at risk include rare plant species and natural communities.

Condition of Values At Risk

The rare plants and natural communities should recover from the fires naturally. Human activities post-fire present the greatest threat due to the potential for damaging rare plants, inhibiting regeneration of native plants, introducing invasive weeds, and spreading Sudden Oak Death.

Emergency Determination

Emergencies to botanical resources related to the Basin Complex and Indians Fires fall into three major categories: 1) threats to rare plants from the fire itself and from post-fire treatments implemented to protect other values, 2) loss of natural community integrity due to invasive weeds and potential post-fire treatments that inhibit natives, and 3) spread of Sudden Oak Death to uninfected areas.

Treatments to Mitigate the Emergency

Treatment Types (including monitoring if applicable)

- Minimizing intervention and disturbance
- Restoration of endangered species habitat
- Pre-activity surveys
- Dozer line remediation
- Invasive weed detection surveys
- Weed control
- Monitoring
- Vehicle inspections
- Wash stations

Treatment Objectives

The treatment objectives are to protect rare plants and rare natural communities from human-caused disturbance, to promote native plant re-colonization of burned areas and dozer lines, to curtail invasive weed infestations in their incipient stages, and to avoid spreading Sudden Oak Death into currently uninfected areas.

Treatment Descriptions

Recommended treatments to mitigate the emergency include pre-activity surveys prior to ground disturbance in known rare plant habitat, avoidance of seeding and mulching to the greatest extent possible, surveys for invasive weeds in key areas and prompt weed control, and cleaning vehicles and boots before leaving areas with severe infestations of Sudden Oak Death.

Treatment Cost

Costs will not be incurred if seeding, mulching, and similar measures are avoided as recommended.

Discussion/Summary/Recommendations

The greatest threat to rare plants and natural communities from the Basin Complex and Indians Fires is related to human-caused disturbance post-fire. Disturbance of rare plant habitat should be minimized if it cannot be avoided. Seeding and mulching are discouraged because they may inhibit natural recolonization of native species and introduce weeds. Additional measures are recommended to avoid the expansion of existing weed populations and the spread of Sudden Oak Death to new areas, particularly those outside of Monterey County.

References – See attached Botany Tech. Report

Fisheries

Resource Condition Assessment

Resource Setting

This assessment is an evaluation of marine resources and fishery habitat in burn areas. The areas evaluated are located along the Big Sur Coast from Andrew Molera State Park south to Dolan Canyon, the Arroyo Seco Creek area west of Greenfield, and south to the Fort Hunter Liggett area.

Survey Methods

Field surveys were conducted by biologists from August 12th through August 21st, 2008. The prime areas examined during this study were the State Parks, State Reserve, Boy Scout camp, Arroyo Seco drainage, and sites along Highway 1. Local biologists with knowledge of the wildlife resources along the Big Sur coast were consulted for additional information.

Resource Condition after Fire

The intense heat of a fire can form a water repelling (hydrophobic) layer in the soil. The waxy substance, from burning plant material, penetrates the soil as a gas and solidifies around the soil particles after it cools. The severity of erosion is influenced by rate, duration and amount of rainfall. There is a strip of highly erodible soils along the western edge of the fire on the slopes above State Highway 1. The Tassajara and Arroyo Seco Creek areas also contain some highly erodible soils on the hillsides.

Recommendations

Critical habitat must be monitored for restoring pre-burn conditions. Typical life stages for steelhead trout in an inland environment include spawning migration, spawning, year-round rearing and emigration. Similarly coastal species and their habitat should be monitored and evaluated for before adverse impacts occur in order to record damages due to excessive runoff

and related pollution. Studies should be conducted to assess long-term population impacts from the fire. Population surveys and long-term monitoring studies must be conducted in the drainage and coastal area. Methods for recovery should be coordinated with the Department of Fish and Game. (Please refer to 'Technical Specialist's Report' for contact information)

References – See attached FisheriesTech. Report

Natural and Cultural Resources

Resource Setting

The 162,818 acre Basin Complex Fire and 76,554 acre Indians Fire perimeter includes hundreds of previously recorded cultural resources.

A. Survey Methods

Field surveys were conducted by biologists from August 12th through August 21st, 2008. The prime areas examined during this study were the State Parks, State Reserve, Boy Scout camp, Arroyo Seco drainage, and sites along Highway Cultural resources in the areas of the Basin Complex and Indians Fires were examined on state and private land

B. Resource Condition after Fire

Numerous sites were visited and evaluations of the condition of these sites were documented. The most likely threats to cultural resources as a result of these fires are from erosion, vandalism, slides, and flooding. Additional threats could come from Hazard trees and exposure to the elements (such as a partially damaged building).

Emergency Determination:

Several cultural resources have been determined to be at-risk in this assessment, due to the effects of the fire including increased risk of erosion, vandalism, and slides.

Treatments to mitigate the emergency

Inventory, monitoring, covering, signing, check dams, armoring, bracing, and removing hazards.

Discussion/Summary/Recommendations:

There are direct and indirect effects from fire. Often indirect after-effects of the fire are greater potential threats to cultural resources than the direct effects.

Treatment Objective:

Lessen or mitigate the potential impacts to cultural resources.

Treatment Description:

Each treatment aims at reducing the potential adverse impacts to the cultural resource.

DRAFT TECHNICAL SPECIALTIST'S REPORT
STATE EMERGENCY ASSESSMENT TEAM (SEAT) Report

Resource: Geology

Fire Name: Basin Complex CA-LPF-001649 August 2008
Indians Fire CA-LPF-001491

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I. Resource Condition Assessment

A. Resource Setting

The Basin Complex and Indians Fires comprised an approximately 240,000 acre burn area located within the Coast Ranges geomorphic province. The area contains several major bedrock units in two main structural blocks, both of which are situated west of the San Andreas Fault (Jennings and Strand, 1958, Figure 1). The Salinian block, which lies between the San Andreas Fault and the Sur-Nacimiento fault, is composed of Paleozoic metamorphic rocks (Sur Series), and Mesozoic granitic rocks. West of the Salinian block is an unnamed block containing rocks of the Franciscan Complex. This area was attached to the North American Plate along a series of boundary faults, one of which is inferred to be the Sur-Naciemento fault. The Franciscan Complex is locally comprised of predominately greywacke (sandstone with sand-sized material containing abundant feldspar and rock fragments with a matrix of silt and clay) and minor amounts of volcanic rocks, some of which include evidence that they were extruded in a deep marine environment. The rocks of the Franciscan Complex have been metamorphosed to varying degrees. All bedrocks units are overlain by tertiary sedimentary rocks and quaternary deposits. A description of the geologic units within the Basin Complex and Indian fire area is included in the legend to the Geologic Index Map (Figure 1).

Wills and others (CGS, 2001) have mapped landslide deposits throughout the western margin of the burn area along the Highway 1 corridor. These deposits include chaotic mixtures of soil and rubble and displaced bedrock blocks (debris slides, rock slumps, or earth slumps). Landslides, whether active or inactive, may be adversely affected as a consequence of the

fires removing the conifer and chaparral canopy and the loss of the reinforcing effect of roots.

Topography within the burn area ranges from gentle to very steep, with elevations ranging from approximately 200 above mean sea level along the western margin of the fires to over 5100 feet where the fires burned near Cone Peak. The burn area lies below the elevation generally subject to rain-on-snow events, although snow may occasionally fall near the higher peaks. Much of the mountainous interior of the burn area drains into watersheds that discharge into the Big Sur River, Little Sur River, Carmel Valley River, Tassajara, Arroyo Seco River, San Antonio River, and the Partington Creek Frontage (west facing slopes along the southwest portion of the burn area that drain into the Pacific Ocean via numerous west-flowing watercourses).

A. Survey Methods

A helicopter reconnaissance of the eastern and central portions of the burn area was conducted on August 12, 2008 (because of fog, the western part of the area could not be evaluated from the air).The purpose of the flight was to identify areas of high value that were at potential risk due to the effects of the fire. High value areas are defined as locations that are at risk for possible loss of life and property due to in-channel floods, hyperconcentrated floods, debris torrents, debris flows, slope-generated landslides, rock fall, and associated slope movement. Areas that contained concentrations of homes, businesses, State Parks, and public infrastructure received the greatest attention. Following the initial reconnaissance, road and foot inspections were conducted in the high value/high risk areas from August 12 to 19, 2008. It should be noted that the majority of the interior of the burn area is in the Los Padres National Forest where campgrounds, trails, and scattered cabins were surveyed by the USDA Forest Service Burn Area Emergency Response (BAER) team. Road-related features, such as culverts and bridges, were surveyed at major drainage crossings. It is understood that Cal Trans is surveying and identify road-related high-value sites along Highway 1.

I. General Observations

The principal concern with the Basin/Indians Fire area is an increase in the potential for in-channel floods, hyperconcentrated floods, debris torrents, and debris flows. The primary mechanisms for this are:

- Increases in runoff resulting from the loss of live vegetation,
- Reductions in infiltration due to the removal of duff and the dehydration of the soil,
- Development of hydrophobic soils,
- The simplification of surficial runoff patterns, and
- The loss of mechanical support of hillslope materials that was provided by vegetation and vegetative litter along stream channels.

In the upper portions of the Tassajara, Arroyo Seco, Big Sur, Little Sur, and San Antonio watersheds, the fires burn hot and hydrophobic soils have developed (waxy substances released by plant materials during hot

fires which have congealed within the soils as continuous surfaces). Dry ravel (downslope mobilization of loose bedrock, soils, and sediment wedges accumulated behind vegetation consumed by the fire) was observed on very steep slopes at numerous locations within the burnt headwaters. This loose material may become mobilized into sediment laden masses during heavy rains (debris flows and debris torrents) that may flow downstream from the watershed headwater source areas. The magnitude of post-fire damage will ultimately be determined by the intensity and duration of storms that impact the burn area, particularly during the winter of 2008-09.

a) <u>County Road System and Highway 1 Infrastructure</u>

Numerous bridges, culverts, and other watercourse crossings are located along county roads, USFS roads, and Highway 1. Many crossings will likely be impacted by sediment laden floods, debris flows, and debris torrents. At risk roads identified by the SEAT team include: Carmel Valley Road, Arroyo Seco Road, and the Tassajara Hot Springs access road. These roads are described in specific observations section (below). It should be noted that it is beyond the scope of the SEAT team assessment to identify every risk associated with the entire county road system. It is understood that CalTrans is conducting a detailed survey that identifies road-related high-value sites along Highway 1.

b) <u>Downstream Impacts (flooding, sedimentation, debris flow)</u>

The communities of Sleepy Hollow, Camp Stephaney, Robles Del Rio Along the River, Garza Baroda, Carmel Valley Ranch, Robinson Canyon, Schulty Bridge, Valley Greens, Rancho San Carlos are downstream from the 30,000 acres of the Carmel River watershed that burned. Although the Los Padres and San Clemente Dams separate these communities from much of the burn area, it is understood that Los Padres dam (Map Point 1606) has lost roughly half of its capacity from previous flooding, and that San Clemente Dam (Map Point 1607) is filled with sediment and is structurally impaired. Because the headwaters above the Los Padres Dam experience high and moderate burn severity, there appears to be a possibility of increase runoff, flooding, and sedimentation to Los Padres Dam and the downstream San Clemente dam. If San Clemente Dam were to fail, it would likely lead to flooding and debris flows that could impact down steam communities and infrastructure.

The communities of Greenfield and Salinas lie below the burned portion of the Arroyo Seco drainage (approximately 106,037 acres burned). Fort Hunter Liggett is downstream from the 30,000 acres of the San Antonio watershed that burned. It is anticipated that flooding and sedimentation is likely to occur in these drainages during heavy winter and spring rains. The resulting downstream sedimentation and flooding may impact infrastructure (for example agricultural systems, seepage systems, pumps, water lines, roads, watercourse crossings).

Tassajara Hot Springs and Monastery, residential communities along Arroyo Seco River and Piney Creek, and resort areas along the Big Sur River drainage (described in specific observations below) appear to be in positions where sudden hyperconcentrated floods, debris torrents, debris flows, and rock fall pose a significant risk to lives. Because most of these

areas are inhabited year-round, we believe these areas constitute an exigency, *a sudden crisis involving a high risk to life that requires immediate action*. We believe that inaction may and can lead to the loss of life on the order of many tens in these areas. The magnitude of post-fire damage will be determined by the intensity and duration of storms that impact the area.

c) Impacts to Sewage Systems

Impacts to sewage systems are likely to occur in effected waterways. Increases in water velocity and sediment loads may result in erosion and/or destruction of leach lines, septic tanks and associated plumbing. Releases of raw sewage into the waterways may occur through rupture or flooding of the sewage systems. Said releases will result in increased bacteria levels within the streams which may in turn result in impacts to water supply wells situated along the waterways.

d) Areas Not Assessed.

Several private in holdings and cabins reside in the interior of the burn area that are not accessible because they are gated or do not have a passable road allowing access (for example cabins located in the “Caves” area along Church Creek, the “English” cabin in Pine Valley, and Bear Valley in the San Antonio watershed). Additionally several homes along the western front of the burn area (for example along the Big Sur and Partington Ridge drainages) were gated and inaccessible.

III. Specific Observations

Houses and other high-value sites within and down slope from burned areas were assessed to evaluate potential risks from near-site debris flow, rock fall floods, and other geologic hazards. Structures (houses, resorts, campgrounds, and monastery) and infrastructure (roads, highways) near, within, and or downstream of large watersheds appear to be in positions where they may be affected by significant in-channel floods, hyperconcentrated floods, debris torrents, and debris flows. It is our understanding that the Federal BAER team, USDA Forest Service, and the US Geological Survey are developing models to assess the potential magnitudes of post-fire events. At risk sites, some with multiple homes, that were identified as having potential risks to lives or property are listed and briefly described below and summarized in Appendix 1 (Hazard Location Summary Sheet). The locations of the sites are shown on Figures 2 through 6.

Tassajara Hot Springs and Monastery.

Map Points: 624, 625, 626, 688, 689, 690

Of particular concern is the Tassajara Hot Springs and Monastery. The site is located at the bottom of an active inner gorge area with steep (nearly vertical) highly fractured rock walls. Rockfall, dry ravel and deposits from previous debris flows and torrents was observed impacting the site during our visit.

Photographs and anecdotal evidence obtained and viewed during our visit suggest the site is subject to flooding, debris flows, and rock fall during heavy rains. It is anticipated that the effects of the high and moderate burn severity in the headwater areas that drain to the area will increase and magnify the size and intensity of flooding, rock fall, and debris flows as a function of the severity of this winter and spring rains. The unpaved county road that accesses the area is bermed, insloped, and contains numerous watercourse crossing that appear to be fords or culverts. Most of the watercourses above the crossings appear to have a high burn severity and contain stored boulders and loose materials. Burnt wood cribbing was observed at various locations along the outside edge of the road fill and it is considered unlikely that these areas will be able to support fill materials when wetted from winter rains. This suggests that the county road may be impacted by debris flows, flooding, and fill failures and will likely be impassable after a heavy rain. As such, access to the hot springs and monastery may be cut off, making evacuation difficult.

a.) Residential developments in the Arroyo Seco and Piney Creek Drainage.

Map Points: 600-623, 631-639, 642

Many residential communities, trailer parks, and campgrounds are located on the floodplains of affected drainages (for example; Sycamore Flat, Grandmas Flat, Millers Flat, Oak Flat, Arroyo Seco Resort, Arroyo Seco campgrounds, and residences located along Piney Creek). Impact to the communities, parks, and campgrounds from increased flooding and sediment laden flooding resulting from increased runoff from the burnt watersheds appears likely. Several residences are on the opposite side of the watercourses from the county roads and are accessed via low water bridges or fords. If the crossings are flooded evacuation may be difficult. County road G-14 crosses the Arroyo Seco at map point 642 with an older-appearing one lane bridge. The bridge appears high in the drainage and is supported by a foundation column situated in the center of Arroyo Seco waterway. This foundation column may be undermined via scour during a large flood event.

b.) Resort areas along the Big Sur River drainage.

Map Points: 651-658, 1603, 1604

Private campgrounds, cabins, resorts, shops, and other businesses are located along the bottom of Big Sur Drainage. Photographs and anecdotal evidence obtained and viewed during our visit suggest the site is subject to flooding, debris flows, and rock fall during heavy rains following fires. Cleveland (1973) documents flooding and damaging mudslides that occurred after the 1972 fires in the Big Sur watershed. It is anticipated that the effects of the high and moderate burn severity in the watersheds (Pheneger Creek, Juan Higuera Creek, Pfeiffer Redwood Creek, Upper Big Sur River) that drain to the developed Big Sur area will increase and magnify the size and intensity of flooding and mud flows depending on the severity of winter and spring rains.

c.) Pico Blanco Boy Scout Camp Infrastructure.

Map Points: 659-664.

The Pico Blanco Boy Scout camp is located at the base of the headwaters of the Little Sur River which experienced high and moderate burn severity. Dry ravel was observed on the very steep slopes (greater than 100%) that form the upper headwaters above the camp. It is anticipated that the effects of the high and moderate burn severity in the watershed that drain to the camp area could lead to flooding, debris flows, and mud flows depending of the severity of winter and spring rains. Such flows and flooding may impact an existing concrete dam, boat house, spring box and water filtration system, and camp sites along the Little Sur River. The access road that leads to the camp crosses several streams that experienced high burn severity. The crossings contain culverts that may not pass debris flow material. Access to the camp is likely to be cut off during and following heavy rains. Additionally, tree fall hazard appears to be a significant concern in the camp area. The camp is currently closed and based on conversation with Bill Ward (BSA Council) during the site visit it is understood that work parties will not be allowed to stay overnight.

d.) Jeffery Road, Tanbark Cabins, Millers Canyon

Map Points: 627, 628

Cabins located near the bottom of Millers canyon may be subject to flooding. The steep slopes on the opposite side of the canyon that face the cabins may pose a threat of rock fall or debris sliding and the unpaved access road to the cabins (Jeffery road) is likely to receive additional runoff and erosion due to the fires effects.

e.) Coleman Canyon.

Map Points: 640, 644-650.

Coleman Canyon is a relatively small drainage in the San Antonio watershed that experienced high to moderate burn severity. The canyon contains a series of earthen dams with excavated spillways. Some of the faces of these dams appear eroded and burrowed by rodents. Water was observed piping through some of the apparent burrows. An increase in surface runoff and sediment from the headwaters should be expected during the winter rains. Such sediment laden runoff may impact the upper most dam and could result in over topping and possible breaching of the earthen fill face. Such a failure may then impact lower dams in a similar manner and ultimately impact a ranch located along the bottom of Coleman Canyon (map point 650). Additionally the unpaved road system in the canyon contains culverted and low water bridge crossings that may be adversely impacted by debris flows and sediment laden floods.

f.) California State Parks Infrastructure

Andrew Molera, Pfeiffer Big Sur, and Julia Pfeiffer Burns Sate Parks are situated along Highway 1, at or near the western extent of the Basin Fire. Campgrounds, shops, trails, roadways, bridges, and support facilities are located along drainages which are likely to experience tree fall, flooding, debris flows, and rock fall during heavy rains. Campsites, cabins, historic structures, and natural areas are likely to be damaged or destroyed. It is anticipated that access to the park system via Highway 1 will be severely curtailed or nonexistent due to rock falls, slides, and potential problems associated with the high number of streams crossed by the highway. A

large percentage of these streams are situated in areas of moderate to high burn severity and contain culverts that may not pass possible debris flow material.

Andrew Molera State Park.

Map Points: 1603, 1604

The walk-in campground (northern portion of the park) and horse stables and barn (southeast end of the park) are situated on flood plains that are approximately 10 to 15 feet above the active Big Sur River channel. Depending on the severity of winter and spring rains, it is anticipated that these sites may be affected due to the high and moderate burn severity that occurred in the watersheds of Big Sur River and the associated increased risk for flooding along Big Sur River within the park.

Pfeiffer Big Sur State Park

Map Points: 690, 691, 692, 698, 699, 1600, 1601

Pfeiffer Big Sur State Park is situated along the banks of the Big Sur River below the confluence of Doland and Ventana Creeks. Depending on the severity of winter and spring rains, it is anticipated that the effects of the high and moderate burn severity in the upper watersheds (Doland Creek, Ventana Creek, Pfeiffer Redwood Creek, and the Upper Big Sur River) will increase and the potential for flooding, debris flows, and mud flows to occur on the Big Sur River within the park.

Campsites, roads, bridges and infrastructure within Pfeiffer Big Sur State Park are likely to sustain moderate to major damage. Particular concern is expressed for the Weyland Bridge, culverts and bridges along Pfeiffer Redwood Creek, Highway 1 at or near the park entrance, and the parks sewage treatment facility. The Weyland Bridge forms the first point of restriction for the Big Sur River within the park and as such is considered to be at high risk of destruction or major damage due to flooding, debris flows, and mud flows. Bridges and culverts situated along Pfeiffer Redwood Creek are considered to be at risk for breaching or overtopping by flood waters or debris flows, with the resulting flows directed towards the park lodge (Big Lodge Sur) and parking lot. Highway 1 opposite the entrance to the park may be undercut or removed by erosion (outside edge of meander) resulting from in-channel floods, hyperconcentrated floods, debris torrents, or debris flows on the Big Sur River.

The Pfeiffer Big Sur sewage treatment plant consists of a primary treatment process coupled with leach field disposal. The processing tanks, piping and related structures (electrical switching, lab building and propane tank) are at risk from rock fall, debris slides and slumping, and/or debris flow off of the slopes immediately east of the facility. The leach field is situated within the flood plain of the Big Sur River and as such, is subject to damage from erosion or deposition of sediments over the top of the systems control structures (cleanouts, valves, and access points).

Julia Pfeiffer Burns State Parks.

Map Points: 674

The Julia Pfeiffer Burns State Park is situated along Highway 1 within the watersheds of Partington, McWay, and Burns Creeks. Depending on the

severity of winter and spring rains, it is anticipated that the effects of the high and moderate burn severity in the watersheds of McWay and Partington Creeks will increase and magnify the size and intensity of flooding, debris flows, and mud flows on the within the park.

Specific at risk features within Julia Pfeiffer Burns State Park include the parking lot on the south of McWay Creek (handicap access), the upper portion of the trail to McWay falls, and the historic pelton wheel site. Rock fall, dry ravel, and visible scars from previous slope failures were observed on the steep eastern slope above the handicapped parking lot and the upper portion of the McWay Falls trail. This unstable slope is at increased risk of failure due to the loss of vegetation and cohesion resulting from the fire. Depending upon the duration and severity of winter rains, the historic pelton wheel site and the wooden bridge to Mc Way Falls are considered to be at high risk for damage or destruction due to flooding, debris flows, and mud flows which may on McWay Creek.

g.) Esalen Institute

The Esalen Institute is situated along the banks of Hot Springs Creek, the upper reaches of which experienced high and moderate burn severity. It is anticipated that this burn severity in will increase and magnify the size and intensity of rainfall runoff that could lead to flooding, debris flows, and mud flows depending of the intensity of winter and spring rains. Such flows and flooding are likely to impact the existing buildings, bridges, and water supply piping which a situated within Hot Springs Creek.

h.) Partington Ridge

The Partington Ridge region of the Basin Fire generally sustained low to moderate burn severity. Slopes below pads constructed for homes situated on the steep canyon walls were burned by the fire and back fires set to protect the structures. The resulting loss of vegetation and corresponding loss of soil cohesion is likely to pose a threat to these structures depending of the severity of winter and spring rains. Cracking, dry ravel, and rock falls were observed on slopes below homes. The situation may be exasperated by slope loading resulting from the additional weight produced by swimming pools, spas, and irrigated lawns.

i.) Resort Areas along Highway 1.

A variety of campgrounds, cabins, resorts, shops, and other businesses are situated along Highway 1 between Julia Pfeiffer Burns State Park (southern end) and Pfeiffer Big Sur State Park (northern end). Visual inspection and anecdotal evidence obtained during site visits to these locations suggest that a large percentage of these facilities may be subject to flooding, debris flows, and rock fall during heavy rains. Specific areas of concern include the Coast Gallery and surrounding structures, the Henry Miller Library, and the resort at the mouth of Castro Canyon (sites are all located within drainages that sustained moderate burn severity). Site inspections of each of these locations identified evidence of slope failures, rock falls, culverts subject to plugging, and large amounts of woody debris on the slopes and bottoms of adjacent waterways.

j.) Water Quality Concerns

The Basin Plan for the Central Coast Region identifies beneficial uses for a number of named waterways that have been, or may be impacted by the Basin and Indian Fires. These water bodies include the Carmel River, Salinas River, Arroyo Seco River, Tassajara Creek, Big Sur River, Little Sur River, and Big Creek. Beneficial uses that are likely to be impacted as a result of the fire include: municipal water supply, groundwater recharge, agricultural water supply, contact and non-contact recreation, commercial and sport fishing, spawning, warm fresh water habitat fisheries, cold fresh water habitat, wildlife habitat, rare threatened and endangered species, and biological habitats of special significance.

Depending on the severity of winter and spring rains, municipal water supplies situated along the above named rivers and creeks are anticipated to be moderately to highly impacted due to increased turbidity, sediment load, pollutants, and increased bacteria levels resulting from flooding, debris flows, and mud flows. Wells located within sedimentary deposits that are directly influenced by stream bed infiltration may experience reduced recharge due to a plugging of stream bed porosity by fine-grained sediments.

Agricultural Water supplies are likely to be impacted by high turbidity and sediment load. The direct effect of this condition may be increased wear to pumps, valves, and piping. Filters systems for sprinklers, micro sprinkler, and drip irrigation systems are likely to plug rapidly and repeatedly.

Contact and non-contact recreation may need to be curtailed or eliminated due to safety concerns on streams experiencing high winter or spring flows, debris flows, flooding, or mud flows. Said streams will be subject to increased erosion, streambed alteration, sediment deposition and pollution from a variety of chemicals stored within or around affected homes and businesses.

I. Emergency Determination

The values at risk considered in this assessment include the possible loss of life and property due to landsliding, debris flow, rock fall, debris torrents, and hyperconcentrated flooding from increased surface water runoff. In general, the risk from landslides, debris flows and rock falls are possible where roads, residences or other development are located within and/or adjacent to canyon stream channels or on alluvial fans, colluvial footslopes and debris flow deposits.

It should be noted that these hazards are part of the natural processes in this environment, and that these risks were present under pre-fire conditions. Many existing structures in the burn area and downstream of the burn area have been, and will continue to be at risk from these hazards. The potential for these processes to be exacerbated by fire is primarily dependent upon burn severity and slope steepness, both of which are highly variable in the Basin/Indians Fire area. In general, where the burn severity is moderate to high and the slopes are steep, (areas such as at the Tassajara Hot Springs and Monastery) the potential for increased hazard is greatest. The potential for increased hazard from flooding is also present downstream of large watersheds (on the order of 100,000 acres in area) that experienced high and moderate burn severity throughout the majority of the headwaters of the watershed. This situation was observed at residential communities along the Arroyo Seco River,

Piney Creek, and at State Parks and resort areas along the Big Sur River. As stated before, because most of these areas are inhabited year round, we believe these areas constitute an exigency, *a* ***sudden crisis involving a high risk to life that requires immediate action*****.**

Risks to cultural, soils and biologic assets are covered in other specialist reports. Areas with moderate to high potential risks to life and property from slope instabilities exist elsewhere in the vicinity of the Basin/Indians Fires, but the assessment of sites that were not affected by the fire is beyond the scope of this evaluation.

V. General Recommendations:

a). <u>County Roads and Highway 1 Infrastructure</u>

The existing highway drainage systems along Highway 1 should be inspected by Cal Trans to evaluate potential impacts from floods, hyperconcentrated floods, debris torrents, debris flows and sedimentation resulting from winter rains. Cooperation with landowners along the Highway corridor should be established so as to enable Cal Trans to implement erosion control outside of the highway corridor easements.

It is understood that Carmel Valley Road, Arroyo Seco Road, and Tassajara Hot Springs access road are all roads controlled by Monterey County. Erosion control measures will need to be implemented along the access road to Tassajara Hot Springs as this road may be needed for emergency evacuations. One area on Carmel Valley Road (map point 630) should be monitored for potential landslides during winter storms. Three bridges on Arroyo Seco Road (map points 610, 619, 642) should be evaluated by county engineers to assess the potential for foundation scour and possible plugging from a debris flow or flood. Other county roads not specifically addressed in this report should be evaluated by county engineers for possible implementation of erosion control measures as deemed necessary.

b.) <u>Downstream Impacts (flooding, sedimentation, debris flow)</u>

Communities located downstream from areas where large portions of watersheds were burned should be notified of the potential risks. Monterey County, Monterey County Water Resources Agency, Department of Public Works, Sherriff's Department, Fire Department, and Office of Emergency Services; Police, Fire, Public Works, and Emergency Services Departments for cities that could be affected by post-fire floods and debris flows; the Natural Resources Conservation Service, and any other responsible party should be made aware of the potential hazard to lives and property in and downstream from the fire area, especially downstream of the Arroyo Seco, Piney Creek, Carmel Valley River, Tassajara, and Big Sur watersheds. Emergency response plans, including early warning systems and evacuation plans, should be developed by responsible agencies. Modeling being conducted by the U.S.D.A. Forest Service and the US Geological Survey, and the site-specific observation included with this review should be considered in any emergency response plan develop by emergency agencies.

c.) <u>Impacts to Sewage Systems</u>

The county health department and/or other similar agency should be made aware of possible increases in bacteria levels in water supplies. Potable water may have to be supplied to affected areas for extended periods of time.

d.) Areas Not Assessed.

Assessment of all properties within the burn area is beyond the scope of this review. Any properties not included in this report and summary table (Appendix 2) should be visited by emergency response agencies and/or community groups in an effort to provide further assessment and advise those property owners.

VI. Specific Recommendations

a.) Tassajara Hot Springs and Monastery.

In order to minimize loss of life, the Hot springs and Monastery should not be inhabited during winter and spring storms. Because the unpaved access road is very steep, long and subject to impact following rains, evacuation should begin well before (days before) rainfall impacts the area. Signs should be posted along the access road that warn motorist of pending risks and danger. Monterey County, Monterey County Water Resources Agency, Department of Public Works, Local Fire Departments, and Office of Emergency Services, the Natural Resources Conservation Service, and any other responsible party should be made aware of the potential hazard to lives and property in the Tassajara Hot Springs location. Emergency response plans, including early warning systems and evacuation plans, should be developed by emergency agencies. The modeling being conducted by the U.S.D.A. Forest Service and the US Geological Survey and the site-specific observation included with this review should be considered in any emergency response plan develop by emergency agencies. and Residential developments in the Arroyo Seco and Piney Creek Drainage and Resort areas along the Big Sur River drainage

In order to minimize loss of life, the residential areas, campgrounds, resorts, shops, and other structures should not be inhabited during heavy winter and spring storms. Because many of the homes, campgrounds, and resorts are accessed via low-water crossings, preparation for evacuation should begin well before rainfall impacts the area. The culverts that drain Pheneger Creek (map point 654) and Juan Higuera Creek (map point 658) should be monitored and kept open following storm events. The access driveway to the Captain Cooper School may become blocked by debris and the school should be closed in anticipation of storm events. In general, where possible, structures located low in the watersheds should be moved out of potential flooding areas. Signs should be posted along roads, Highway 1, and at State Parks that warn motorist of pending risks and danger. Monterey County, Monterey County Water Resources Agency, Department of Public Works, Sherriff's Department, Fire Department, Office of Emergency Services, and Police, Fire, Public Works, and Emergency Services Departments for cities that could be affected by post-fire floods and debris flow, as well as the Natural Resources Conservation Service, and any other responsible party should be made aware of the potential hazard to lives and property in and downstream from the fire area. Emergency response plans including early warning systems and

evacuation plans should be developed by emergency agencies. The modeling being conducted by the U.S.D.A. Forest Service and the US Geological Survey and the site-specific observation included with this review should be considered in any emergency response plan develop by emergency agencies.

b .) Pico Blanco Boy Scout Camp Infrastructure.

In order to minimize loss of life the camp should not be inhabited during winter and spring storms. Because the unpaved access road is very steep, long and subject to impact following rains, access to the camp may be cut off and as such, evacuation should begin well before the advance of a storm. An erosion control plan should be considered for the slopes that drain onto the camp area. Erosion control methods could include such measures as straw bale fences, wattles, and mulching. The spring box that feeds the water filtration system will need to be protected. Camp staff should consider armoring the spring box with logs or other materials to protect it from high flows. The aquatics area and dam may be subject to flooding and plugging and should be monitored after storm events if possible. A hazard tree removal program should be implemented before this winter's rains. Where possible, structures located low in the watershed should be moved to positions outside of the anticipated flooding stage. The Boy Scout Council, Monterey County, Monterey County Water Resources Agency, Department of Public Works, Sherriff's Department, Fire Departments, Office of Emergency Services, the Natural Resources Conservation Service, and any other responsible party should be made aware of the potential hazard to lives and property at the Pico Blanco Boy Scout Camp. Emergency response plans including early warning systems and evacuation plans should be developed by emergency agencies. The modeling being conducted by the U.S.D.A. Forest Service and the US Geological Survey and the site-specific observation included with this review should be considered in any emergency response plan develop by emergency agencies.

c.) Jeffery Road, Tanbark Cabins, Millers Canyon

Erosion control measures should be implemented to Jeffery road. Cabins that are close to the watershed bottom should not be inhabited during rains.

d.) Coleman Canyon

It is understood the Federal BAER team evaluated this area. Landowners should cooperate with the BAER team recommendations. Any earthen dam found to be structurally impaired should be removed. Homes or ranches located low in the canyon should not be inhabited during heavy rains or storm events. The unpaved road system in the canyon may be inundated with debris flows and torrents making the road impassable. As such, erosion control methods designed to minimize erosion of the road should be implemented.

e.) Andrew Molera State Park, Pfeiffer Big Sur State Park and Julia Pfeiffer Burns State Parks

The walk in campgrounds at Molera State Andrew Park should be closed in anticipation of storm events and the horses should be moved to higher ground.

Pfeiffer Big Sur State Park campgrounds should be closed in anticipation of storm events. The Weyland Bridge and other bridges within the park should be removed prior to the 2008/2009 rainy season if at all possible. Additional review of the culverts above the Big Lodge Sur should be conducted by an engineering geologist or geotechnical engineer. It appears possible to direct

flow (if the culverts were to plug) into the parking lot north of the Big Lodge Sur. Culverts should be regularly cleaned after storm events. The propane tank at the Pfeiffer Big Sur sewage treatment plant should be moved to a more stable location. The treatment buildings should not be occupied during a storm event.

The Julia Pfeiffer Burns State Park trail system that leads to the falls should be closed in anticipation of storm events. The parking lot on the south side of McWay Creek should remain closed. The trail head at the parking lot that is experiencing rock fall should be abandoned. Additional review of the trail should be conducted by an engineering geologist or geotechnical engineer. It appears possible to construct a new trail head on the north side of the park. The historic Pelton wheel should be removed from its housing and relocated to a more stable location if possible.

f.) Esalen Institute

The Esalen Institute should be apprised of the risk to life and property at the institute. Structures situated low down within the waterway should not be inhabited during storm events. The footbridge located across Hot Springs Canyon should be closed. Evacuation plans should be made in anticipation of storm events.

g.) Partington Ridge

The home owners should be apprised of the risk to property. Additional review of burnt slopes located below homes should be conducted by an engineering geologist or geotechnical engineer. Erosion control methods could include such measures as straw bale fences, wattles, and mulching. Evacuation routes should be planned in anticipation of storm events.

h.) Resort Areas along Highway 1.

The business owners should be apprised of the risk to life and property. Evacuation routes should be planned in anticipation of storm events. Businesses should not be occupied during storm events. Culverts and other crossings behind and above the businesses should be cleaned and debris removed prior to and after storm events.

i.) Water Quality Concerns

Septic tanks should be emptied in preparation of winter storms. Flammable, toxic, or caustic fluids should be removed from homes and businesses located in areas of likely impact, or if they cannot be moved they should be protected to the greatest extent possible. Water systems should be turned off and drained prior to leaving prior to leaving the area. If spills occur, the Regional Water Quality Board should be contacted immediately to discuss mitigations that may minimize adverse impacts to water quality.

j.) Dani Ridge road off of Coast Road

GPS point 1605

Along Dani ridge road several redwood trees have been severely scotched and are likely to die and become hazard trees. They will likely impact ingress and egress along the road. It is recommended the hazard trees be removed to protect the road prior to this season's rain.

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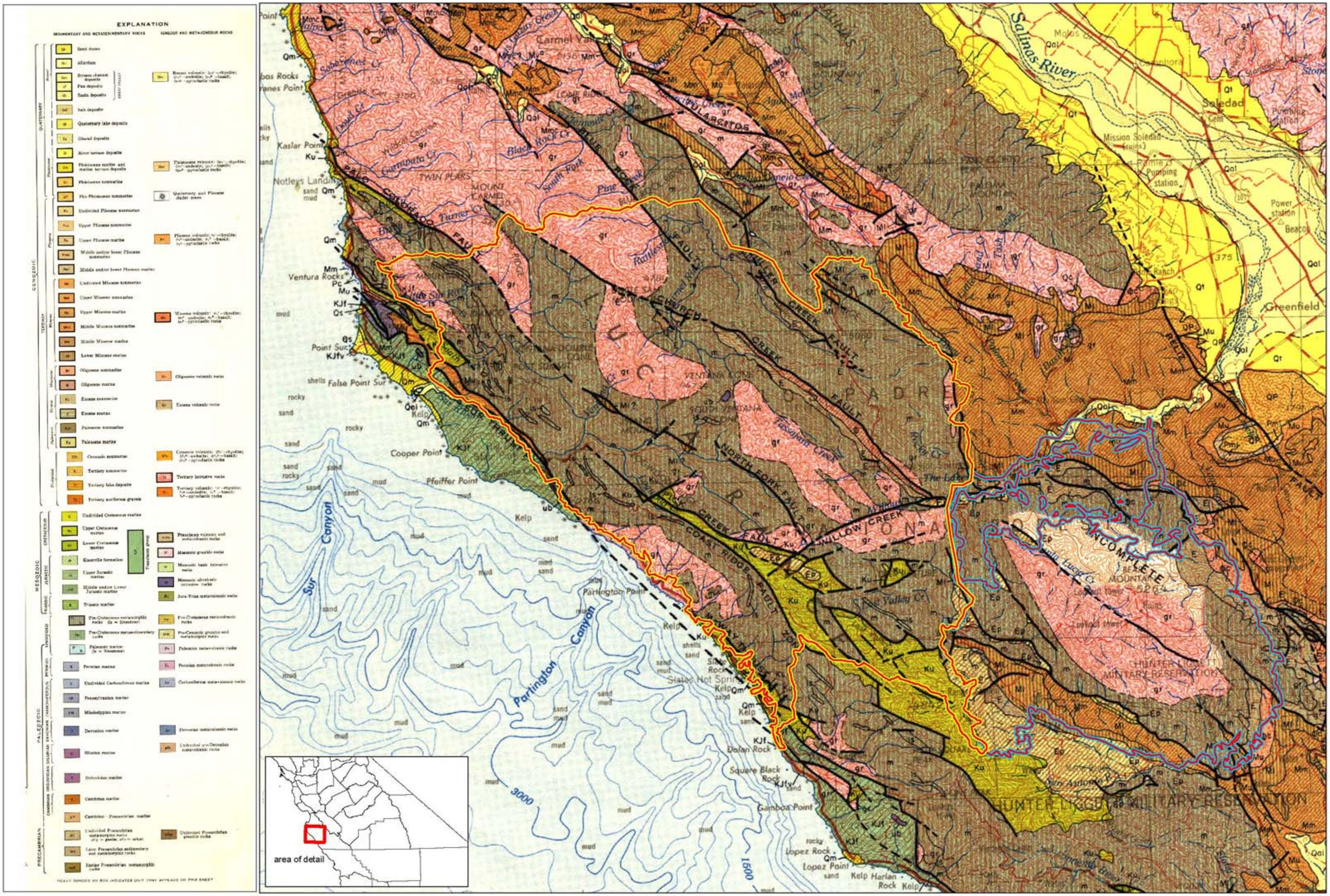
C.J. Wills, M.W. Manson, K.D. Brown, C.W. Davenport and C.J. Domrose, 2001, *Special Report 185 - Landslides in the Highway 1 Corridor: Geology and Slope Stability along the Big Sur Coast between Point Lobos and San Carpoforo Creek, Monterey and San Luis Obispo Counties, California*, California Geological Survey, 40 pgs.



0 1.25 2.5 5 7.5 10 Miles

Scale: 1:150,000

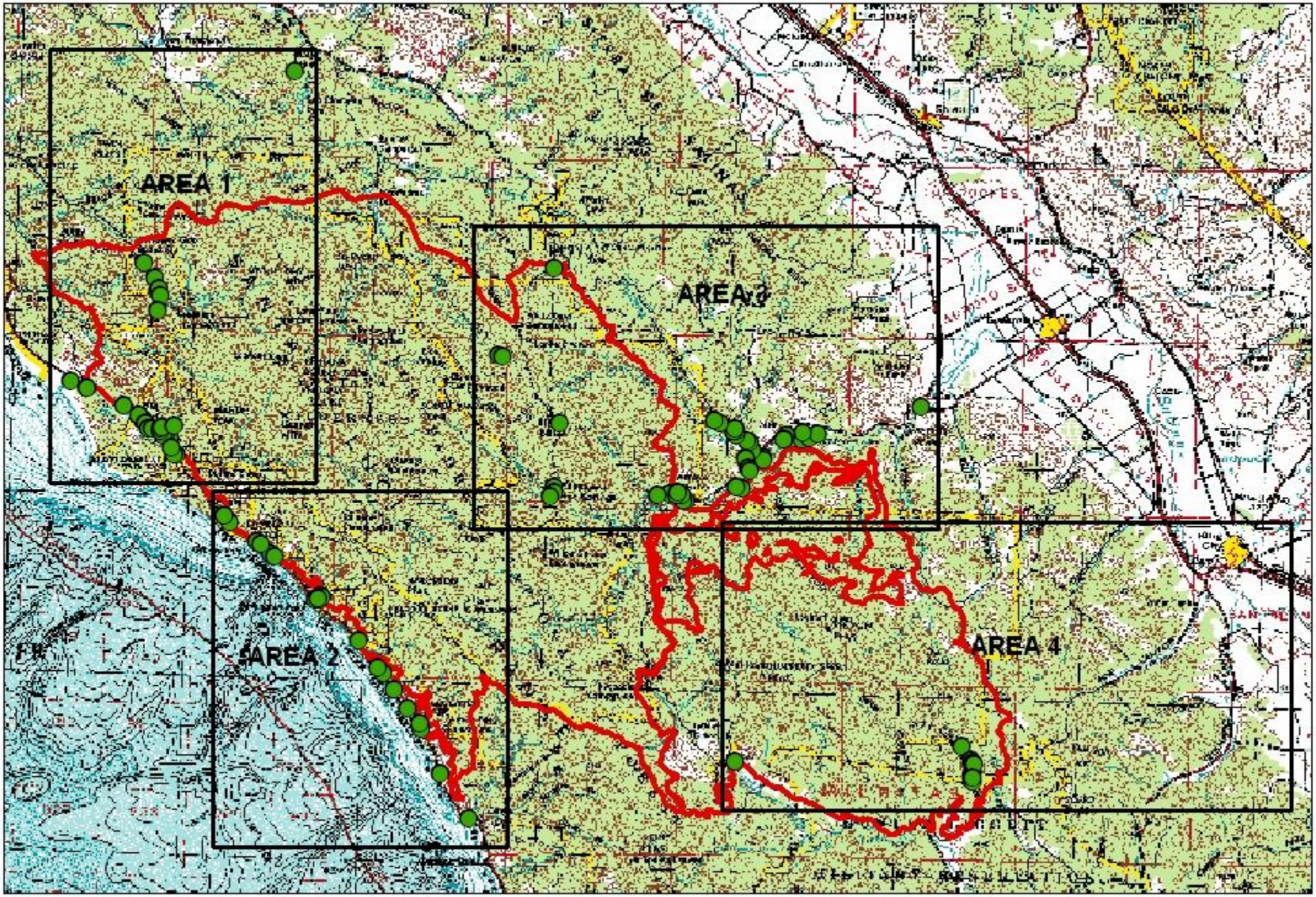
Basin & Indian Fire Perimeters
Geologic Map
August, 2008

Basin Fire

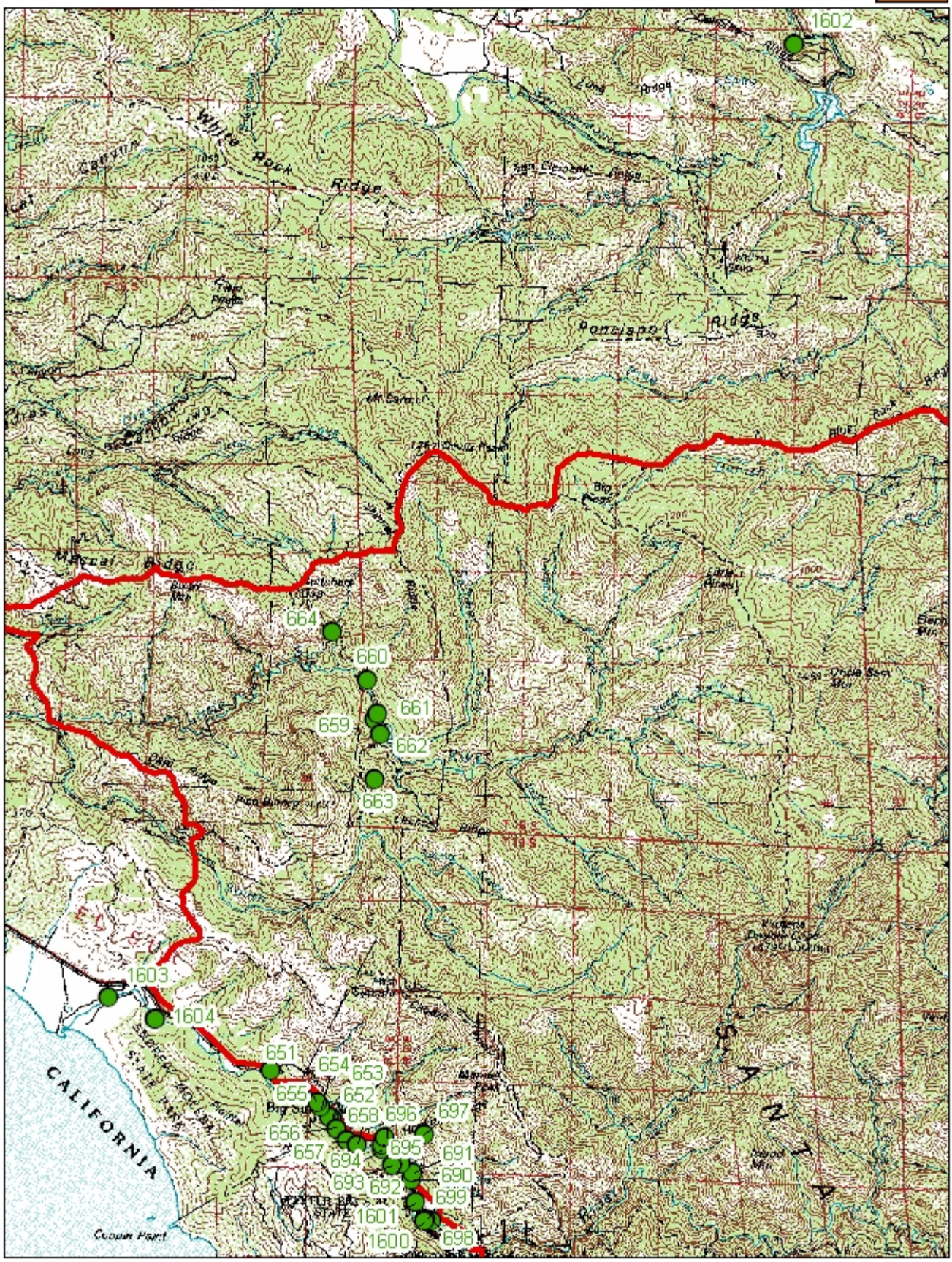
Indian Fires

CGS
CALIFORNIA GEOLOGICAL SURVEY

Basin\Indians Fire
SEAT Team Evaluation Points - Locator Map



Basin\Indians Fire
SEAT Team Evaluation Points - Area 1



Geologic Map Points

Fire Perimeter

0 0.5 1 2 3 4 Miles

SCALE: 1:100,000

N

Base Map: USGS 1:100,000 DRG

Basin\Indians Fire
SEAT Team Evaluation Points - Area 2

Geologic Map Points

Fire Perimeter

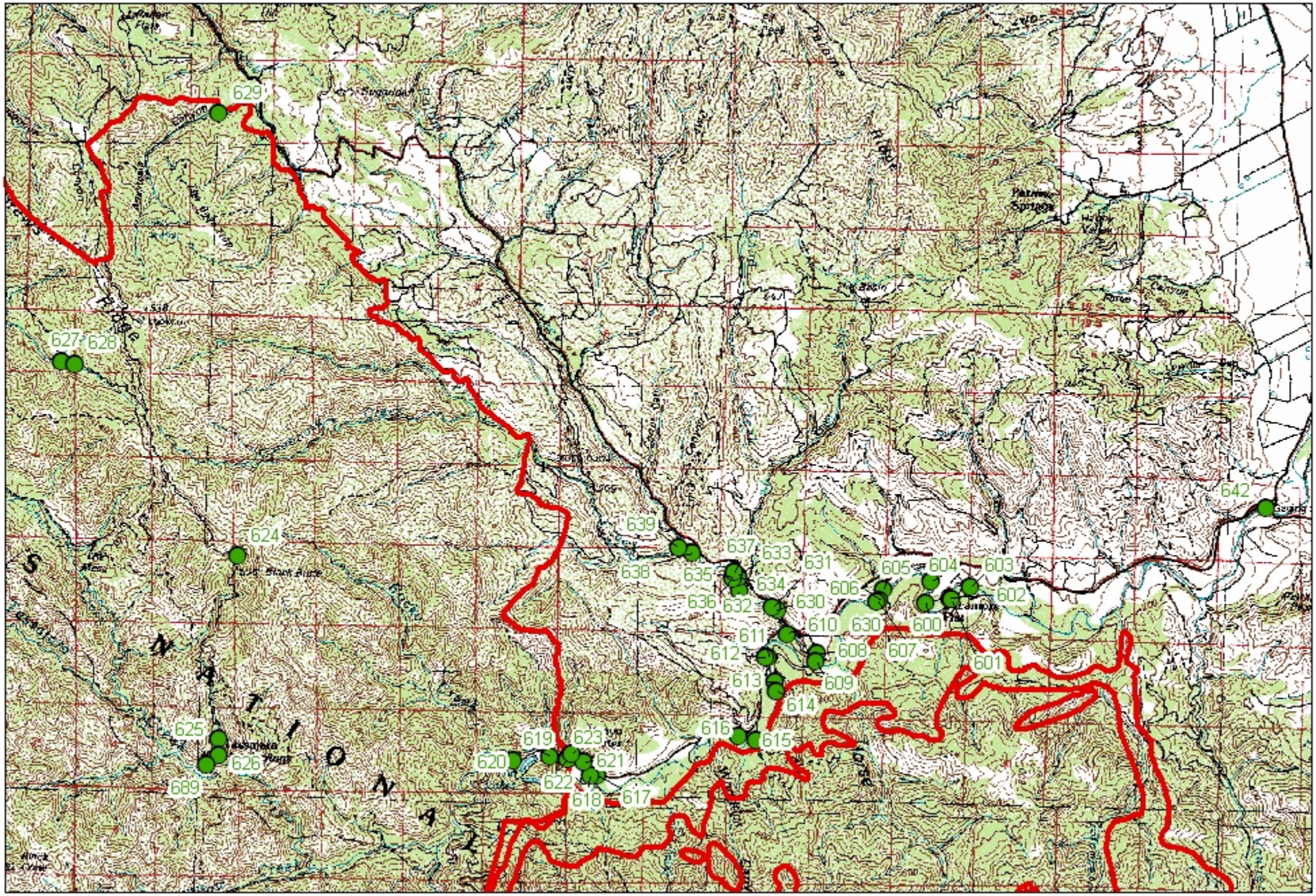
0 0.5 1 2 3 4 Miles

SCALE: 1:100,000

N

Base Map: USGS 1:100,000 DRG

Basin\Indians Fire
SEAT Team Evaluation Points - Area 3



Basin\Indians Fire
SEAT Team Evaluation Points - Area 4

DRAFT TECHNICAL SPECIALTIST'S REPORT
STATE EMERGENCY ASSESSMENT TEAM (SEAT) Report

Resource: **Hydrology**

Fire Name: Basin Complex CA-LPF-001649 August 2008
Indians Fire CA-LPF-001491

Author Name: Les Grade, P.E.
Department of Water Resources,
2440 North Main St,
Red Bluff, CA 96080
Office (530) 529-7331

I. Resource Condition Assessment

C. Resource Setting

The Basin Complex and Indians Fire burned approximately 240,000 acres in the Upper Carmel River, Arroyo Seco, San Antonia, Rat Creek, Big Sur and Little Sur watersheds. (USFS, 2008).

The jagged and very steep topography causes many separate microclimates within the watersheds. These micro climates make it almost impossible to generalize about the weather in these coastal areas around the Partington Creek Frontal and surrounding areas. Most of the mountainous portion of the burn area drain into seven different major watersheds; which are, Big Sur River, Little Sur River, Carmel Valley River, Tassajara Creek, Arroyo Seco River, San Antonio River, and the Partington Creek Frontage (west facing slopes along the southwest portion of the burn area that drain into the Pacific Ocean via numerous west-flowing watercourses).

Big Sur Drainage

Annual rainfall for the Coastal Region around Big Sur can range from 88 inches (1983) in a very wet year to 18 inches (1990) in a very dry year. Peak rainfall intensities in the Big Sur area can be as high as 9 ¼ inches (Jan 31, 1963) in a single twenty four hour period (WRCC). During the SEAT assessment, hydrologists made personal contact with local residents in the Big Sur area that witnessed the flood of 1978. Rainfall that year reached well above normal with annual rainfall amounts reaching 81 inches, 200% of normal (USFS, 2008). The 1978 flood event produced water levels that reached lower to mid portions of several homes along the bank of the river. Local residences reported that after the flows receded, two to three feet of silt and debris along the banks and parking areas.

Arroyo Seco and Carmel Valley River Watersheds.

The Arroyo Seco and Carmel Valley River watersheds have typically lower average annual rainfall intensities than the Big Sur watershed ranging from 20

inches per year for the Carmel Valley River watershed (WRCC) to 30-40 inches within the Arroyo Seco river basin with diminishing rainfall amounts towards the Salinas Valley (Cleveland, 1977; USFS, 2008). The burn areas are below the elevation generally subject to rain-on-snow events, although snow may occasionally fall near the higher peaks. Measurable snowfall has not been recorded in coastal Big Sur, but is common in the winter months on the higher ridges of the Santa Lucia Mountains. Topography within the burn area ranges from gentle to very steep, with elevations ranging from about 200 above mean sea level along the western margin of the fires to a high of over 5100 feet where the fires burned near Cone Peak with 50 to 100+% slopes.

A. Survey Methods

To evaluate the risk to life and property helicopter reconnaissance was conducted August 12, 2008. The eastern and central portions of the burn area was inspected to identify where high-value sites may be present that need on-site reviews, concentrating on developed residential areas, State Parks, Highway 1, businesses, and infrastructure. Follow up road and foot surveys were conducted in the areas with high value sites on August 12 through 19, 2008. Most the interior of the burn area is located in the Los Padres National Forest where campgrounds, trails, and scattered cabins were survey by the Federal Burn Area Emergency Response (BAER) team. Road-related features, such as culverts and bridges, were also surveyed identified over major drainage crossings. It is understood that Cal Trans is surveying and identify road-related high-value sites along Highway 1.

The values at risk are possible loss of life and property due to in-channel flooding, hyper-concentrated of on slope runoff, debris torrents, and debris flows.

General Observations

The principal concerns with the Basin Complex and Indians Fire area are the high potential for flash flooding, in-channel flooding, hyper-concentration of on slope runoff, debris torrents, and debris flows. The soil burn severity for the Basin Complex and Indians Fire area is approximately 56,000 acres rated as high burn severity, 90,000 acres rated as moderate burn severity, 38,000 acres rated as low burn severity, and 57,000 acres rated as very low or unburned (USFS, 2008) After a burn event resulting in high to moderate soil burn intensities, soil infiltration rates may be significantly reduced by the formation of a thin hydrophobic layer in the soil. This hydrophobic layer is commonly developed by the intense heat and gases during the consumption of fuel in high and medium intensity burns. Typically higher runoff rates and increased stream flows can be expected during mild to moderate rainfall events. Reduced infiltration rates can be expected to last over a possible one to three year period and depending on the annual rainfall it may continue for several additional years. The loss of foliage and woody debris on steep slopes adds to the concentration of runoff flows by reducing rainfall interception, evapotranspiration, root function, and the filtering effect of slash. On steep burnt slopes large amounts of silt and sediment will be concentrated in troughs, streams and rivers. Runoff will likely increase in energy and become laden with sediment and debris. Rivers and streams may become more swollen than normal and travel at faster rates through out the drainage area. This increase in speed and density may impart large destructive forces into objects along its flow path and possibly surrounding structures.

County Road System, Water Supply, and Highway 1 Infrastructure

Numerous bridges, culverts, and other watercourse crossings are located along the county road system and the Highway 1 corridor. Many of these crossings will likely be impacted by sediment laden floods, debris flows, and debris torrents. Specific risks were identified by the SEAT team where increased flooding and debris flows could overtop culverts and the roadbed. It is beyond the scope of the SEAT team assessment to identify every risk to the Highway 1 and it is understood that Cal Trans is conducting a detailed survey that identifies road-related high-value sites along Highway 1. It is similarly beyond the scope of the SEAT team assessment to survey the entire county road system. Downstream impacts include flooding, sedimentation, and debris flows. Municiple water systems, numerous bridges, culverts, and watercourses are located below the Danish Creek-Carmel River and Cachugua Creek watershed watershed (45,000 acres burned). The communities of Sleepy Hollow, Camp Stephany, Robles Del Rio along the river, Garza Baroda, Carmel Valley Ranch, Robinson Canyon, Schulty Bridge, Valley Greens, Rancho San Carlos are located downstream the Los Padres and San Clemente Dams. **Anticipated increase in water yield ranges from 178% in Danish Creek-Carmel, 186% in the Los Padres Reservour to 244% in Finch Creek. (USFS, 2008).** It is understood that Los Padres dam has lost about half of its capacity from previous flooding, and that San Clemente Dam is filled with sediment and is structurally impaired. Because the headwaters above the Los Padres Dam experience high and moderate burn severity, there appears to be a high possibility of increase runoff, flooding, and sedimentation below Los Padres Dam and San Clemente dam.

The communities of Greenfield and Salinas are located below the Arroyo Seco drainage with approximately 106,000 acres burned in the watershed leading to the area. **Increased yield for this area is approximately 163%** for the entire watershed from the beginning of the watershed to the confluence of Arroyo Seco and Salinas River. Increase water yield will cause increased flows throughout the watershed affected by the fire and downstream of watercourses outside of the watershed area.

Fort Hunter Liggett is located downstream of the San Antonio watershed with approximately 30,000 acres burned. **Increased yield for this area is expected to be 149%** of normal runoff flows.

The Big Sur watershed yield is expected to **increase by 259%.** Increase water yield may cause increased flows throughout the watershed affected by the fire and downstream of watercourses outside of the watershed area.

It is anticipated that severe flooding and sedimentation will occur in these drainages during heavy winter and spring rains. The resulting downstream sedimentation and flooding may impact infrastructure (for example agricultural systems, seepage systems, pumps, water lines, roads, watercourse crossings). The magnitude of post-fire damage will be ultimately be determined by the intensity and duration of storms that impact the area.

Specific Observations

Houses and other high-value sites within and down slope from the burn area were assessed to evaluate potential risks from near-site debris flow, rock fall

floods, and other geologic hazards. At risk sites, some with multiple homes, identified as having potential risks to lives or property are listed and briefly described below and summarized in Appendix 1(Hazard Location Summary Sheet).

Structures such as, houses, resorts, campgrounds, and monastery's and infrastructure such as, roads, bridges and highways near, within, and or downstream of large watersheds appear to be in positions where they may be affected by significant in-channel floods, hyperconcentrated floods, debris torrents, and debris flows. It is our understanding that the Federal BAER team, USDA Forest Service, and the US Geological Survey are developing models to determine the potential magnitudes of post-fire events. The SEAT believes the Tassajara Hot Springs and Monastery, residential communities along Arroyo Seco River and Piney Creek, and resort areas along the Big Sur River drainage appear to be in positions where sudden severe flooding pose a significant threat and risk to lives. Because most of these areas are inhabited year round, we believe these areas constitute an exigency, **a sudden crisis involving a high risk to life that requires immediate action.** We believe that inaction may and can lead to the loss of life on the order of many tens in these areas. The magnitude of post-fire damage will be determined by the intensity and duration of storms that impact the area. A brief description of these areas is provided below:

a) <u>Tassajara Hot Springs and Monastery</u>

Map Point: 145

Of particular concern is the Tassajara Hot Springs and Monastery. The site is located at the bottom of an inner gorge area with steep (nearly vertical) highly fractured rock walls that overlook the development. The walls confine the Tassajara River in this portion of the watershed and increase the risk of potential log jams, debris deposits, and flash floods. Deposits from previous debris flows and flash flooding events that impacted on-site structures were observed during our visit. Photographs and anecdotal evidence obtained and viewed during our visit suggest the site is subject to flooding, debris flows, and rock fall during heavy rains. Due to the steep confined banks and small area water passage it is anticipated that the effects of the high and moderate burn severity in the drainage areas have an **increased water yield of 390% for Tassajara Creek at Tassajara, 1141% for unnamed tributary creek at Tassajara, and unnamed tributary to Church Creek road crossing of 855%** (USFS, 2008). A high water yield increase combined with the small hydraulic area will significantly increase and magnify the size, water velocities, and intensity of flooding. The unpaved county road that accesses the area is bermed, insloped, and contains numerous watercourse crossing that consist of what appears to be fords or culverts. Most of the watercourses above the crossings appear to have a high burn severity with stored boulders and loose materials, suggesting that the county road will be impacted by debris flows and flooding and will likely be impassable after a heavy rain. As such, access to the hot springs and monastery may be cut off, making evacuation difficult.

b) <u>Residential developments in the Arroyo Seco and Piney Creek Drainage</u>

Map Points:, 109-127

Many residential communities, trailer parks, and campgrounds are located within the flood plain of these confined drainages (for example; Sycamore Flat, Grandmas Flat, Millers Flat, Oak Flat, Arroyo Seco Resort, Arroyo Seco campgrounds, and residences located along Piney Creek). . The expected water yield for the area **will increase by 213% above the Arroyo Seco Resort, 193% above the confluence of Piney Creek, 186% above Sycamore Flat, and 163% below the entire Arroya Seco watershed** (USFS, 2008). The possibility of impact to the communities, parks, and campgrounds from increased flooding, sediment laden flooding, and debris flows resulting from increased runoff from the burnt watersheds appears likely. Access to these locations is along Carmel Valley Road (a county road). Several residences are located on the opposite side of the watershed than the county roads and are accessed via low water bridges or fords. If the crossings are flooded evacuation may be difficult. County road G-14 crosses the Arroyo Seco with an older appearing one lane bridge. The bridge appears high in the drainage and is supported with a center foundation column located in the center of Arroyo Seco.

c) Resort areas along the Big Sur River drainage

Map Points: 102, 103, 104, 105

Campgrounds, cabins, resorts, shops, and other businesses are located along the bottom of Big Sur Drainage. Multiple areas along the water course may be at risk of overtopping and flooding. Pfeiffer-Redwood Creek and Juan Higuera creek pass through numerous culverts and low bridge crossings throughout the park and are likely to be at risk of overtopping and flooding of areas around these structures. Downstream areas close to the Highway 1 Big Sur Bridge may be at risk of increase erosion and overtopping of the state highway. Multiple pictures document flooding and damaging mudslides that associated with the smaller 1972 fires in the Big Sur watershed. Photographs and anecdotal evidence obtained during the SEAT assessment period provide valuable information about flooding, debris flows, and rock fall during heavy rains following fires in the Big Sur area. It is anticipated that the effects of the high and moderate burn severity in the watersheds (Pheneger Creek, Juan Higuera Creek, Pfeiffer Redwood Creek, Upper Big Sur River) that are part of Big Sur watershed area will increase and magnify the size and intensity of flooding, debris flows, and mud flows. Increased water yield for Big Sur upstream of Pfeiffer-Big Sur State Park **will increase by 282%**. (USFS, 2008).

d) Pico Blanco Boy Scout Camp Infrastructure

Map Points: 146, 148, 149

The Pico Blanco Boy Scout camp is located at the base of the headwaters of the Little Sur River which experienced high and moderate burn severity. Dry ravel was observed on the very steep slopes (50 to 90%) that form the upper headwater slopes that overlook the camp area. It is anticipated that the effects of the high and moderate burn severity in the watershed that drain to the camp area will increase and magnify the size and intensity of rainfall runoff that could lead to flooding, debris flows, and mud flows depending on the severity of winter and spring rains. The expected water yield for the area **will increase by 273%** (USFS, 2008). Such flows and flooding may likely impact an existing concrete dam, boat house, spring box and water filtration system, and campgrounds located along the bottom of the Little Sur River. The access road that leads to the camp crosses several streams that experienced high burn severity. The

crossings contain culverts that may not pass debris flow material. Access may be cut off from the camp during and following heavy rains.

e) Jeffery Road, Tanbark Cabins, Millers Canyon

Map Points: 627, 628

Cabins located near the bottom of Millers canyon may be subject to flooding. The expected water yield for the area **will increase by 185%** (USFS, 2008). The steep slopes on the opposite side of the canyon that face the cabins may pose a threat of debris sliding. The unpaved access road to the cabins (Jeffery road) may receive additional runoff and erosion.

f) Coleman Canyon

Map Points: 640, 643-650.

Coleman Canyon is a relatively small drainage in the San Antonio watershed that experienced high to moderate burn severity. The expected water yield for the area **will increase by 612%** (USFS, 2008). A series of earthen dams that drain to one another are located within the canyon bottom. Some of the dam faces appear eroded and burrowed by rodents. Spillways have been excavated through each of the dams. Water was observed piping from some of the apparent burrows. An increase in surface runoff and sediment from the headwaters should be expected during the winter rains. The increase in water yield **can be as high as 152%** for the San Antonio River watershed (USFS, 2008). Such sediment laden runoff may impact the upper most dam and could result in over topping and possible breaching of the earthen fill face. Such a failure may then impact lower dams in a similar manner and ultimately impact a ranch located along the bottom of Coleman Canyon (map point 650). Additionally the unpaved road system in the canyon contains culverts and low water bridge crossings that may be adversely impacted by debris flows and sediment laden floods.

g) California State Parks Infrastructure

Andrew Molera, Pfeiffer Big Sur, and Julia Pfeiffer Burns Sate Parks are situated along Highway 1, at or near the western extent of the Basin Fire. Campgrounds, shops, trails, roadways, bridges, and support facilities are located along drainages which are likely to experience severe flooding, debris flows, and rock fall during heavy rains. Campsites, historic structures, and natural areas are likely to be damaged or destroyed. It is anticipated that access to the park system via Highway 1 will be severely curtailed or nonexistent due to rock falls, slides, and the high number of streams crossed by the highway. A large percentage of these streams are situated in areas of moderate to high burn severity and contain culverts that may not pass possible floods and debris flow material.

h) Pfeiffer Big Sur State Park

Map Points: 102 - 105

Pfeiffer Big Sur State Park is situated along the banks of the Big Sur River below the confluence of Doland and Ventana Creeks. The high and moderate burn severity in the watersheds of Doland Creek, Ventana Creek, Pfeiffer Redwood Creek, and the Upper Big Sur River will increase and magnify the size and intensity of flooding, debris flows, and mud flows on the Big Sur River within the park. Increased water yield ranges from **282% at Big Sur River upstream of Pfeiffer-Big Sur State park at the Weyland bridge, 445% for the Las Piedras**

Canyon Frontal at the Sierra Creek culvert, to 330% in the Pheneger Creek confluence with Big Sur River (USFS, 2008).

During high intensity rainfall events campsites, roads, bridges and infrastructure within Pfeiffer Big Sur State Park are likely to sustain major to moderate damage. Particular concern is expressed for the Weyland Bridge, culverts and bridges along Pfeiffer Redwood Creek, Highway 1 at or near the park entrance, and the parks sewage treatment facility. The Weyland Bridge forms the first point of restriction for the Big Sur River within the park and as such is considered to be at high risk of destruction or major damage due to flooding, debris flows, and mud flows. Bridges and culverts situated along Pfeiffer Redwood Creek are considered to be at risk for breaching or overtopping by flood waters or debris flows, with the resulting flows directed towards the park lodge (Big Lodge Sur) and parking lot. Highway 1 opposite the entrance to the park may be undercut or removed by erosion along the outside edge of a meander.

The Pfeiffer Big Sur sewage treatment plant consists of a primary treatment process coupled with leach field disposal. The leach field is situated within the flood plain of the Big Sur River and as such, is subject to damage from erosion or deposition of sediments over the top of the systems control structures (cleanouts, valves, and access points).

i) Julia Pfeiffer Burns State Parks

Map Point: 138

The Julia Pfeiffer Burns State Park is situated along Highway 1 within the watersheds of Partington, McWay, and Burns Creek. High to moderate burn severity in the watersheds of McWay and Partington Creeks may increase and magnify the size and intensity of potential flooding, debris flows, and mud flows within the park. **Water yields may increase by 333% in McWay Creek and 343% in Partington Creek** (USFS, 2008)

Due to this significant increase in water yield, several downstream sites are threatened. The historic pelton wheel site, wooden bridge to McWay Falls, and possibly the larger concrete bridge over the creek appear to be well within possible flood elevations. Each of these sites should be considered at high risk for damage and/or destruction.

j) Esalen

Map Point: 133

The Esalen institute is situated on either side of Hot Springs Canyon Creek. High to moderate burn severity in the watershed **may increase water yields by approximately 300%** (USFS, 2008). Two buildings situated approximately 50' feet downstream of a walkway bridge, the walkway bridge itself, and water intake system are potentially threatened by elevated flood elevations and debris flows. Each of these structures should be considered at high risk for threat to life and property damaged.) Partington Ridge

Map Point: 139

The Partington Ridge area of the Basin Fire generally sustained moderate burn severity. **Increase water yields for these areas are estimated to be 343%** (USFS, 2008). Multiple residences draw water from this creek by in channel intake structures and have an increased likelihood of structural damage by impact of high velocities and debris associated with severe flood flows. Also,

increased flood flows and debris will likely significantly impair the intake into the Highway 1 culvert resulting in possible overtopping of the road.

k) Coast Gallery

Map Point: 140

The Lafler Canyon area of the Basin Fire generally sustained high to moderate burn severity. **Increase water yields for these areas are estimated to be 374%** (USFS, 2008). Residences draw water from this creek by in channel intake structures and have an increased likelihood of structural damage by impact of high velocities and debris associated with severe flood flows. Also, increased flood flows and debris will likely significantly impair the intake into the Highway 1 culvert resulting in possible overtopping of the road.f.) Henry Miller Library

Map Points: 144

The Graves Canyon area of the Basin Fire generally sustained high to moderate burn severity. **Increase water yields for these areas are estimated to be 209% (USFS, 2008).** Residences draw water from this creek by in channel intake structures and have an increased likelihood of structural damage by impact of high velocities and debris associated with severe flood flows. The potential for increased sediment laden floods could significantly impair and/or plug the culvert inlet. Overflow and debris will likely adversely impact the library buildings and Highway 1.

l) Castro Canyon

Map Points: 143

The Castro Canyon area of the Basin Fire generally sustained high to moderate burn severity. **Increase water yields for these areas are estimated to be 246% (USFS, 2008)**. Multiple residences use water from this creek by the means of an in channel intake structure. In channel intake systems will have an increased potential of structural damage from debris laden floods. The potential for increased sediment laden floods could significantly impair and/or plug the Highway 1 culvert inlet. Overflow and debris will likely adversely impact the surrounding buildings and Highway 1.

m) Highway 1

Mile marker 30.1 to 50.8

The Partington Creek Frontal area of the Basin Fire generally sustained high to moderate burn severity. **Increase water yields for the coastal frontal are estimated to be 199% (USFS, 2008)**. The potential for increased sediment laden floods may significantly impair and/or plug the Highway 1 culvert inlets. Overflow from these culverts and debris will likely adversely impact the surrounding buildings causing a significant threat to life and property to the public on Highway 1. Emergency Determination

The values at risk considered in this assessment include the possible loss of life and property due to flash flooding, severe flooding, debris flow, debris torrents, and hyperconcentrated runoff on hillsides from increased surface water runoff. In general, the risk from severe flooding and debris flows are possible where roads, residences or other developments are located within and/or adjacent to canyon streams. The potential for these processes to be exacerbated by fire is primarily dependent upon burn severity and slope steepness, both of which are highly

variable in the Basin Complex and Indians Fire area. The potential for increased flooding and debris flow is greatest in the Tassajara Hot Springs and Monastery area. The majority of large watersheds have a significant potential for increased hazards from flash flooding and debris flows capable of reaching miles downstream of the impacted watersheds. This situation was observed by local residential communities along the Arroyo Seco River, Piney Creek, Tassajara, San Clemente reservoir, Church Creek, and State Parks and resort areas along the Big Sur River drainage. As stated before, because most of these areas are inhabited year round, we believe these areas constitute an exigency, **a sudden crisis involving a high risk to life that requires immediate action.**
Risks to cultural, soils and biologic assets are covered in other specialist reports. Areas with moderate to high potential risks to life and property from slope instabilities exist elsewhere in the vicinity of the Basin Complex and Indians Fires, but the assessment of sites that were not affected by the fire is beyond the scope of this evaluation.

Recommendations

General Recommendations:

a). <u>County Roads and Highway 1 Infrastructure</u>

The existing highway drainage systems should be inspected by Cal Trans to evaluate potential impacts from floods, hyperconcentrated floods, debris torrents, debris flows and sedimentation resulting from winter rains. Cooperation with landowners along the Highway corridor should be established so as to enable Cal Trans to implement erosion control outside of the highway corridor easements.

It is understood that Carmel Valley Road, Arroyo Seco Road, and Tassajara Hot Springs access road are all roads controlled by Monterey County. Erosion control measures should be implemented for the access road to Tassajara Hot Springs as this road may be needed to perform evacuations.

b.) <u>Downstream Impacts (flooding, sedimentation, debris flow)</u>

Communities located downstream of large watersheds should be notified of the potential risks. Community meetings were held in the Big Sur, Tassajara, and Arroyo Seco areas to disclose possible threats to life and property. Future meetings are planned but have yet to be determined at the time of this report. The County of Monterey County, Monterey County Water Resources Agency, Department of Public Works, Local Fire Departments, and Office of Emergency Services, the Natural Resources Conservation Service, and any other responsible party should be made aware of the potential hazard to lives and property in and downstream from the fire area, especially downstream of the Arroyo Seco and Carmel Valley River watersheds. Emergency response plans including ALERT (Automated Local Evaluation in Real Time) early warning systems and evacuation plans should be developed by emergency agencies. The modeling being conducted by the U.S.D.A. Forest Service and the US Geological Survey and the site-specific observation included with this review should be considered in any emergency response plan develop by emergency agencies.

Specific Recommendations

a.) Tassajara Hot Springs and Monastery

In order to minimize loss of life, the Hot Springs and Monastery should not be inhabited during winter and spring storms. Because the unpaved access road is very steep and long and subject to impact following rains, evacuation should begin well before (days before) rainfall impacts the area. Signs should be posted along the access road that warn motorist of pending risks and danger. The County of Monterey County, Monterey County Water Resources Agency, Department of Public Works, Local Fire Departments, and Office of Emergency Services, the Natural Resources Conservation Service, and any other responsible party should be made aware of the potential hazard to lives and property in the Tassajara Hot Springs location. Emergency response plans including ALERT (Automated Local Evaluation in Real Time) early warning systems and evacuation plans should be developed by emergency agencies. The modeling being conducted by the U.S.D.A. Forest Service and the US Geological Survey and the site-specific observation included with this review should be considered in any emergency response plan develop by emergency agencies.

b). Residential developments in the Arroyo Seco and Piney Creek Drainage and Resort areas along the Big Sur River drainage

In order to minimize loss of life, the residential areas, campgrounds, resorts, shops, and other structures should not be inhabited during heavy winter and spring storms. Because many of the homes, campgrounds, and resorts are accessed via low water crossings preparation for evacuation should begin well before rainfall impacts the area. The culverts that drain Pheneger Creek and Juan Higuera Creek should be monitored and kept open following storm events. In general where possible structures located low in the watershed should be moved to locations high in the watershed (out of flooding stage). Signs should be posted along roads and the highway that warn motorist of pending risks and danger. The County of Monterey County, Monterey County Water Resources Agency, Department of Public Works, Local Fire Departments, and Office of Emergency Services, the Natural Resources Conservation Service, and any other responsible party should be made aware of the potential hazard to lives and property. Emergency response plans including ALERT (Automated Local Evaluation in Real Time) early warning systems and evacuation plans should be developed by emergency agencies. The modeling being conducted by the U.S.D.A. Forest Service and the US Geological Survey and the site-specific observation included with this review should be considered in any emergency response plan develop by emergency agencies.

c.) Pico Blanco Boy Scout Camp Infrastructure

In order to minimize loss of life the camp should not be inhabited during heavy winter and spring storms. Structures located low in the watershed should be moved to locations high in the watershed (out of flooding stage). A hazard tree removal program should be implemented before this winter's rains. The aquatics area and dam may be subject to flooding and plugging and should be monitored after storm events if possible. The

spring box that feeds the water filtration system should be protected with logs or other armoring as high flows are expected to pass over the box. The County of Monterey County, Monterey County Water Resources Agency, Department of Public Works, Local Fire Departments, and Office of Emergency Services, the Natural Resources Conservation Service, and any other responsible party should be made aware of the potential hazard to lives and property. Emergency response plans including and ALERT (Automated Local Evaluation in Real Time) early warning system and evacuation plans should be developed by emergency agencies. The modeling being conducted by the U.S.D.A. Forest Service and the US Geological Survey and the site-specific observation included with this review should be considered in any emergency response plan develop by emergency agencies.

d). Jeffery Road, Tanbark Cabins, Millers Canyon

Erosion control measures should be implemented to Jeffery road. Cabins located closed to the watershed bottom should not be inhabited during heavy rains and storm events.

e). Coleman Canyon

It is understood the Federal BAER team evaluated this area. Landowners should cooperate with the BAER team recommendations. Any earthen dam found to be structurally impaired should be removed. Homes or ranches located low in the canyon should not be inhabited during heavy rains or storm events. The unpaved road system in the canyon may be inundated with debris flows and torrents making the road impassable.

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DRAFT TECHNICAL SPECIALTIST'S REPORT
STATE EMERGENCY ASSESSMENT TEAM (SEAT) Report

Resource: Soils

Fire Name: Basin Complex CA-LPF-001649 August 2008
Indians Fire CA-LPF-001491

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I. Resource Condition Assessment

A. Resource Setting

The 162,818 acre Basin Complex and 76,554 acre Indians Fires burned federal, state, and private lands. This assessment is an evaluation of soil conditions in burned areas upslope of the features at risk. The areas evaluated are located on the Big Sur Coast from Andrew Molera State Park south to Dolan Canyon, the Arroyo Seco Creek area west of the city of Greenfield, and the San Antonio River watershed that drains to the Fort Hunter Liggett area.

This report focuses mostly on soils located in state and private lands. The potential features at risk from debris flows, mudslides and flooding identified by the State Emergency Assessment Team (SEAT) include people, homes, businesses, domestic water supplies, infrastructure, state parks, fish and amphibian passage.

B. Survey Methods

The team evaluated features at risk using soil hydrophobicity tests, slope measurements, estimating vegetation loss and measuring ash depth. The site evaluations were supplemented by reviewing BARC maps, State Parks, US Forest Service, County Soil Survey documents and other specialized reports.

C. Resource Condition after Fire

Burn Area Reflectance Classification (BARC) maps provided by Cal Fire indicated the level of burn severity within the fire boundaries. The levels are unburned, low, moderate and high burn soil severity. Moderate and high burn soil severity can alter the way water infiltrates into the soil and lead to an increase in soil erosion. Rainfall and runoff carry the eroded soil downhill into any water channels increasing the potential for debris flows, mudslides, flooding and rockfall risks.

The intense heat of a fire can form a water-repelling or a hydrophobic layer in the soil. A waxy substance, from burning plant material, penetrates the soil as a gas

and solidifies around the soil particles after it cools. The hydrophobic layer is generally one-half to-three inches beneath the soil surface and is usually an inch or more thick. This soil hydrophobicity forms during longer periods of intense heat. In the moderate-to-high and high-burn severity areas the soil hydrophobicity usually measured high. High hydrophobicity reduces water infiltration into the soil and increases water runoff.

Under pre fire conditions plant canopy and plant debris on the ground protect the soil from rainfall impact and slow down runoff. Fire burns off the vegetation and plant litter; and speeds up and increases soil erosion from rain and water runoff compared to pre-fire conditions. Plant roots hold the soil in place and help rain to infiltrate into the soil. Fires can be hot and burn roots in the ground, reducing and/or eliminating root function. The severity of erosion is influenced by duration, intensity and amount of rainfall, slope steepness and length.

The type of soil influences erosion potential from a burn area. The Monterey County Soil Survey shows a strip of highly erodible soils along the western edge of the fire on the slopes above State Highway 1. The Tassajara and Arroyo Seco Creek areas also have some highly erodible soils on the hillsides and poses high erosion potential from increased run off.

II. Observations.

Evaluations for Big Sur Coast from Andrew Molera State Park south to Dolan Canyon include

- Multiple home sites threatened by apparent debris flows, mud slides, flooding, and rock fall.
- Business sites and water systems threatened by apparent debris flows and mud slides.
- Structure, culvert clogged by brush and debris.

Evaluations for Arroyo Seco Creek area west of Greenfield listing observed feature and the hazard

- Multiple home sites threatened by apparent debris flows, mud slides and flooding.
- The Arroyo Seco Creek alluvial fan at the base of the Santa Lucia Mountains may be at risk from debris flow and mud slides. The agricultural lands could be flooded by water carrying debris and eroded soil. The heaviest debris and soil will settle out first at the top of the fan, and then the rest will be deposited by size down the slope. If this happens, the farmland will need to be cleared, before any crop work can begin.

III. Emergency Determination

The features at risk in this assessment include the possible loss of life and property due to erosion, mudslides and flooding from the steep hillsides. These hazards are located in close proximity to or upstream of the features. The risk of flooding will increase depending on number and intensity of winter storm events. November through April is the typical winter rainy season. Burn severity

combined with the slope steepness accelerates, intensifies and increases the possibility of these hazards.

IV. Recommendations

The homes and businesses designated as moderate to high risk should have an individual emergency plan and be part of a local evacuation plan. Locations assessed as high risk to human life and safety should be followed up with site-specific investigations by the appropriate licensed professionals.

Debris flows, Mudflows, Rock Fall, – Please refer to the Geological Technical Report included in the compiled SEAT report. Structures downstream of areas threatened by debris flow, mud flows, rock fall, flooding, and any other type of landslide should not be occupied during storm events.

- Watercourse crossings – Monitor and maintain channels, drainages, catch basins, trash racks and other structures in the burn area, and on the slopes below, to minimize the potential for blockage and/or plugging. Have any culverts or water control structures monitored to verify that they are large enough for predicted flows.

V. References

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DRAFT TECHNICAL SPECIALTIST'S REPORT
STATE EMERGENCY ASSESSMENT TEAM (SEAT) Report

Resource: Wildlife

Fire Names: Basin CA-LPF-001649 August 2008
Indians CA-LPF-001491

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Resource Condition Assessment

I. Resource Setting

A. Setting

The 162,818 acre Basin fire started as the result of lightning strikes near Big Sur, in Monterey County on June 21, 2008, and was declared 100% contained on July 27. The 76,554 acre Indians Fire started as the result of human cause northwest of Fort Hunter-Liggett Military Base (FHLMB), also in Monterey County, on June 8, 2008, and was declared 100% contained on July 10, 2008. The two fires eventually converged along the southeast end of the Basin Fire to form the Basin Complex and Indians Fires, totaling 239,372 acres to date, the third largest fire event in California history. The final acreage of the fire may be somewhat higher due to the continued burning of islands of vegetation within the fire's interior perimeter. Approximately 85% of the Basin Fire occurred on Federal land occupied by the Los Padres National Forest (LPNF), while the remaining 15% (approximately 24,400 acres) of the fire occurred on State, County, or Private land (Appendix 3). The Indians Fire occurred almost entirely on Federal lands. The fires occurred in the Santa Lucia Mountain Range.

Andrew Molera (4,786 acres), Pfeiffer Big Sur (964 acres), and Julia Pfeiffer Burns (2,122 acres) State Parks, John Little State Reserve (21 acres), and Landels-Hill Big Creek Reserve (3,848 acres), part of the University of California Natural Reserve System, are the significant State properties located within the Basin Fire burned area. The Indians Fire did not burn any State land, and wildlife resource issues are virtually negligible on the private lands affected by this fire, A majority of this report will focus on impacts from the Basin Fire.

The Basin Complex and Indians Fires burned many different wildlife habitats (vegetation types) at various levels of intensity. This report will focus primarily on the direct and indirect impacts of the fire to rare, threatened, and endangered wildlife species on the State, County and private lands. (The U.S. Forest Service is conducting a separate assessment of impacts on the LPNF.) A short

description of the likely impacts to and response of some common wildlife species found on the non-Federal lands is also included.

B. Survey Methods

The initial review of wildlife resources potentially impacted by this fire included a search of the California Natural Diversity Database (CNDDB) for occurrences of sensitive species (rare, threatened, or endangered) within the burn area, creation of a pre-fire vegetation type GIS map with the categories shown in Table 1, and the soil burned severity map, generated from a satellite image of the burned area (called a Burned Area Reflectance Classification, or BARC.) Maps were provided by Cal Fire and California Department of Fish and Game (CDFG) GIS specialists. In addition to CNDDB occurrences and map analysis, field visits were conducted to view impacts to selected species and habitats, and many local biologists with knowledge of the wildlife resources along the Big Sur coast were consulted for additional information. Fortunately, the Big Sur area has attracted much attention from wildlife biologists since the early 1970's, so considerable species information was collected by talking with local experts. These contacts are listed in the References section.

II. Findings of On-The-Ground Surveys

A. Values at Risk

1. Habitat (Vegetation) Types

Major vegetation types found in the Basin Complex and Indians Fires burn area are shrubland (39%), hardwood forest/woodland (35%), conifer forest/woodland (18%), and grassland (3%) (Table 2). In general, shrubland, conifer forest/woodland, and grassland dominated the coastal (western) part of the fire, while shrubland, hardwood forest/woodland, and conifer forest/woodland dominated the large interior part of the burned area. Much of the State-Responsibility lands burned at a low to moderate severity, according to the BARC map. Exceptions to this scenario were the private lands south of Mescal Ridge and Dani Ridge, and the upper drainage of Rat Creek, and parts of Julia Pfeiffer Burns State Park that experienced moderate to high burn severity. Unfortunately, GIS resources for this report did not allow for a precise calculation of each vegetation type actually burned in the fire. However some rough estimations of impacts to selected wildlife habitats were possible by comparing a vegetation type map with the Soil Burn Severity map. These results will be discussed for a few selected species later in this section.

2. Wildlife Resources at Risk

Fire has impacted many species of wildlife and their habitat within the Basin Complex and Indians Fires burned areas. It is certain that significant amounts of mammals, birds, reptiles, amphibians, and even insects perished or lost important habitat in the fire. However, not all the habitat within the fire perimeter was burned, and a significant amount within the State-Responsibility lands burned at a low intensity, frequently resembling a mosaic pattern seen with prescribed fire that is often used by natural resource professionals to improve wildlife habitat in California. Also, most wildlife species in this area have evolved to live in this fire-adapted ecosystem. Many species were likely able to move out of the way of approaching fire to areas that were not

burned, or they found shelter in moist areas such as streams or creeks, underground, or even in large rocky outcrops and caves.

Some wildlife species, such as mule deer, will ultimately benefit from this fire as new vegetation growth provides highly nutritious forbs and shrubs for them to eat. Fire also opens up habitat for deer and other wildlife that has become too thick or tall for use as cover, food, or travel corridors. California quail and mountain quail also typically increase in number after fire alters their habitat. Accordingly, as the prey base increases, so will the predator population (mountain lions, black bear, bobcats, coyotes, gray fox, etc.) There is a large community of native wildlife that reside in the habitat types affected by the fire, but this assessment will only address impacts to state and/or federally listed endangered or threatened species and State Species of Concern that occur within the State-Responsibility lands impacted by the fires.

It is likely that many of the sensitive wildlife species within the burned area survived the fire, and will likely recover from losses to individual animals and/or habitat; however some significant impacts from the fire have occurred for certain sensitive species (Table 1). The following section reports and discusses these impacts.

B. Condition of Values at Risk

Many of the native plant communities within the burn area have also evolved under a fire regime and will regenerate quickly (1-3 years). As the habitat recovers, wildlife species will reoccupy the burned area, and have already begun this process. Vegetation types with a variety of age classes distributed in a mosaic throughout the landscape typically provide for high animal use and diversity.

1. Sensitive Species Assessments

<u>Smith's blue butterfly</u>

This federal endangered insect has the most occurrences of all the threatened and endangered wildlife found on the State-Responsibility lands burned by the Basin Fire. They occur in scattered populations in coastal scrub, chaparral, and grassland habitats (Arnold 1983). They spend their entire life cycle in association with two species of buckwheat plants in the genus *Eriogonum*, and show a strong preference for seacliff buckwheat (*Eriogonum parviflorum*). Most of the CNDDB occurrences are located along Highway 1. According to the BARC map, many occurrences were not impacted by the Basin Fire, but populations of seacliff buckwheat were burned in Julia Pfeiffer Burns State Park, and in Lafler, Torre, and Anderson Canyons (Figure 7). Los Padres National Forest staff reported to another SEAT members that 55 of 100 known Smith's blue occurrences were burned in the fire, but it is unknown if these locations were exclusive to the Los Padres National Forest or if they also included the CNDDB sightings along Highway 1. The CNDDB lists 20 occurrences for the butterfly in or near the burned area, but less than half of these showed impact. Unfortunately, the scope of this report precluded visiting every known Smith's blue butterfly occurrence in or near the State-Responsibility lands. While the butterfly did sustain significant habitat damage and individual losses, field visits confirmed that both habitat and butterflies survived the fire in certain locations. It is expected that, with the regeneration of damaged habitat, and revegetation with new plants in damaged areas, the butterfly will not suffer long-term impacts.

California red-legged frog

This Federal threatened amphibian is found in forests, woodlands, grasslands, and streamsides with adequate plant cover. It prefers deep pools with vegetation, but may also be terrestrial, sometimes living in damp places far from water. Populations of this species may have been directly impacted by low to moderate burn severity on private land located in Grimes and Lafler Canyons along Highway 1 (Figure 7), and on private land located on the Miller Fork of the Carmel River (near Chews Ridge) and on the Carmel River upstream of Los Padres Reservoir. The frog could also be impacted by excessive sediment filling their preferred deep pool habitat in these locations during significant rainfall events that erode the burned hillsides above the drainages. Portions of drainages not burned by the fire (for example, the Big Sur River in Andrew Molera State Park, and Castro Canyon west of Highway 1) (Figure 7), are also susceptible to excessive sediment. They are downstream of burned hillsides that may erode during winter rainstorms. Frogs in drainages that receive woody debris and little sediment during storms may benefit from increased perching habitat.

Foothill yellow-legged frog

These frogs prefer shallow, slow, gravelly streams and rivers with sunny banks, in forests, chaparral, and woodlands. This species was not indicated by CNDDB occurrences, but was reported by a Los Padres National Forest biologist (T. Murphey, personal communication) to occur in the Little Sur River drainage (Figure 7). This area burned from low to moderate severity near the river, possibly causing direct loss of frogs. The slopes north of the river burned with moderate to high severity, leading to the potential for excessive sediment covering their preferred habitat during rainstorms.

Southwestern pond turtle

This turtle is found in ponds, lakes, rivers, streams, creeks, marshes, and irrigation ditches with abundant vegetation, and either rocky or muddy bottoms, in woodland, forest, and grassland habitat. Logs, rocks, cattail mats, and exposed banks are required for basking. They may be active all year, but also may hibernate underwater, often in the muddy bottom of a pool. Pond turtles estivate during summer droughts by burying themselves in soft bottom mud. In some areas, they inhabit streams that dry out and the move onto land to hibernate under dense brush or wood rat nests. Southwestern pond turtles may have been directly impacted by the Basin Fire along the Carmel River, upstream of Los Padres Reservoir, and in some larger drainages where they may occur but may not have been reported to the CNDDB (T. Murphey, personal communication). Turtles occupying drainages not burned by the fire (for example, the Big Sur River in Andrew Molera State Park, and Arroyo Seco, near the north boundary of the Indians Fire), are also susceptible to excessive sediment because they are downstream of burned hillsides that may erode during winter rainstorms.

Coast horned lizard

This reptile inhabits open areas of sandy soil and low vegetation in valleys, foothills and semiarid mountains from sea level upward. It is found in grasslands, coniferous forests, woodlands, and chaparral with open areas and patches of loose soil. Coast horned lizards are often found in lowlands along sandy washes with scattered shrubs and along dirt roads, frequently near ant hills (their main prey). Although occurrences are not reported in the burned areas by CNDDB, their presence is likely (T. Murphey, personal communication.) This species would have been impacted in burned areas if individuals were unable to escape advancing fire or find escape cover such as a burrow. They are unlikely to be impacted by erosion or debris flows, as they usually occupy upland areas.

California condor

This endangered bird is in the vulture family and has the largest wingspan of all birds found in North America. The current worldwide population of condors is approximately 330 individuals (including captive populations), and fewer than 50% of these occur in the wild. Captive breeding and release programs in California, Arizona, and Baja Mexico are slowly increasing the population. Ventana Wildlife Society (VWS), a non-profit research group, began releasing condors into the wild along the Big Sur coast in 1997. Forty individual birds occupy the area impacted by these fires. Unfortunately, two adult birds are assumed to have perished in the Basin Fire as they have not been located, and their radio transmitters are no longer producing signals. The VWS condor project also sustained the loss of the rearing pen and flight/release facility located on a private in-holding within the Los Padres National Forest when it was consumed by the fire. However, prior to the loss, eight condors that were living at the facility were rescued by biologists and a Coast Guard helicopter crew as the fire creeped towards the cages. VWS is already proceeding with clean-up of the facility and making plans to re-build it for future releases. The condors appear to be adapting well to the effects of the fire, and will probably benefit from increased detection of animal carcasses now that large, decadent shrublands have been made accessible and visibility to the ground has increased due to the fire. Three active nests near or within the burned area also survived the fire, and the parent condors have maintained the care and feeding of their chicks. (Information on condors was obtained from interviews with VWS biologists H. Bonifas and J. Konig and the VWS website.)

California spotted owl

This subspecies of the spotted owl is a State Species of Concern rather than being endangered, like its northern cousin. Along the western slope of the Big Sur region, spotted owls prefer cool, moist canyons dominated by a redwood upper canopy and a tanoak understory. Foraging habitat extends into coast live oak habitat where owls hunt and feed primarily on the dusky-footed woodrat (*Neotoma fuscipes*) (Verner et al. 1992). Occurrences of the owl are fairly numerous within the Basin Fire perimeter, with over 300 recorded detections from 1964 to 2006 (Shihadeh and Cooper 2006).

The steep, moist canyons of the Big Sur coast contain numerous stands of the redwood-tanoak vegetation type that the owls prefer. Unfortunately, sudden oak death has killed many tanoak trees in Big Sur in recent years, reducing the habitat quality of this vegetation type, and also providing fuel that makes the habitat more vulnerable to wildfire. Indeed, many (but not all) owl detection sites were in the

burned areas of the Basin Fire, although many of these locations appear to be in areas of low to moderate severity. However, even low severity fire probably had an indirect effect on owls by killing woodrats or destroying woodrat habitat and their lodges. It is likely that at least some young, unfledged owls of the year perished directly or indirectly in the fire, mainly from parents abandoning nests at night or loss of prey for parents to feed young owls (Henke, personal communication). There is hope for the owl's recovery if a large number of adults survived the fire and can find enough suitable remaining habitat to accommodate their needs. As the woodrat population recovers, there should be adequate prey for the owls to re-establish their impressive reproductive rate (often two nestlings per year). The impacts of continued sudden oak death occurrences on the spotted owls of Big Sur remain to be seen (Shihadeh and Cooper 2006), and are now combined with the impacts of the fire. Low genetic diversity also remains a potential problem for the spotted owls of Big Sur, possibly affecting their ability to adapt to changes in their habitat, as well as contributing to possible effects from inbreeding (Henke, personal communication).

Black swift

This species is a secretive, long-winged bird that is usually foraging in the air over long distances when not sitting on a nest or on a cliff face near a nest. They nest in moist crevices or cave on sea cliffs above surf, or on cliffs behind or adjacent to waterfalls in deep canyons. Between 10 and 20 nests are active annually in Monterey County, including the Big Sur area (J. Griffiths, personal communication). The Basin Fire probably had little to no effect on the black swift due to its preference for nesting and resting near waterfalls and moist cliff faces.

Grasshopper sparrow

This bird is an uncommon summer resident of the area that breeds in foothills and coastal lowlands. The species prefers dry, dense grasslands, especially those with a variety of grasses and tall forbs and scattered shrubs for singing perches. Thick cover of grasses and forbs is essential for concealment from predators. The grasshopper sparrow builds its nest made of grasses and forbs in a slight depression in the ground, hidden at the base of an overhanging clump of grasses or forbs. Grasshopper sparrows have been documented nesting in grasslands in east Andrew Molera State Park, much of which burned at moderate severity in the Basin Fire (J. Griffiths, personal communication). Nests at Dolan Canyon also were potentially impacted by the fire.

Ringtail

This mammal is a widely-distributed but small, secretive predator that prefers a mixture of forest and shrubland in close association with rocky areas or riparian habitats at low to middle elevations. If seen at all, it is usually at night. The large black and white-striped tail sometimes leads to misidentification as a raccoon or even a lemur. The ringtail is a state Fully Protected Mammal. Ringtails are well-adapted to many of the habitats found within the Basin Fire perimeter, and their desire to be near water and rocky areas probably serves them well in surviving wildfires.

Emergency Determination

There has been a significant loss of native habitat and, most likely, native wildlife by the Basin Complex and Indians Fires, but many of the impacts should be of short-term duration. There were also significant losses of individuals and habitat for the endangered Smith's blue butterfly, and the California spotted owl, a California Species of Special Concern. These vegetation and wildlife communities are adapted to recovering from fire, and this fire event should be no different. Emergency actions are not recommended for wildlife habitat and species recovery at this time, but recommendations are given in the following section for treatments and monitoring that may be conducted to improve sensitive species habitat and document the possible effects of the fires on wildlife resources.

Treatments to Mitigate the Emergency

I. Treatment Types

- Post-fire monitoring of stream and river habitats
- Re-vegetate and control invasive weeds in Smith's blue butterfly habitat burned in the fire
- Monitor and survey known California spotted owl locations and habitat burned or indirectly impacted by the fire
- Re-vegetation and invasive weed control of grasslands known to be grasshopper sparrow nesting habitat that was burned in the fire

II. Treatment Objectives

- Drainages that are identified as habitat for the California red-legged frog, foothill yellow-legged frog, and southwestern pond turtle are at risk from excessive sedimentation during high rainfall and should be monitored and surveyed for impacts when rain events warrant. Identify areas having poor native plant regeneration and showing signs of excessive soil erosion. Identify areas of increased exotic plant cover. Identify areas that exhibit below-normal seasonal water quality standards for amphibians and reptiles
- Restore Smith's blue butterfly habitat burned by the fire
- Document California spotted owl occurrences, nesting sites, and habitat quality to evaluate post-fire recovery of species
- Restore grasslands in east Andrew Molera State Park (AMSP), and possibly the Dolan Canyon location documented as grasshopper sparrow nesting habitat

III. Treatment Descriptions

- Monitor side-slopes using ocular plant cover estimates and plant species composition on a site specific basis to identify areas of poor plant regeneration and areas showing signs of excessive soil erosion. Implement appropriate best management practices (BMPs) upstream of sensitive riparian habitats to

minimize sediment load. Water quality should be monitored on the Big Sur River, Grimes and Lafler Canyons along Highway 1, Castro Canyon west of Highway 1, Little Sur River drainage, the Miller Fork of the Carmel River (near Chews Ridge) and on the Carmel River upstream of Los Padres Reservoir, Arroyo Seco. Monitoring may be coordinated through the Regional Water Quality Control Board, State Parks, Fish and Game, or a local biologist with knowledge of the species and habitat in question

- Contact U.S. Fish and Wildlife Service and California State Parks office in Monterey prior to undertaking any surveys or restoration work for Smith's blue butterfly. Re-plant small populations of seacliff buckwheat that were burned in Julia Pfeiffer Burns State Park, and in Lafler, Torre, and Anderson Canyons. Use local plant stock as source of new plants. Use hand-pulling or selective herbicides to eradicate invasive plants that compete with new plants or naturally resprouting plants. Conduct post-fire population surveys for Smith's blue butterfly in areas impacted by the fire

- Coordinate surveys and habitat evaluations with biologists who have experience working with spotted owls in the Big Sur area. Big Sur Ornithology Lab, California State Parks, Los Padres National Forest, and PG& E biologist Andrea Henke are suggested as resources

- Grasshopper sparrow habitat at Andrew Molera State Park (AMSP) is located on State Parks property, and they would probably be the lead agency on the restoration project. Consult with local biologists, including Big Sur Ornithology Lab for details on nesting ecology and requirements. Work with professionals knowledgeable about restoring local grassland habitats; use local plant stock as source of new plants

Discussion/Summary/Recommendations

Basin Complex and Indians Fires consumed 239,372 acres including valuable upland and lowland habitat types that supported numerous sensitive species. Approximately 24,400 acres of State-Responsibility lands were burned by the Basin Fire; the Indians Fire occurred mostly on Federal land and burned only a small amount of State-Responsibility lands. Most of the vegetation communities that were affected by the Basin Complex and Indians Fires have evolved with periodic fires and will naturally regenerate within a few years. The fires have impacted many species of wildlife and their habitats within the Basin Complex and Indians Fires burned areas. It is nearly certain that significant amounts of mammals, birds, reptiles, amphibians, and even insects perished or lost important habitat in the fire. However, many species were likely able to move out of the way of approaching the fire to areas that were not burned, or they found shelter in moist areas such as streams or creeks, underground, or even in large rocky outcrops and caves. Also, not all of the habitat within the fire perimeter was burned, and a significant amount within the State-Responsibility lands burned in a low intensity mosaic pattern, probably providing long-term habitat improvement to many native wildlife species.

The population of California condors along the Big Sur coast appears to have endured the effects of the fire fairly well, although two adult birds likely perished in the fire, and the Ventana Wildlife Society will have to re-build the rearing pen and release facility that were badly damaged during the fire. On a positive note, the eight condors that

occupied the rearing pen and release facility were safely rescued before the fire reached them, and the three known active condor nests all survived the fire, with the parents exhibiting behavior typical for raising a baby condor.

The Federal endangered Smith's blue butterfly and the California spotted owl (state species of concern) were most likely significantly impacted by the fire, through loss of individual animals and habitat. Losses of individuals and habitat for the Federal threatened California red-legged frog on State-Responsibility lands were likely, but to an unknown extent. The frog could also be impacted this winter by excessive sediment filling their preferred deep pool habitat locations during significant rainfall events that erode the burned hills above drainages they occupy. Impacts to the foothill yellow-legged frog and southwestern pond turtle, both state species of concern, were also likely, but somewhat unknown due to a shortage of known occurrences reported for both species. These species also risk the same impacts from rain-induced erosion that may impact the California red-legged frog. All of the above-mentioned species will benefit from survey and monitoring programs that emphasize evaluating the impacts of the fire on the animals. Habitat enhancement, especially for the Smith's blue butterfly, could make significant, positive impacts to their recovery from the effects of the fire. The grasshopper sparrow, a species of concern that is very dependent on grassland habitat, is another species that could possibly benefit greatly from habitat restoration efforts that compliment natural recovery.

General Recommendations

Four primary categories of threats to wildlife and their habitats were identified within the Basin Complex and Indians Fires that prompted the following recommendations for monitoring and restoration: (1) post-fire monitoring of stream and river habitats known to be occupied by sensitive amphibians and reptiles; (2) re-vegetation and invasive weed control of Smith's blue butterfly habitat burned by the Basin fire; (3) surveying and monitoring of known California spotted owl locations and habitat burned or indirectly impacted by the Basin fire; and (4) re-vegetation and invasive weed control of grasslands known to be grasshopper sparrow nesting habitat that was consumed by the fire.

For areas along and adjacent to Highway 1, where emergency treatments are needed to protect values at risk, the responsible agency should consult with the U.S. Fish and Wildlife Service to evaluate potential impacts to seacliff buckwheat (*Eriogonum parviflorum*), the habitat for the endangered Smith's blue butterfly.

Actions taken to mitigate erosion and sediment flows to protect lives and property should be designed to include plant regeneration measures in order to hasten stability of watersheds within the burned areas. If required, vegetation removal along perennial and ephemeral streams in order to facilitate winter rain containment should be coordinated through appropriate county, state and federal agencies.

Avoid livestock grazing in burned areas until at least the 2009-2010 growing season (longer if rainfall is below the long-term average in the year following the fire).

Avoid disturbing islands of unburned vegetation, which provide wildlife habitat as well as seed sources for natural re-vegetation.

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Table 1 – Sensitive wildlife species potentially impacted by the Basin and Indians Fires*

Common Name	Scientific Name	Status
Smith's blue butterfly	*Euphilotes enoptes smithi*	Federal Endangered
California red-legged frog	*Rana aurora draytoni*	Federal Threatened
Foothill yellow-legged frog	*Rana boylii*	State Species of Concern
Southwestern pond turtle	*Actinemys marmorata pallida*	State Species of Concern
Coast horned lizard	*Phrynosoma coronatum frontale*	State Species of Concern
California condor	*Gymnogyps californianus*	Federal Endangered State Endangered
California spotted owl	*Strix occidentalis occidentalis*	State Species of Concern
Black swift	*Cypseloides niger*	State Species of Concern
Grasshopper sparrow	*Ammodramus savannarum*	State Species of Concern
Ringtail	*Bassariscus astutus*	State Fully Protected

*The southwestern pond turtle is the only sensitive species potentially impacted by the Indians Fire.

Pre-existing figures and a table referenced in this report:
Appendix 3 - Basin Complex & Indians Fires - Ownership Map
Figure 7 - Basin-Indians Fire Natural Resource Impacts
Table 2 of the Botany Section - Pre-fire vegetation type categories

DRAFT TECHNICAL SPECIALTIST'S REPORT
STATE EMERGENCY ASSESSMENT TEAM (SEAT) Report

Resource: Botany

Fire Name: Basin Complex CA-LPF-001649 August 2008
Indians Fire CA-LPF-001491

Author Name: Ellen Cypher, Ph.D., Regional Botanist
California Department of Fish and Game
Central Region
1234 East Shaw Avenue
Fresno, CA 93710
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Resource Condition Assessment

I. Resource Setting

A. Setting

The 162,818-acre Basin Complex Fire and 76,554-acre Indians Fire burned 16 separate vegetation types (Table 2) on a combination of Federal, State, County, and Private lands in Monterey County from the Big Sur coast to the western edge of the Salinas Valley (Appendix 3). Those 16 vegetation types represent 4 major categories: shrubland (39% of the area within the fire perimeter), hardwood forest/woodland (35%), conifer forest/woodland (18%), and grassland (3%).

This report will focus on impacts to vegetation and rare, threatened, and endangered plant species on State Responsibility Lands (State, County, local, and Private ownership), which account for approximately 25,000 acres of the burned area. Botanical values at risk from contingency dozer lines constructed outside of the actual burn perimeter on State Responsibility Lands also are included in this report. State-owned lands entirely or partially within the fire perimeter include Andrew Molera State Park, John Little State Reserve, Julia Pfeiffer Burns State Park, Pfeiffer-Big Sur State Park, and the University of California Landels Hill-Big Creek Natural Reserve.

B. Survey methods

Rare plant and natural community locations from the California Natural Diversity Data Base (CNDDB) (2008) were overlain on dozer lines and the Burned Area Reflectance Classification (BARC) map to identify potential areas of impact from fire suppression and rehabilitation activities, high and moderate severity burns (see definitions page), and future flooding/erosion/debris flow in the watershed. Based on this analysis, certain plant populations were identified as possibly being disturbed during the fire or potentially subject to disturbance during post-burn treatments and after-effects of the fire. Field visits were made on August 13, 15, 16, and 18, 2008 to assess potential impacts to sensitive natural communities and rare plant populations that were likely to be visible in August. Potential impacts to rare plants that were in inconspicuous phases of their life cycle, did not have detailed location information, or were in inaccessible areas were inferred from the map exercise and personal communications with local experts.

II. Findings of the On-The-Ground Survey

A. Values At Risk

Twenty-five rare plant species have been reported to occur in the Basin Complex and Indians Fires area, although nine of them are not known from State Responsibility Lands (Table 3). The only listed plant species within the fire perimeter is Dudley's lousewort (*Pedicularis dudleyi*), which is State-listed as Rare. Sea cliff buckwheat (*Eriogonum parvifolium*) is not in itself rare, but it is a host plant for Smith's blue butterfly, a federally-listed endangered species found in the burn area.

The ecological integrity of all the natural communities in the area of the Basin Complex and Indians Fires is a value at risk because disturbance can allow encroachment of invasive weeds. Weeds compete with native plants for moisture, nutrients, and sunlight; alter vegetation structure, which can create unsuitable habitat for native wildlife; and can contribute to an unnaturally high fire frequency, which could result in type-conversion (permanent changes in the vegetation type and species composition). Four vegetation types within the fire perimeter are of particular concern because they are considered rare natural communities (CNDDB, 2003): Central Coast Cottonwood-Sycamore Riparian Woodland [described as Riparian Mixed Hardwood by the Remote Sensing Lab (2004)], Redwood Forest, Santa Lucia Fir Woodland, and Valley Oak Woodland.

The Basin Complex Fire (but not the Indians) also created a risk for the ecological integrity of natural communities outside of the burned area due to possible inadvertent transmission of Sudden Oak Death, a devasating plant disease. The Big Sur coast is part of the area infected with Sudden Oak Death, which is caused by the fungus *Phytophthora ramorum* (University of California Statewide Integrated Pest Management Program 2008, http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7498.html). True oaks, including coast live oak (*Quercus agrifolia*), California black oak (*Q. kelloggii*), and Shreve oak (*Q. parvula* var. *shrevei*), plus the related species tanoak (*Lithocarpus densiflorus*), are most susceptible to the disease, which typically results in mortality of the entire tree. Other trees and shrubs are less susceptible, showing some leaf spots and twig dieback but typically surviving the fungal infection. Leaves from these other plants act as carriers of the fungus, as does contaminated soil. Fungal spores of the Sudden Oak Death pathogen can persist for many years in the soil (University of California Statewide Integrated Pest Management Program, 2008).

B. Condition of Values At Risk

Possible hazards to rare plants or sensitive natural communities from the fire itself, dozer lines, or potential post-burn treatments were identified on State Responsibility Lands in the following areas:

- Arroyo Seco (upper watershed): Arroyo Seco bush-mallow, Hickman's checkerbloom, hooked popcorn-flower
- Arroyo Seco watershed between the campground and Sycamore Flat: Carmel Valley malacothrix, Jolon clarkia, Lemmon's jewelflower, Valley Oak Woodland
- Big Creek: San Luis Obispo sedge, teardrop moss
- Los Padres Reservoir: hooked popcorn-flower
- Lucia: Hutchinson's larkspur, bristlecone fir

- Mill Creek: maple-leaved checkerbloom
- Miller Canyon: bristlecone fir
- Mission Canyon: pale-yellow layia
- Pfeiffer Big Sur State Park (Pine Ridge Trail): Hutchinson's larkspur
- San Clemente Ridge: hooked popcorn-flower
- Tassaraja Hot Springs: Hickman's checkerbloom
- Tin House Road: sea cliff buckwheat

According to the U.S. Forest Service (Lloyd Simpson, personal communication, 2008), more than 50% of sea cliff buckwheat stands burned during the Basin Fire. However, Smith's blue butterfly did not necessarily inhabit all of those stands. The sea cliff buckwheat will return naturally, but restoration plantings may be desired so that Smith's blue butterfly populations will not decline in the interim. The Wildlife Technical Specialist's report includes a discussion of potential impacts to Smith's blue butterfly and treatment recommendations for sea cliff buckwheat. The U.S. Fish and Wildlife Service must approve any measures relative to Smith's blue butterfly and its habitat before implementation begins.

The Redwood Forest and Santa Lucia Fir Woodland natural communities and the rare plants on State Responsibility lands are primarily in areas of low burn severity. Most of these rare plants and the Redwood Forest natural community are adapted to wildfires. In fact, the seeds of many chaparral plants require stimulation by fire or smoke before they can germinate (Keeley and Foteringham 1998). Studies have shown that native vegetation should recover rapidly after the fire without any further treatment (Keeley, 1977; California Native Plant Society [CNPS], 1995). Although the Santa Lucia Fir Woodland is not fire-adapted, no recommendations are provided here because the condition of the small area of this natural community on State Responsibility lands is not known.

The primary concern for the rare natural community Central Coast Cottonwood-Sycamore Riparian Woodland, which is largely outside of the fire perimeter, is damage from human efforts to control debris flows, flooding, and associated hazards in the aftermath of the fire. Trees and shrubs may be cut to avoid debris dams. Native trees will take many years to become established and reach the size of the trees that are cut down, and shading for fish and other aquatic organisms will be reduced in the interim. Conversely, the invasive tree-of-heaven (*Ailanthus altissima*), which grows in floodplains and was observed in Arroyo Seco, sends up multiple stump sprouts after the tree is cut down, which crowd out the young growth of native trees and shrubs. Another potential concern would be heavy equipment operating in stream beds to install culverts or other flood-control structures and destroying native plants and wildlife habitat in the process.

In fact, the greatest threat to all natural communities from the Basin Complex and Indians Fires is related to human-caused disturbance. Various treatments that have been used in the past in an attempt to stabilize soil and suppress weeds have failed to achieve the desired objectives and instead made matters worse by inhibiting the recolonization and growth of native plants. Even thin layers of mulch (such as those from hydromulch) can inhibit natural recruitment from the native seed bank, and hydromulch and hyroseeding are ineffective without high soil moisture. Moreover, various types of mulches and seed mixes may contain invasive weed seeds as contaminants (CNPS, 1995). Wood fiber

is less likely than straw mulch to introduce seeds of invasive weeds but can change the soil pH and thereby the species composition. Introduction of non-local "native" seed may compromise the adaptive ability of native plants remaining in the area by hybridizing. Seeding also changes the species composition within a habitat type, thereby affecting its suitability for local wildlife (Keeler-Wolf, 1995).

Dozer lines may have disturbed rare plant populations in the vicinity of Lucia, Mill Creek, and Coleman Canyon/Mission Canyon; the assessment is uncertain because the rare plant population boundaries have not been mapped precisely. More than 100 miles of dozer line were constructed in attempts to contain the Basin Complex and Indians Fires. Much of the dozer line followed the pre-existing line established during the Marble Cone fire in 1977. However plants, including rare species, have had ample opportunity to recolonize that dozer line over the past three decades. Another concern is that dozer lines may invite off-highway vehicle trespass if they cross existing roads. Contingency lines (dozer lines constructed outside the fire boundary as a preventative measure) were located at Andrew Molera State Park, Arroyo Seco, Big Creek, Carmel Valley, Joshua Creek Ecological Reserve (a Department of Fish and Game property), Lucia, San Clemente Ridge, Vaqueros Creek, and White Rock Ridge.

The ecological integrity of rare natural communities and rare plant habitats in and near the burned area may be compromised by invasive weed encroachment, particularly along dozer lines. Disturbance of the soil surface tends to favor non-native plants because their seeds typically germinate more quickly than seeds of native plants and then crowd out the natives. At least 25 species of invasive weeds occur in and adjacent to the Basin Complex and Indians Fires area (Table 4). Thus, there is an existing seed source for invasive weeds to invade burned areas and dozer lines. Heavy equipment such as dozers can easily transport weed seeds that become caught in the machinery or in caked mud. Livestock and wildlife can also transport weed seeds in their fur and their droppings. The area of greatest concern for invasive weed encroachment on State Responsibility lands is the Valley Oak Woodland Valley between Arroyo Seco and Sycamore Flat.

Another issue along dozer lines is burial of native annual plant seed bank. Annual plants are those that die each year after setting seed. Populations of annual plants persist from year to year through seeds stored in the soil, which germinate when they are exposed to appropriate temperature and moisture. If the seeds are buried too deep, they may rot before they have an opportunity to germinate, or sprouts may not have sufficient energy to reach the sunlight. Typically, rare annuals and perennials with underground buds recover from wildfires over a period of several years if further disturbance to the burned habitat is controlled and minimized. Thus, it is important to retain and respread soil in habitats where native annual plants occur so they can recolonize. Rare annual species for which occupied habitat may have been disturbed by dozer lines include Jolon clarkia, pale-yellow layia, and hooked popcorn-flower.

Particular areas of concern for weed invasion are the road from Bottcher's Gap to the Little Sur River, the Coleman Canyon/Mission Canyon area, the Highway 1 Front, Joshua Creek Ecological Reserve, Post Creek in Pfeiffer-Big Sur State Park, and Valley Oak Woodlands of the Arroyo Seco watershed. These areas have pre-existing populations of invasive weeds. The Indians Fire camp is reported to have staged in a large infestation of yellow star-thistle (*Centaurea soltitialis*) at Fort Hunter Liggett, so dozers may well have carried those seeds (Lloyd Simpson, personal communication, 2008).

Although Sudden Oak Death was present in Monterey County before the Basin Complex and Indians Fires, the fuel load created by dead tanoaks likely increased the extent and severity of the burn. Two areas within the Basin Complex Fire area with high incidence of Sudden Oak Death are Partington Canyon and the Little Sur drainage from Jackson Creek downstream. These areas sustained low to moderate burn severity, but dead tanoaks remain in mosaic patterns. In both watersheds, the increased number of personnel and vehicles traveling through infected areas to suppress the fire, remove fallen trees, conduct assessments, and mitigate the threat of mudslides, debris flows, and excessive flooding from more severely burned areas increases the opportunities for disease transmission to other areas both within and outside of Monterey County.

Emergency Determination

Emergencies to botanical resources related to the Basin Complex and Indians Fires fall into three major categories: 1) threats to rare plants from the fire itself and from post-fire treatments implemented to protect other values, 2) loss of natural community integrity due to invasive weeds and potential post-fire treatments that inhibit natives, and 3) spread of Sudden Oak Death to uninfected areas.

Treatments to Mitigate the Emergency

I. Treatment Types

- Restoration of endangered wildlife habitat
- Minimizing intervention and disturbance
- Dozer line remediation
- Invasive weed detection surveys
- Weed control
- Pre-activity surveys
- Monitoring
- Vehicle inspections
- Wash stations

II. Treatment Objectives

The treatment objectives are to protect rare plants and rare natural communities from human-caused disturbance, to promote native plant recolonization of burned areas and dozer lines, to curtail invasive weed infestations in their incipient stages, and to avoid spreading Sudden Oak Death into currently uninfected areas.

III. Treatment Descriptions

General Recommendations

- Avoid ground disturbing activity and herbicide use in areas where rare plant species have been reported, if possible. Ground disturbing activities include but are not limited to excavation, contour tilling, scarification, mulching, and driving heavy equipment. If these activities cannot be avoided in the vicinity of known rare plant occurrences, pre-activity surveys should be conducted.

- For *restoration of sensitive wildlife habitat*, propagate plants from the closest possible stands.
- Other than necessary to protect life and property, avoid seeding and tilling in wildlands as much as possible. If seeding is needed, weed-free seed should be used.
- Avoid the use of mulch if possible. If mulching is essential, biodegradable matting such as wood fiber is preferred. Straw is less desirable but should be weed-free if used. Hydroseed and hydromulch are discouraged.
- Restrict chip layers from use of hydro-axes to 1 inch deep or less to avoid inhibiting sprouting from native seeds and root crowns.
- Minimize the amount of vegetation removed while clearing chokepoints in channels to that essential to reduce risk to life and property. Vegetation smaller than 3 inches in diameter should be left in the channel, and only the actual channel should be cleared (unless a threat to life and property exists upslope of the channel).
- Implement appropriate best management practices upstream of sensitive riparian habitats to minimize sediment load.
- Redistribute soil that was piled into berms or piles during creation of dozer lines to salvage native plant seeds.
- Block or disguise entrances to dozer lines with shrubs, logs, or other means to minimize trespass.
- Avoid planting or seeding invasive species.
- Conduct invasive weed surveys during the 2009 growing season along dozer lines and roads used by suppression equipment.
- Promptly control weed populations upon detection, and follow up with monitoring and control for at least 2 years.
- Avoid livestock grazing in burned areas until at least the 2009-2010 growing season (longer if rainfall is below the long-term average in the year following the fire).
- Avoid disturbing islands of unburned vegetation, which provide wildlife habitat as well as seed sources for natural revegetation.

<u>Specific Recommendations</u>

- Conduct pre-activity surveys for multiple rare plants before disturbing road banks in the Arroyo Seco area from the campground to Sycamore Flat.
- Conduct pre-activity surveys for Dudley's lousewort before disturbing the floodplain of the Little Sur River downstream from Jackson Creek.
- Monitor and control weeds along dozer lines in Coleman and Mission Canyons, the Joshua Creek Ecological Reserve, and Valley Oak Woodland.
- Monitor and control weeds in burned areas and dozer lines that intersect Highway 1.
- Monitor and control weeds along the road from Bottcher's Gap to the Little Sur River.
- Monitor and control weeds along Post Creek in Pfeiffer-Big Sur State Park.
- If tree-of-heaven must be cut, treat stumps with appropriate herbicide immediately after cutting to prevent stump sprouting.

- If bristlecone fir stands along Mill Creek are found to be burned, monitor for regeneration.
- Inspect vehicles leaving the Pico Blanco area and Partington Canyon areas, manually remove obvious plant material, and use wash stations to remove mud from vehicles (upper and undersides).
- Provide boot wash stations for hikers and workers leaving the Pico Blanco area and Partington Canyon.
- Avoid removal of tanoak or oak wood from the Pico Blanco area, Partington Canyon, and any other sites with known Sudden Oak Death infections.

IV. Treatment Cost

Costs will not be incurred if seeding, mulching, and similar measures are avoided as recommended. Biological consultants may charge $100 or more per hour to survey for rare plants and weeds. The total cost is unknown because it is dependent on the amount of ground-disturbing activities in known rare plant habitats.

Discussion/Summary/Recommendations .

Rare plants and habitats that may require special attention include Dudley's lousewort along the Little Sur River between Jackson Creek and the western fire perimeter, Hutchinson's larkspur on Pine Ridge Trail in Pfeiffer-Big Sur State Park, and Valley Oak Woodland between Arroyo Seco and Sycamore Flat. If ground-disturbing activities or weed control are planned in these areas, surveys should be conducted at the appropriate time of year to pinpoint rare plant occurrences, and a qualified botanist should be present to guide workers as they implement post-fire treatments. Restoration of. sea cliff buckwheat for Smith's blue butterfly may be necessary along Tin House Road, if approved by the U.S. Fish and Wildlife Service.

Seeding and mulching are discouraged because they may inhibit natural recolonization of native species and introduce weeds. Invasive weeds may invade burned areas and dozer lines throughout the fire as well as contingency lines outside the fire perimeter. Particular areas of concern are the Highway 1 Front, Post Creek in Pfeiffer-Big Sur State Park, and Joshua Creek Ecological Reserve (due to the Basin Complex fire), and Valley Oak Woodlands of the Arroyo Seco watershed (Indians Fire). These areas either have pre-existing populations of invasive weeds or were disturbed by dozer lines, making them more susceptible to spread of invasive weeds.

Recommendations to prevent invasive weed encroachment include surveys for invasive weeds in the specified areas during the growing season of 2009; immediate control of invasive plants upon discovery with at least two additional years of follow-up inspections and control, avoidance of seeding; and using weed-free mulch if this treatment cannot be avoided entirely. Homeowners who desire to replant their properties are encouraged to use alternatives to invasive plants. Lists of invasive species to avoid planting are available from the Monterey County Weed Management Area (http://www.co.monterey.ca.us/ag/nox_weeds.htm) and the California Invasive Plant Council (http://www.cal-ipc.org/ip/management/plant_profiles/index.php). The latter also recommends alternatives to invasive ornamentals for the Central Coast (http://www.cal-ipc.org/landscaping/dpp/planttypes.php?region=centcoast),

Several measures are recommended to avoid having hikers and workers introduce Sudden oak death to new areas, particularly those outside of Monterey County.

Althought the disease existed in the area previously, the Basin Complex Fire has exacerbated the situation by increasing the number of personnel and vehicles traveling through infected areas. Recommendations to mitigate the emergency for Sudden Oak Death consist of inspecting vehicles and washing both boots and vehicles before leaving infested areas and avoiding the removal of pieces of wood from tree or shrub species that are known hosts or carriers of Sudden Oak Death.

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Table 2. Specific vegetation types found in the Basin Complex and Indians Fires perimeter (Remote Sensing Lab 2004, 2007). Where possible, names of vegetation types have been modified slightly to correspond with the "List of California Terrestrial Natural Communities Recognized by the California Natural Diversity Database" (2003).

Vegetation Type	**Percent of burn area**
Shrubland	**39**
Lower Montane Mixed Chaparral	30
Chamise Chaparral	7
California Sagebrush Scrub	2
Ceanothus Chaparral	< 1
Hardwood Forest/Woodland	**35**
Coast Live Oak Forest and Woodland	28
Tanoak Forest and Woodland	5
Blue Oak Woodland	2
Valley Oak Woodland*	< 1
Riparian Mixed Hardwood Woodland (Central Coast Cottonwood-Sycamore Riparian Woodland*)	< 1
Black Oak Forest and Woodland	< 1
Conifer Forest/Woodland	**18**
Coulter Pine Woodland	12
Redwood Forest*	5
Ponderosa Pine Forest and Woodland	< 1
Gray (Foothill) Pine Woodland	< 1
Santa Lucia Fir Woodland*	+
Grassland	**3**
California Annual Grassland	3
Non-vegetated	**< 1**

* Rare natural community (California Natural Diversity Database 2003).

+ Did not appear on the Remote Sensing Lab map. This species is known to occur in the Basin Fire area (California Natural Diversity Database 2008); the stands probably are too small to be detected via remote sensing.

Table 3. Rare plants and natural communities reported from the Basin Complex and Indians Fires area (California Natural Diversity Database 2008).

Common Name	**Scientific Name**	**Status***	**Location Within Fire**
Bristlecone fir, Santa Lucia fir	*Abies bracteata*	1B.3	Julia Pfeiffer Burns State Park, Los Padres National Forest, Miller Canyon, Pfeiffer-Big Sur State Park
Dwarf calycadenia	*Calycadenia villosa*	1B.1	Fort Hunter Liggett, Los Padres National Forest
San Luis Obispo	*Carex obispoensis*	1B.2	Big Creek south of fire

sedge			perimeter
Muir's tarplant	*Carlquistia muirii*	1B.3	Los Padres National Forest
Lemmon's jewelflower	*Caulanthus coulteri* var. *lemmonii*	1B.2	Arroyo Seco/Sycamore Flat
Jolon clarkia	*Clarkia jolonensis*	1B.2	lower Arroyo Seco watershed, Chews Ridge, Los Padres National Forest, Pfeiffer-Big Sur State Park
Lewis' clarkia	*Clarkia lewisii*	4.3	Julia Pfeiffer Burns State Park
Tear drop moss	*Dacrophyllum falcifolium*	1B.3	Big Creek, El Sur, Los Padres National Forest, other private
Hutchinson's larkspur	*Delphinium hutchinsoniae*	1B.2	Pfeiffer-Big Sur State Park, private
Norris' beard moss	*Didymodon norrisii*	2.2	Los Padres National Forest
Butterworth's buckwheat	*Eriogonum butterworthianum*	1B.3	Los Padres National Forest
Sea cliff buckwheat	*Eriogonum parvifolium*	Host for endangered Smith's blue butterfly	Julia Pfeiffer Burns State Park, Los Padres National Forest, private lands
Talus fritillary	*Fritillaria falcata*	1B.2	Los Padres National Forest
fragrant fritillary	*Fritillaria liliacea*	1B.2	Los Padres National Forest
San Benito fritillary	*Fritillaria viridea*	1B.2	Los Padres National Forest
Cone Peak bedstraw	*Galium californicum* ssp. *luciense*	1B.3	Fort Hunter Liggett, Los Padres National Forest
Santa Lucia bedstraw	*Galium clementis*	1B.3	Los Padres National Forest
pale yellow layia	*Layia heterotricha*	1B.1	Mission Canyon
Arroyo Seco bush mallow	*Malacothamnus palmeri* var. *lucianus*	1B.2	Andrew Molera State Park, upper Arroyo Seco watershed, Los Padres National Forest, Pfeiffer-Big Sur State Park (historically)
Carmel Valley malacothrix	*Malacothrix saxatilis* var. *arachnoidea*	1B.2	Arroyo Seco/Sycamore Flat
Kellman's bristle moss	*Orthotrichum kellmanii*	1B.2	Los Padres National Forest
Dudley's lousewort	*Pedicularis dudleyi*	State Rare, 1B.2	Little Sur River from Jackson Camp downstream, Los Padres National Forest
San Benito pentachaeta	*Pentachaeta exilis* ssp. *aeolica*	1B.2	Los Padres National Forest
hooked popcorn flower	*Plagiobothrys uncinatus*	1B.2	upper Arroyo Seco watershed, Los Padres Reservoir, San Clemente Ridge

Hickman's checkerbloom	*Sidalcea hickmanii* ssp. *hickmanii*	1B.3	upper Arroyo Seco watershed, Los Padres National Forest, Tassajara Hot Springs
maple-leaved checkerbloom	*Sidalcea malachroides*	4.2	Mill Creek
Central Coast Cottonwood-Sycamore Riparian Woodland	N/A	N/A	Outside of burn perimeter
Redwood Forest	N/A	N/A	Andrew Molera State Park, Julia Pfeiffer Burns State Park, Los Padres National Forest, Pfeiffer-Big Sur State Park, private lands
Santa Lucia Fir Woodland	N/A	N/A	Julia Pfeiffer Burns State Park, Los Padres National Forest, Miller Canyon, Pfeiffer-Big Sur State Park
Valley Oak Woodland	N/A	N/A	Arroyo Seco/Sycamore Flat, Fort Hunter Liggett, Los Padres National Forest

*California Native Plant Society (2008) Lists:
1B = rare, threatened, or endangered in California and elsewhere
2 = rare, threatened, or endangered in California, but more common elsewhere
4 = limited distribution (watch list)
0.1 = seriously endangered in California
0.2 = fairly endangered in California
0.3 = not very endangered in CaliforniaTable 4. Invasive weeds observed or reported in and adjacent to the Basin Complex and Indians Fires area.

Common Name	**Scientific Name**	**Observed/Reported**
Sticky eupatorium, croftonweed	*Ageratina adenophora*	observed
Tree-of-heaven	*Ailanthus altissima*	observed
Italian thistle	*Carduus pycnocephalus*	observed
Iceplant, Hottentot fig	*Carpobrotus edulis*	observed
Yellow star-thistle	*Centaurea solstitialis*	reported
Bull thistle	*Cirsium vulgare*	reported
Poison hemlock	*Conium maculatum*	observed
Pampas grass	*Cortaderia selloana*	observed
Jubata grass, purple pampas grass	*Cortaderia jubata*	observed
Cape ivy	*Delairea odorata*	observed
Pride-of-Madeira	*Echium candicans*	observed
Veldt grass	*Erharta calycina*	reported
Blue gum	*Eucalyptus globulus*	reported
Fennel	*Foeniculum vulgare*	observed
French broom	*Genista monspessulana*	observed
English ivy	*Hedera helix*	reported

Shortpod mustard	*Hirschfeldia incana*	observed
Taurian thistle	*Onopordum tauricum*	reported
Kikuyu grass	*Pennisetum clandestinum*	observed
Crimson fountain grass	*Pennisetum setaceum*	observed
Harding grass	*Phalaris aquatica*	observed
Himalayan blackberry	*Rubus discolor* = *R. armeniacus*	reported
Milk thistle	*Silybum marianum*	reported
Hedge parsley	*Torilis arvensis*	observed
Big periwinkle	*Vinca major*	observed

DRAFT TECHNICAL SPECIALIST'S REPORT
STATE EMERGENCY ASSESSMENT TEAM (SEAT) Report

Resource: Marine Resources/Fisheries

Fire Name: Basin Complex CA-LPF-001649 August 2008
Indians CA-LPF-001491

Author Name: George Isaac, Environmental Scientist
Department of Fish and Game
20 Lower Ragsdale Drive, #100
Monterey, CA 93940
Office: (831) 649-2813

I. Potential Values at Risk

The 162,818 acre Basin Complex and 76,554 acre Indians Fire burned Federal, State, and Private lands. The Basin Complex and the Indians Fire perimeter include several rivers and creeks that drain into the Pacific Ocean. The area of these fires includes the coastland from the Pacific Ocean north to Carmel Valley and south to the Fort Hunter Liggett area. This report focuses on Marine resources and Fishery habitats (Figure 7). Critical habitat for the Steelhead trout (*Oncorhynchus mykiss irideus*) are at risk in areas of low, moderate and high burn severity areas and downstream including fish passage damages. Potential mudslide runoff can affect coastal Marine Protected Areas (MPAs) via sediment delivery, loss of habitat, and pollution. Marine protected areas include state marine reserves, state marine parks and state marine conservation areas. Marine managed area classifications include state water quality protection areas, state marine cultural preservation areas, and a state marine recreational management area. The potential values at risk identified by the State Emergency Assessment Team (SEAT) include natural resources (inland fisheries and marine organisms), people, homes, businesses, infrastructure, and domestic water supplies.

Species at Risk

Species at risk include fish and invertebrate species and their habitat in the North Central Coast of California that could be potentially affected by post fire mudslides and heavy debris flows (Species List, Table 5, 6).

II. Resource Condition Assessment

A. Resource Setting

This assessment is an evaluation of marine resources and fishery habitat in burn areas. The areas evaluated are located along the Big Sur Coast from Andrew Molera State Park south to Dolan Canyon, the Arroyo Seco Creek area west of Greenfield, and south to the Fort Hunter Liggett area.

B. Survey Methods

In order to evaluate the potential risk to natural resources, field surveys were conducted by biologists from August 12th through August 21st, 2008. The prime areas examined during this study were the State Parks, State Reserve, Pico Blanco Boy Scout camp, Arroyo Seco drainage, and sites along Highway 1. The initial review of wildlife resources potentially impacted by this fire included a search of the California Natural Diversity Database (CNDDB) within the burn area, and the Burned Area Reflectance Classification (BARC) map. Maps were provided by Cal Fire and California Department of Fish and Game (CDFG) GIS specialists. In addition to CNDDB occurrences and map analysis, field visits were conducted to view impacts and potential impacts to selected species and habitats, and many local biologists with knowledge of the wildlife resources along the Big Sur coast were consulted for additional information.

C. Resource Condition after Fire

The intense heat of a fire can form a water repelling (hydrophobic) layer in the soil. The waxy substance, from burning plant material, penetrates the soil as a gas and solidifies around the soil particles after it cools. The hydrophobic layer is generally one-half to-three inches beneath the soil surface and is usually an inch or more thick. The soil hydrophobicity forms during long periods of intense heat. In the moderate and high burn severity areas the soil hydrophobicity almost always measured high. High hydrophobic soil reduces water infiltration into the soil and increases water runoff. Fire consumes vegetation, resulting in an increase in the potential for soil erosion during post-fire rains. The severity of erosion is influenced by rate, duration and amount of rainfall. The type of soil can influence erosion potential from a burn area. There is a strip of highly erodible soils along the western edge of the fire on the slopes above State Highway 1. The Tassajara and Arroyo Seco Creek areas also contain some highly erodible soils on the hillsides. Please see the “Soils” section of the SEAT report for further details.

III. Findings of the On-The-Ground Survey (Observations)

A. Identify Values at Risk (Post Fire)

The principal concern with the Basin Complex and Indians Fires is an increase in the potential for in-channel floods, debris torrents, and debris/mud flows. The primary mechanisms for this are the loss of mechanical support of hillside materials that was provided by vegetation and the increase in runoff resulting from the loss of trees and chaparral growth along stream channels where riparian vegetation was burned. Water runoff may be affected by the development of hydrophobic soils where waxy substances released by plant materials during hot fires follow thermal gradients into the soil and congeal as continuous surfaces.

Post fire flooding could affect water quality at specific sites and downstream drainages creating significant secondary concerns. Runoff into the ocean can affect critical habitat via sediment delivery, loss of habitat, and chemical pollution. The risk of flooding will increase depending on the number and intensity of winter storm events. November through April is the typical winter rainy season. Burn severity combined with slope steepness can accelerate,

intensify and increase the potential for soil erosion and flooding. The loss of surrounding vegetation in and around drainages due to fire can have result in erosion of vegetative debris, heavy ash, silt and sediment. Sediment can travel down slope and collect in drainages and pools, resulting in loss of habitat.

Water quality in the impacted drainages will likely be adversely impacted with increased pH levels and lowering dissolved oxygen levels within aquatic communities. Post-fire pollutants include decaying plants that are washed into streams during run-off events. High water events are usually more severe and violent after a fire, as the water volume travels unimpeded down the drainage, scouring the stream bed and destroying the stream community. These high water events can dislodge boulders and debris into the creek, greatly reducing the habitat quality. The severity of the post-fire impacts to drainages will depend on a) fire severity on the surrounding bank habitat and riparian zone, and b) the frequency and intensity of rain events immediately following the fire event. Anticipated adverse impacts include burn debris and sediment flowing to all the drainage systems in the area. It is also likely that aquatic species will be affected by poor water quality resulting from mobilized debris and sediment. In areas of high and moderate burn soil severity, it is likely that there will be mobilized ash and sediment. The extent of these burn areas will have effects to downstream aquatic biota, as well as an increase in large woody debris throughout and beyond the burn areas. Heavy sedimentation along with floating debris can wash downstream destroying fish passages. Debris can also wash into the coastal areas creating adverse impacts to water quality and habitat degradation.

IV. Recommendations

Critical habitat should be monitored for restoring pre-burn conditions. A habitat inventory should be conducted to assess the need for stream channel improvements. Each life stage of the target species needs to be identified, and habitat needs ascertained. Typical life stages for steelhead trout in an inland environment include spawning migration, spawning, year-round rearing and emigration. Similarly coastal species and their habitat should be monitored and evaluated for before adverse impacts occur in order to record damages due to excessive runoff and related pollution. Methods for recovery should be coordinated with the Department of Fish and Game (VI.Contacts).

Implement Best Management Practices (BMPs) upstream to minimize sediment load. Conduct revegetation efforts where appropriate to promote native habitat recovery. Conduct post-fire surveys for fishery species and their habitat. Conduct species monitoring to assess long-term population impacts from the fire. Coordinate with local agencies regarding maintenance activities to avoid, minimize, and mitigate additional species impacts. Population surveys and long-term monitoring studies must be conducted in the drainage and coastal area. Collect data on species and habitat recovery times.

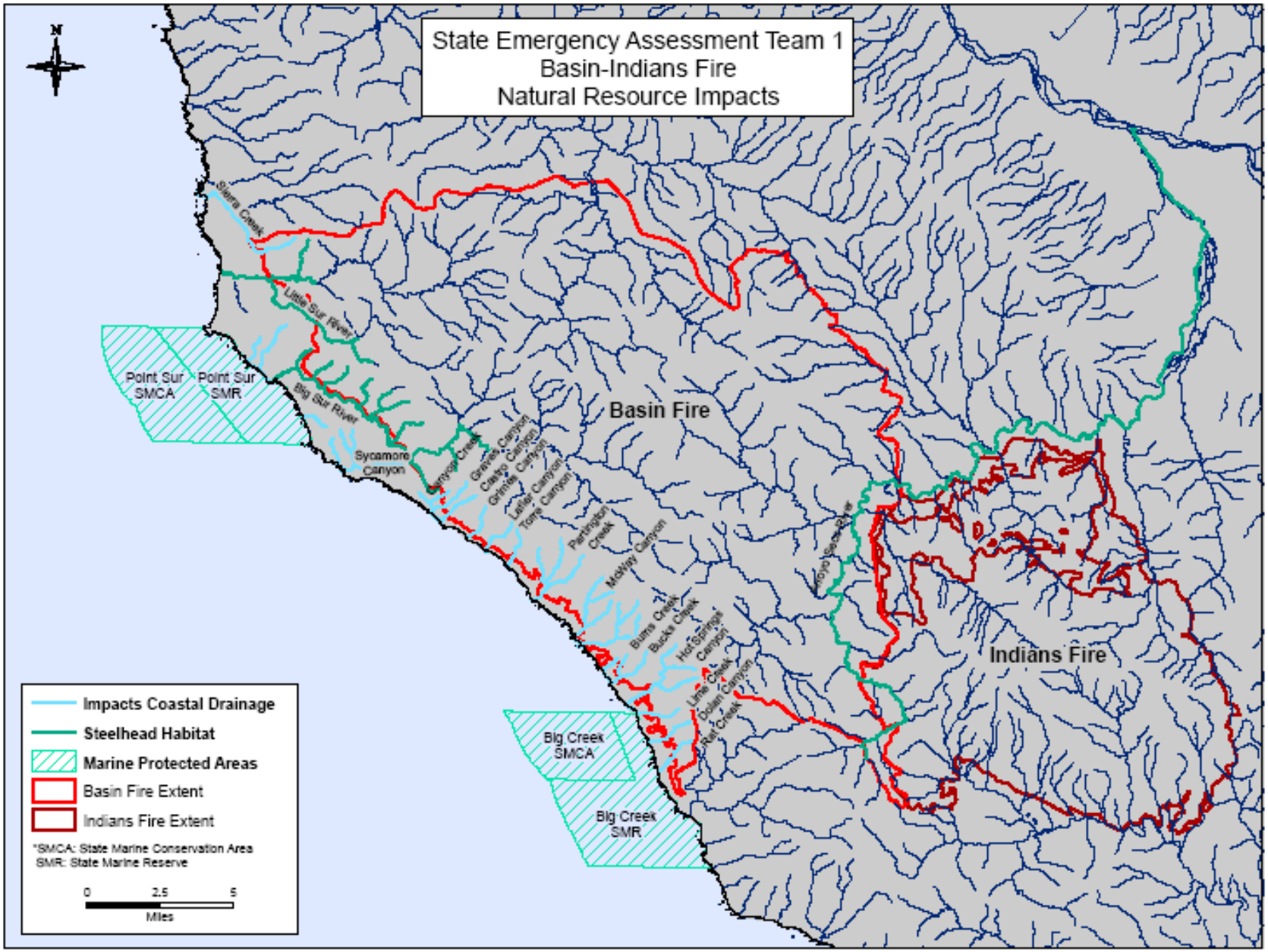
State Emergency Assessment Team 1
Basin-Indians Fire
Natural Resource Impacts
N
Plaiaro Creek
Little Sur River
Big Sur River
Point Sur SMCA
Point Sur SMR
Sycamore Canyon
Canyon Creek
Granite Canyon
Castro Canyon
Grimes Canyon
Latter Canyon
Torre Canyon
Partington Creek
McKay Canyon
Burns Creek
Bucks Creek
Hot Springs Canyon
Lime Creek
Ocean Canyon
Rat Creek
Big Creek SMCA
Big Creek SMR
Basin Fire
Indians Fire
Impacts Coastal Drainage
Steelhead Habitat
Marine Protected Areas
Basin Fire Extent
Indians Fire Extent
*SMCA: State Marine Conservation Area
SMR: State Marine Reserve
0
2.5
5
Miles

Figure 7

V. References

BIOS, Biological Information Observation System, California Department of Fish and Game, Sacramento, California.

California Natural Diversity Database, California Department of Fish and Game, Sacramento, California.

Erosion and Sediment Control: Preventing Additional Disasters After Southern California Fires. Watershed 96 Conference Proceedings, EPA

http://www.dfg.ca.gov/fish/Resources/WildTrout/WT_SSteelhdDesc.asp

http://www.dfg.ca.gov/mlpa/mpsat.asp

VI. Contacts

Jeff Frey, Environmental Scientist - CA Dept. of Parks and Recreation

Terry Palmisano, Senior Biologist Supervisor -CA Dept. of Fish and Game

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Brian Erlandsen, Environmental Scientist, CA Department of Fish and Game

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Act Initiative
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916-327-8840

VI. Species List

Species List for Fish

Table 5

Cabezon	Scorpaenichthysmarmoratus
Eel, wolf	Anarrhichthys ocellatus
Flounder, starry	Platichthys stellatus
Greenling, kelp	Hexagrammos decagrammus
Greenling, rock	Hexagrammos lagocephalus
lingcod	Ophiodon elongatus
Prickleback, monkeyface	Cebidichthys violaceus
Prickleback, rock	Xiphister mucosus
Ray, bat	Myliobatis californicus
Rockfish, black	Sebastes melanops
Rockfish, black-and-yellow	Sebastes chrysomelas
Rockfish, blue	Sebastes mystinus
Rockfish, bocaccio	Sebastes paucispinis
Rockfish, brown	Sebastes auriculatus
Rockfish, calico	Sebastes dalli
Rockfish, China	Sebastes nebulosus
Rockfish, copper	Sebastes caurinus
Rockfish, flag	Sebastes rubrivinctus
Rockfish, gopher	Sebastes carnatus
Rockfish, grass	Sebastes rastrelliger
Rockfish, greenspotted	Sebastes chlorostictus
Rockfish, kelp	Sebastes atrovirens
Rockfish, olive	Sebastes serranoides
Rockfish, quillback	Sebastes maliger
Rockfish, rosy	Sebastes rosaceus
Rockfish, speckled	Sebastes ovalis
Rockfish, squarespot	Sebastes hopkinsi
Rockfish, starry	Sebastes constellatus
Rockfish, treefish	Sebastes serriceps
Rockfish, vermilion	Sebastes miniatus
Rockfish, yelloweye	Sebastes ruberrimus
Rockfish, yellowtail	Sebastes flavidus
Smelt, surf	Hypomesus pretiosus
Surfperch, barred	Amphistichus argenteus
Surfperch, black	Emibiotoca jacksoni
Surfperch, calico	Amphistichus koelzi
Surfperch, pile	Damalichthys vacca
Surfperch, rainbow	Hypsurus caryi
Surfperch, redtail	Amphistichus rhodoterus
Surfperch, rubberlip	Phacochilus toxotes
Surfperch, shiner	Cymatogaster aggregata
Surfperch, striped	Embiotoca lateralis
Surfperch, walleye	Hyperprosopon argenteum
Surfperch, white	Phanerodon furcatus

Invertebrates List

Table 6

Abalone, red	Haliotis rufescens
Clam, littleneck (Tomales Bay cockle)	Protothaca staminea
Limpets	Lottia gigantea
Mussels, native	Mytilus californianus
Snail, turban	Tegula funebralis
Urchin, red	Strongylocentrotus franciscanus

DRAFT TECHNICAL SPECIALIST'S
State Emergency Assessment Team

Resource: Cultural Resources

August 19, 2008

Fire Name: Basin Complex CA-LPF-001649
Indians Fire CA-LPF-001491

Author Name: Herb Dallas Jr., Associate State Archeologist
Cal Fire, 2249 Jamacha Rd.
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Office: (619) 590-3113

I. Resource Condition Assessment

A. Resource Setting

The 162,818 acre Basin Complex Fire and 76, 554 acre Indians Fire perimeter includes hundreds of previously recorded cultural resources. The area of these fires extended from the Pacific Ocean North to Carmel Valley, East to Arroyo Seco and to about Cosio Knob, and South to almost Santa Lucia. Several additional archeological sites were found and recorded during the course of the incident response to each fire. Much of the burned area has not been systematically surveyed for cultural resources. Portions of the USFS and State Parks land have been previously surveyed. This technical report includes an evaluation of resources within the State Responsibility Area (SRA). General treatments or mitigations are offered herein to lessen the potential impacts to these cultural resources. Most of the burned area is within the boundaries of the USFS land and that area has been evaluated by the Federal BAER team.

Cultural resources found in study areas or previously recorded sites include Native California Indian sites, historic cabins, historic features like roads & bridges, Indian Villages, features, artifact scatters, rock art sites, dams, and isolated finds. Each historic or archeological site is given a unique number to identify it. These include a state designation, a county designation, and a numerical number (such as CA-MNT-108). Native California Indian groups that lived in this area include the Ohlone, Essalen, and the Salinan. Representatives of these Native California groups were contacted for their input and concerns.

B. Survey Methods

In order to evaluate the potential risk to cultural resources, a pedestrian reconnaissance survey was conducted between August 12th-August 21st, 2008. This survey was restricted to SRA land. A federal BAER team surveyed the federal land within the boundaries of the two incidents. This report concentrates on the SRA land that does not include the federal land. For information on the federal land, see the federal BAER report on the OES website. Data was examined from the information search conducted during Basin Fire at the Northwest Information Center at Sonoma State University in July 2008.

The prime areas examined during this study were the State Parks, State Reserve, Boy Scout camp, Arroyo Seco drainage, and sites along Highway 1. Several historic properties were at risk and a few were damaged during the Basin Complex Fire.

C: Contacts

Contacts made during this study include counterparts in the Federal BAER team, including Archeologist Nolan Smith, and Native American representatives Quintan Garcia, Jim Crowfeet, and others which are listed in appendix 4. Archeologist Gary Breschini was also contacted for comments and recommendations.

II. Observations

A. General observations

One of the principal concerns of potential risks to cultural resources is the potential threat of destruction due to erosion. The effects of the fire include hydrophobic soils which, lead to increased water runoff. Several cultural resources are within the floodplain or near creeks or near drainages which will be subject to increased erosion. Historic cabins, a historic pelton wheel, and a cemetery are all cultural resources at risk due to increased runoff during a storm event. Some of the targeted SRA areas include Pfeiffer Big Sur State Park, J.P. Burns State Park, and the San Clemente drainage.

B. Specific Observations

Sites visited during the reconnaissance pedestrian survey appeared to be in various degrees of being at-risk due to various effects as a result of the fire. Some sites were directly affected by the fire, like being burned over during the incident. Some sites were partially damaged by fire-suppression activities like the construction of contingency dozer-lines. Other sites are at-risk from future after-effects of the fire, like erosion and flooding. Not many sites on SRA land were directly impacted by fire:

III. Emergency Determination

Several cultural resources have been determined to be at-risk in this assessment, due to the effects of the fire including increased risk of erosion and slides. The risk increases with increased burn severity (Low, Moderate High) and slope steepness. Also, the location of the resource is a factor in its at-risk status. Many significant cultural resources are found in floodplains or along creeks or drainages that put them at greater risk for erosion, due to flooding. Cultural features at the base of slopes with a high degree of burn severity, are especially at risk from erosion and debris slides.

Several cultural resources have been determined to be at-risk and could be further damaged or destroyed by the after-effects of the fire. These will be outlined below and recommendations are offered, where an obvious solution can be applied to protect the resource. Several resources are also at-risk, but there is no clear solution for the resource due to the severity of threat due to potential erosion. For those resources, a detailed discussion of the threat is outlined but no specific solution is offered. The agency in charge of the resource is encouraged to determine its own solution or contact a specialist in that area of expertise.

A general discussion of potential threats like vandalism is outlined and the responsible agency can evaluate for itself the degree of risk to the resource and determine whether the resource needs any treatment. For many of these resources, their remoteness might offer the best protection. Many trails will be closed and public access will be unavailable or limited at best.

Discussion/Summary/Recommendations

A: Discussion:

1. While archeological sites often can survive direct effects of fire with minimal damage, after-effects of fire can be devastating. Vandalism of archeological sites can cause extreme damage to the sites. People steal artifacts by digging that permanently ruins a site. Archeological sites are non-renewable resources. These sites are the cultural history of the United States. They are vulnerable to any disturbances, such as erosion, digging, soil removal, flooding, and artifact displacement. The importance of these sites is the relationship of each artifact to each other in depth and space. So it is important to protect these sites from vandalism (once vegetation has been destroyed), control erosion (from displacing artifacts which tell the story of each event), and protect the integrity of each site.

2. For example, a historic rock and adobe cabin situated in a floodplain is in jeopardy of being destroyed by increased flooding and or debris slides. Archeological sites, either prehistoric or historic are threatened by vandalism. Sites can be easily vandalized after a fire, due to the loss of protective vegetation covering the site. These sites are easily found after a fire and can be looted. Vulnerable sites at the bottom of slopes or in drainages can be destroyed by a single catastrophic event A large landslide or a major flood can destroy a historic feature, cabin, or a site in a single event. These sites might often represent the last example of an historic event, history of a famous person, or be the last site of an extinct culture. States laws offer guidelines in protecting and preserving cultural resources.

B: Summary:

Few archeological sites or historic structures were directly impacted by the Indians and Basin Complex fires. Of the hundreds of recorded archeological sites, only a handful of sites were damaged during the course of these two incidents. A few of the sites were burned-over by the fire. A few more sites were damaged as a result of fire suppression activities, like construction of dozer-lines. However in an area that is so large, as encompassed by these fires (over 230,000 acres), not every site has been recorded, visited, or evaluated. Many areas, due to their remote locations could not be examined during the course of this brief evaluation. It is likely that more sites are damaged that are not known (officially recorded as a site with a trinomial) or were too remote to visit. Certain areas were harder hit by the effects of fire than other areas. The USFS land was probably hardest hit by fire (see federal BAER team report). State Parks lands are vulnerable to indirect after-effects of the fire. Private land was less impacted by the fire, but are also vulnerable to the after-effects of the fire.

C: Recommendations:

There are a number of treatments that can lessen or mitigate the potential threats to cultural resources. These treatments come in many forms. These treatments can also be tailor-made to the needs of the individual resources. Many of the same treatments used to protect life and property against catastrophic events, can also be applied to protect important and significant cultural resources. This

is a common practice by land-owning and resource protection agencies such as the National Parks Service, BLM, USFS, and State Parks to name a few. A summary of these general treatments is offered below. A more detailed evaluation can be provided to the land-owning agency, about specific sites visited during this study or they can consult with a specialist. Also, agencies should take advantage of the loss of vegetation from the fire and inventory resources as time permits.

1. To discourage the potential for vandalism or theft, if signing is deemed necessary to protect cultural resources, the signage should be as deemed appropriate for the location of the cultural resource. However, if the site is near a trail or is large or obvious, a general regulatory sign placed in the area is important to establish a warning of consequences. Also if any downed vegetation is available in the area, this slash can be used to cover a site as a temporary treatment until the vegetation re-establishes itself. The above treatments are useful techniques to protect cultural resources from vandalism.

2. In the event of soil-disturbing activities in or near known cultural resource prehistoric sites, the Native American Heritage Commission (NAHC) shall be consulted to determine whether there are concerns to the Native American community in or near the area of activity.

3. Each agency should inventory areas of the fire not previously examined. Also, the status and health of each site should be monitored on a periodic basis.

4. Protection of cultural resources from flooding and slides is a difficult and often expensive treatment. Several sites visited are threatened in a major storm event. Diversionary measures such as check-dams, wattles, straw-bales, and armoring are potential solutions. Check-dams, logs, or an equivalent can be particularly effective if used above the cultural resource to divert erosion forces away from the target cultural resource. Armoring of the slope along a creek, next to a cultural resource, can protect the resource from damages due to erosion and flooding.

5. Partially damaged historic resources are probably the most difficult to protect after a fire. A partially burned historic building is often difficult to protect in the short-term until a permanent solution can be determined. The best approach is to protect the building from additional damages due to rain. Cover the roof and any open exposures to the elements. Brace weakened structures, so that wind or other factors won't cause further deterioration. This is especially important if the building is going to be restored. Also, inspect the area for tree hazards. If a nearby tree is determined to be a hazard tree, it should be removed immediately if it will damage the building if it falls.

6. Rock-art sites are another class of vulnerable cultural resources that are difficult to protect after a fire-event. Look to hide the site if it will be prone to vandalism. Erosion control measures should be considered if the site will be inundated with water or debris. These measures should consider diverting the water or material above the resource. If there are hazard trees

nearby that threaten the site, these should be removed and felled away from the resource. Similar treatments can be used for other cultural resources.

References

Site records on file at the Northwest Information Center, Sonoma State University.
The Secretary of the Interior's Standards and Guidelines, Code of Federal Regulations, 36 CFR Part 61.
Instructions for Recording Historical Resources, Office of Historic Preservation P.O. Box 942896 Sacramento, CA 942196-0001.
Native American Heritage Commission, 915 Capitol Mall, Room 364 Sacramento, CA 95814.
Handbook of North American Indians, Volume 8, Smithsonian Institution. Washington, D.C.
Ms. By State Parks on effects of fire on cultural resources within State Parks.

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DEFINITIONS

BURN SEVERITY CLASSES (FRAZIER 1989). (See Parsons (2003) for more detailed descriptions.)

High Severity

a. Hydrophobicity—soils are strongly water repellant; they will repel water for greater than 40 seconds. Very strongly hydrophobic soils may repel water for several minutes or longer. Hydrophobicity may be from the soil surface downward, from about 1/8 of an inch in depth to many inches, or it may begin below surface.
b. Organic Ground Cover Density—less than 20% cover of litter, duff, or woody debris remains. Often fully consumed in very high severity burns.
c. Vegetation—Trees: crowns fully burned, no needles or leaves remaining. Some or many branches may be consumed. Brush: crowns partially or fully volatilized; no leaves remaining. Herbaceous plants: usually fully consumed, often including roots and sometimes, residual seed.

Moderate Severity

a. Hydrophobicity—soil will repel water for 10-40 seconds. Longer than that is strong hydrophobicity; less than that is weakly hydrophobic.
b. Organic Ground Cover Density—Approximately 20-50% density.
c. Vegetation—Trees: crowns remain but needles/leaves are singed to the extent that more than 50% of the crown is discolored (i.e., the crown of a pine tree has more than half to all the needles browned by fire). Brush: crowns remaining but leaves mostly discolored by burn. Herbaceous plants: mostly consumed, but patches remain.

Low Severity

a. Hydrophobicity—soil will repel water for less than 10 seconds. Often water will infiltrate within a second or two.
b. Organic Ground Cover Density—greater than 50% density. Often the fire will consume only fine woody debris and scorch the surface of a duff layer.
c. Vegetation—Trees: crowns remain. Fire will often only scorch the tree bole and perhaps a few lower branches on smaller trees. All or nearly all the crown will remain green. Shrubs: mostly unburned, but some scorching may be present on lower parts. Herbaceous plants: usually singed or partially burned, but will recover.

SEAT Burn Site Evaluation Summary - Map Points

Fire Name : Basin/Indians Fires

Bold where risks are high

Site number	At-risk Feature	Location	GPS location WGS 84 Latitude	Longitude	Hazard	Likeli-hood	Risk to lives fire	pre-exist	Risk to property fire	pre-exist
600	**Homes**	**Sycamore Flat**	**36.26353**	**-121.39637**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
601	**ford crossing**	**Sycamore Flat**	**36.26422**	**-121.39121**	**Debris Flow, Flooding**	**High**	**Low**	**Low**	**High**	**Mod**
602	**House**	**Grandma's Flat**	**36.26408**	**-121.39103**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
603	**House**	**Sycamore Flat**	**36.26637**	**-121.38676**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
604	**Pump House**	**Arroyo Seco Drainage**	**36.26721**	**-121.39543**	**Debris Flow, Flooding**	**High**	**Low**	**Low**	**High**	**Low**
605	**House**	**Arroyo Seco**	**36.26568**	**-121.40580**	**Debris Flow, Flooding**	**High**	**High**	**Low**	**High**	**Low**
606	**House**	**no address Arroyo Seco Drainage**	**36.26378**	**-121.40665**	**Debris Flow, Flooding**	**High**	**High**	**Low**	**High**	**Low**
607	**House**	**Arroyo Seco**	**36.26362**	**-121.40728**	**Debris Flow, Flooding**	**High**	**High**	**Low**	**High**	**Low**
608	**House**	**Oak Flat**	**36.25439**	**-121.41987**	**Debris Flow, Flooding**	**High**	**High**	**Low**	**High**	**Low**
609	**House**	**No address Arroyo Seco Drainage Oak Flat**	**36.2529**	**-121.42008**	**Debris Flow, Flooding**	**High**	**High**	**Low**	**High**	**Low**
610	**House Bridge**	**Intersection of Arroyo Seco and Carmel Valley**	**36.25763**	**-121.42643**	**Debris Flow, Flooding**	**High**	**High**	**Low**	**High**	**Low**
611	**Trailer Park**	**Arroyo Seco Drainage**	**36.25349**	**-121.43057**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
612	**ford crossing**	**Trailer Park Access, Arroyo Seco Drainage**	**36.25352**	**-121.43106**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
613	**Trailer Park**	**Miller Flat, Arroyo Seco Drainage**	**36.24919**	**-121.42894**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
614	House	Arroyo Seco Drainage	36.24764	**-121.42866**	Flooding	Mod	Low	Low	Low	Low

SEAT Burn Site Evaluation Summary - Map Points

Fire Name : Basin/Indians Fires

Bold where risks are high

Site number	At-risk Feature	Location	GPS location WGS 84 Latitude	Longitude	Hazard	Likeli-hood	Risk to lives fire	pre-exist	Risk to property fire	pre-exist
615	Pump House	Arroyo Seco Drainage	36.23881	**-121.43290**	Flooding	Low	Low	Low	Mod	Low
616	**Two Houses**	**Arroyo Seco Drainage**	**36.23958**	**-121.43687**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
617	**Homes**	**Arroyo Seco Drainage**	**36.23233**	**-121.46726**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
618	**Three Homes**	**Arroyo Seco Drainage**	**36.23219**	**-121.46897**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
619	Bridge	Arroyo Seco Campground	36.23548	**-121.47774**	Debris Flow, Flooding	High	Low	Low	Mod	Mod
620	**Camp ground**	**Group Camp, Arroyo Seco**	**36.23469**	**-121.48572**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
621	**Resort**	**Arroyo Seco Resort**	**36.23454**	**-121.47034**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
622	**ford crossing**	**Arroyo Seco Resort**	**36.23501**	**-121.47378**	**Debris Flow, Flooding**	**High**	**Low**	**Low**	**High**	**Mod**
623	**Resort**	**Arroyo Seco Resort**	**36.23602**	**-121.47291**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
624	**Road, ford crossing**	**Tassajara Road**	**36.26977**	**-121.54640**	**Erosion, Debris flow**	**High**	**Low**	**Low**	**High**	**Mod**
625	**hot springs**	**retreat**	**36.23761**	**-121.54991**	**Debris Flow, Flooding**	**High**	**Low**	**Low**	**High**	**Mod**
626	**Monastery**	**Hot Springs**	**36.23486**	**-121.54963**	**Rock fall, flooding, debris flow.**	**High**	**High**	**High**	**High**	**High**
627	Cabin	Jeffery Road	36.30352	**-121.58533**	Flooding, rock fall	Mod	Mod	Low	Mod	Low
628	Two Cabins	Jeffery Road	36.30308	**-121.58249**	Flooding, rock fall	Mod	Mod	Low	Mod	Low
629	Cabin	Anastasia Canyon	36.34749	**-121.55192**	Flooding	Low	Low	Low	Low	Low

SEAT Burn Site Evaluation Summary - Map Points

Fire Name : Basin/Indians Fires

Bold where risks are high

Site number	At-risk Feature	Location	GPS location WGS 84 Latitude	Longitude	Hazard	Likeli-hood	Risk to lives fire	pre-exist	Risk to property fire	pre-exist
630	County Road	Carmel Valley Road	36.2619	**-121.42879**	road loss, fill failure	Mod	Low	Low	Mod	Mod
631	**House**	**Carmel Valley Road**	**36.26237**	**-121.42984**	**flooding**	**Mod**	**Low**	**Low**	**High**	**Low**
632	**Trailer Park**	**Carnel Valley Road**	**36.26499**	**-121.43696**	**Debris Flow, Flooding**	**High**	**Mod**	**Low**	**High**	**Low**
633	**Homes**	**Carmel Valley Road**	**36.26758**	**-121.43744**	**Flooding**	**High**	**High**	**High**	**High**	**High**
634	**Bridge**	**Crosses Piney Creek**	**36.26734**	**-121.43729**	**flooding, over topping**	**High**	**Low**	**Low**	**High**	**Low**
635	**House**	**Carmel Valley Road**	**36.2674**	**-121.43847**	**Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
636	**Homes**	**Carmel Valley Road**	**36.26719**	**-121.43862**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
637	**House**	**Carmel Valley Road**	**36.26839**	**-121.43826**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
638	**Homes**	**Carmel Valley Road**	**36.27152**	**-121.44732**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
639	**House**	**Carmel Valley Road**	**36.27255**	**-121.45046**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
640	Ranch	Coleman Canyon	36.09352	**-121.28705**	Flooding	Mod	Mod	Low	Mod	Low
641	Ranch	Indians Ranch	36.10158	**-121.43457**	Flooding	Low	Low	Low	Low	Low
642	**Bridge**	**County Road G-17**	**36.28087**	**-121.32283**	**Scour**	**Mod**	**Low**	**Low**	**High**	**Low**
644	Earthen Dam	Coleman Canyon	36.09822	**-121.28762**	Sedimentation, Flooding	Mod	Low	Low	Mod	Low
645	Bridge	Coleman Canyon	36.09626	**-121.28799**	Flooding	Mod	Low	Low	Mod	Low

SEAT Burn Site Evaluation Summary - Map Points

Fire Name : Basin/Indians Fires

Bold where risks are high

Site number	At-risk Feature	Location	GPS location WGS 84 Latitude	Longitude	Hazard	Likeli-hood	Risk to lives fire	pre-exist	Risk to property fire	pre-exist
646	Earthen Dam	Coleman Canyon	36.1107	**-121.29395**	Flooding	Mod	Low	Low	Mod	Low
647	Culvert	Coleman Canyon	36.10405	**-121.28859**	Plugging	Mod	Low	Low	Mod	Low
648	Earthen Dam	Coleman Canyon	36.10301	**-121.28743**	Flooding	Mod	Low	Low	Mod	Low
649	Culvert	Coleman Canyon	36.10233	**-121.28676**	Plugging	Mod	Low	Low	Mod	Low
650	**House**	**Coleman Canyon**	**36.09511**	**-121.28743**	**Flooding**	**Mod**	**High**	**Mod**	**High**	**Mod**
651	Culvert	School	36.27519	**-121.81767**	plugging	Mod	Low	Low	Mod	Low
652	**Camp ground**	**Campground and Cabins**	**36.2674**	**-121.80506**	**Flooding**	**High**	**High**	**Mod**	**High**	**Mod**
653	**Bridge**	**Campground and Cabins**	**36.26781**	**-121.80542**	**Scour**	**High**	**High**	**Mod**	**High**	**Mod**
654	**Culvert**	**Drains Pheneger Creek under HWY 1.**	**36.26937**	**-121.80745**	**Plugging, Debris flow**	**High**	**Low**	**Low**	**High**	**Low**
655	**Shops, resort**	**Inn, Stores, Shops**	**36.27002**	**-121.80806**	**Flooding, Debriw Flow**	**High**	**High**	**Low**	**High**	**Low**
656	**ford crossing**	**Highway 1**	**36.26593**	**-121.80394**	**Flooding, Debriw Flow**	**High**	**High**	**Low**	**High**	**Low**
657	**Bridge, Campground**	**Private Lodge**	**36.26384**	**-121.80203**	**Flooding, Debris Flow**	**High**	**High**	**Low**	**High**	**Low**
658	**Culvert**	**Drains Juan Higuera at Big Sur Grange**	**36.26333**	**-121.79974**	**Plugging, Flooding**	**High**	**High**	**Low**	**High**	**Low**
659	**Boat House**	**Pico Blanco**	**36.33263**	**-121.79801**	**Debris Flow, Flooding**	**High**	**High**	**Low**	**High**	**Low**
660	Campground	Campground, Pico Blanco	36.339	**-121.79945**	Debris Flow, Flooding	High	Mod	Low	Mod	Low

SEAT Burn Site Evaluation Summary - Map Points

Fire Name : Basin/Indians Fires

Bold where risks are high

Site number	At-risk Feature	Location	GPS location WGS 84 Latitude	Longitude	Hazard	Likeli-hood	Risk to lives fire	pre-exist	Risk to property fire	pre-exist
661	**Aceess Road**	**Access Road, Pico Blanco**	**36.33357**	**-121.79749**	**Erosion, Debris Flow, Flooding**	**High**	**Low**	**Low**	**High**	**Low**
662	**Water tanks**	**Pico Blanco**	**36.33012**	**-121.79666**	**Debris Flow, Flooding**	**High**	**Low**	**Low**	**High**	**Low**
663	**Spring box**	**Pico Blanco**	**36.32282**	**-121.79766**	**Debris Flow, Flooding**	**High**	**Low**	**Low**	**High**	**Low**
664	**Access Road**	**Pico Blanco**	**36.34669**	**-121.80688**	**Erosion, Debris Flow, Flooding**	**High**	**Low**	**Low**	**High**	**Low**
665	**Office Cabin**	**Big Creek at Hwy 1**	**36.07125**	**-121.59903**	**Sed-concentrated flood, debris torrent**	**High**	**High**	**Mod**	**High**	**Mod**
666	**Water supply**	**Rancho Barranca**	**36.09306**	**-121.61755**	**Narrow Canyon Debris Flow, Rock Slide**	**High**	**Low**	**none**	**High**	**Low**
667	**Water Supply**	**Hwy 1 - Rat Creek**		**0.00000**	**Debris Flow, Rock Fall**	**High**	**Low**	**Low**	**High**	**Low**
668	Water supply	Unknown Hwy 1- Lime Creek	36.11552	**-121.62941**	Debris Flow, Rock Fall	Low	Low	Low	Low	Low
669	Water supply	Homes on Doland Creek	36.11847	**-121.63009**	Debris Flow, Rock Fall	Low	Low	Low	Low	Low
670	**Cabins, Foot Bridge**	**Hotsprings Canyon**	**36.12558**	**-121.63820**	**Debris Flow, Flooding**	**High**	**High**	**Low**	**High**	**Low**
671	Water supply	Buck Creek	36.13527	**-121.64690**	Debris Flow, Flooding	Low	Low	Low	Low	Low
672	Water supply	Hyw 1 - Burns Creek	36.14291	**-121.65405**	Debris Flow, Flooding	Low	Low	Low	Low	Low
673	Home, Culvert	Hwy 1	36.14611	**-121.65759**	Debris Flow, Flooding	Mod	Mod	Low	Mod	Low
674	**Parkinglot and Trail**	**Julia Pfeiffer Burns State Park**	**36.15932**	**-121.66885**	**Debris torrent, debris slide/ rock fall**	**High**	**High**	**Mod**	**High**	**Mod**
675	Home	Partington Ridge -	36.17935	**-121.69675**	Landslide, Slope Stability	Mod	Mod	Mod	Mod	Mod

SEAT Burn Site Evaluation Summary - Map Points

Fire Name : Basin/Indians Fires

Bold where risks are high

Site number	At-risk Feature	Location	GPS location WGS 84 Latitude	Longitude	Hazard	Likeli-hood	Risk to lives fire	pre-exist	Risk to property fire	pre-exist
676	Home & Road	Partington Ridge.	36.17929	**-121.69413**	Landslide, Slope Stability	Mod	Mod	Mod	Mod	Mod
677	Home	Partington Ridge -	36.17993	**-121.69395**	Landslide, Slope Stability	Mod	Mod	Mod	Mod	Mod
678	Home	Unkown - Partington Ridge	36.18111	**-121.69359**	Slope Stability	Mod	Mod	Mod	Mod	Mod
679	Home & Roadway	Unkown - Partington Ridge	36.18055	**-121.69220**	Landslide, Slope Stability	Mod	Mod	Mod	Mod	Mod
680	Home & Roadway	Hwy 1	36.18034	**-121.69495**	Slope Stability	Mod	Mod	Mod	Mod	Mod
681	**Bulidings & Trailer**		**36.20079**	**-121.72311**	**Rock Fall, Debris Flow**	**High**	**High**	**Mod**	**High**	**Mod**
682	**Buildings**	**Hwy 1**	**36.20209**	**-121.72483**	**Slides, Flooding >45 degree slopes**	**High**	**High**	**Mod**	**High**	**Mod**
683	**Home**	**Hwy 1**	**36.20088**	**-121.72247**	**Rock Fall, Debris Flow**	**Mod**	**Mod**	**Mod**	**High**	**Mod**
684	Hwy 1	Hwy 1 at Grimes Canyon	36.20837	**-121.73396**	Debris Flow to small Culvert	Low	Mod	Low	Mod	Low
685	**Road to Home**	**Residence**	**36.20678**	**-121.73121**	**Rock Fall, Debris Flow**	**Mod**	**Mod**	**Low**	**High**	**Low**
686	**Cabins, Water Supply & Bridges**	**Castro Canyon Hwy 1**	**36.21744**	**-121.75030**	**Rock Fall, Rock Slides**	**High**	**High**	**Mod**	**High**	**Mod**
687	**Buildings, Home, Water Supply**	**Library**	**36.22069**	**-121.75400**	**Debris Flow, Flooding, Rock Slides**	**High**	**High**	**Low**	**High**	**Low**
689	**Bathouse**	**Hot Springs**	**36.23302**	**-121.55228**	**Rook Fall Chute (Dip Slope)**	**High**	**High**	**High**	**High**	**High**
690	**Sewage Treatment Plant & Leach Field**	**Pfeiffer State Park Sewage Plant Hwy 1**	**36.25764**	**-121.78871**	**Debris Flow, Rock Slide, Flooding**	**Mod**	**Mod**	**Low**	**High**	**Low**
691	Hwy 1	Northern Boundary of Pfieffer State Park	36.25894	**-121.78864**	Landslide, Rockfall	Mod	Mod	Mod	Mod	Low

SEAT Burn Site Evaluation Summary - Map Points

Fire Name : Basin/Indians Fires

Bold where risks are high

Site number	At-risk Feature	Location	GPS location WGS 84 Latitude	Longitude	Hazard	Likeli-hood	Risk to lives fire	pre-exist	Risk to property fire	pre-exist
692	**Hwy 1**	**48" Culvert to 36" Culvert Beneath Hwy 1**	**36.26037**	**-121.79092**	**Rockfall Shoot**	**Mod**	**High**	**Low**	**Mod**	**Low**
693	**Camp grounds**	**Fernwood - Hwy 1**	**36.26015**	**-121.79268**	**Flooding, Debris Flow**	**High**	**High**	**Low**	**High**	**Low**
694	Riverhouse	Hwy 1	36.26263	**-121.79487**	Flooding, Debris Flow	Mod	Mod	Low	Mod	Low
695	**Crurch**	**Church**	**36.26334**	**-121.79490**	**Flooding, Debris Flow**	**High**	**High**	**Low**	**High**	**Low**
696	**Hwy 1**	**Culvert and Slope above church**	**36.26444**	**-121.79414**	**Debris Flow, Rock Fall, Rock slide**	**High**	**High**	**Mod**	**High**	**Mod**
697	**Hwy 1**	**Slope above Hwy 1**	**36.26511**	**-121.78642**	**Debris Flow, Rock Fall, Rock slide**	**High**	**High**	**Mod**	**High**	**Mod**
698	Bridge & Roadway	Pfieffer State Park	36.25114	**-121.78455**	Debris Flow, Flooding	Mod	Low	Low	Low	Low
699	Bridge & Roadway	Pfieffer State Park	36.25132	**-121.78578**	Debris Flow, Flooding	Mod	Low	Low	Low	Low
1600	Road & Lodge	Pfieffer State Park	36.25110	**-121.78598**	Debris Flow, Flooding	Mod	Low	Low	Mod	Low
1601	**Hwy 1**	**Pfieffer State Park**	**36.25406**	**-121.78781**	**Debris Flow, Flooding**	**High**	**High**	**Mod**	**High**	**Low**
1602	**Steelhead Facility**	**Carmel River**	**36.44387**	**-121.71563**	**Debris Flow, Flooding, siltation**	**Mod**	**High**	**Mod**	**High**	**Mod**
1603	campground	Andrew Molera State Park Big Sur River	36.28644	**-121.85059**	flooding	mod	mod	low	mod	low
1604	Stables/ ranch	Andrew Molera State Park Big Sur River	36.28313	**-121.84090**	flooding	mod	mod	low	mod	low
1605	Road	Danny Ridge Road	36.324	**-121.84300**	tree fall	Mod	Mod	Low	High	Low
1606	Dam	Los Padres Dam	**36.4362**	**-121.70895**	Overtopping,Flooding	Mod	Mod	Low	Mod	Low

SEAT Burn Site Evaluation Summary - Map Points

Fire Name : Basin/Indians Fires

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Site number	At-risk Feature	Location	GPS location WGS 84 Latitude	Longitude	Hazard	Likeli-hood	Risk to lives fire	pre-exist	Risk to property fire	pre-exist
1607	Dam	San Clemente	**36.3866**	**-121.66830**	Overtopping, Flooding	Mod	Mod	Low	Mod	Low
102	**Wooden Bridge Thru Park**		**36.24590**	**-121.77338**	**Overtopping**	**High**	**Mod**	**Low**	**High**	**Low**
103	Post Creek Culvert		36.24215	**-121.77346**	Overtopping w/ damage to d/s campground	High	Mod	Low	Mod	Low
104	**Two Lane Metal Bridge**		**36.25016**	**-121.78551**	**Overtopping**	**High**	**High**	**Low**	**High**	**Low**
105	**Waste Water Plant**		**36.25712**	**-121.78834**	**Potential Flooding from Big Sur**	**High**	**Low**	**Low**	**High**	**Low**
106	**Two Very Low Briges (One ADA)**		**36.15950**	**-121.66877**	**Overtopping**	**High**	**Mod**	**Low**	**High**	**Low**
107	Culvert		36.15553	**-121.66911**	Overtopping to Hwy 1	**Mod**	Mod	Low	Mod	Low
108	**House across Road from Chute**		**36.15446**	**-121.66743**	**Debri Slide and Water**	**Mod**	**High**	**Low**	**High**	**Low**
800	**Sycamore Flats Homes**		**36.26391**	**-121.39416**	**Severe Flooding**	**High**	**High**	**Mod**	**High**	**Low**
109	**Multiple Houses**		**36.26286**	**-121.40878**	**Severe Flooding**	**High**	**High**	**Low**	**High**	**Low**
110	**Multiple Houses**		**36.25268**	**-121.41961**	**Severe Flooding**	**High**	**High**	**Low**	**High**	**Low**
111	**Campers and Mobiles**		**36.26565**	**-121.40581**	**Severe Flooding**	**High**	**High**	**Low**	**High**	**Mod**
112	**Multiple Houses**		**36.26379**	**-121.40668**	**Severe Flooding**	**High**	**High**	**Low**	**High**	**Low**
113	**Two Houses**		**36.25440**	**-121.41973**	**Severe Flooding**	**High**	**High**	**Low**	**High**	**Low**
114	**House**		**36.25284**	**-121.42006**	**Severe Flooding**	**High**	**High**	**Mod**	**High**	**Mod**

SEAT Burn Site Evaluation Summary - Map Points

Fire Name : Basin/Indians Fires

Bold where risks are high

Site number	At-risk Feature	Location	GPS location WGS 84 Latitude	Longitude	Hazard	Likeli-hood	Risk to lives fire	pre-exist	Risk to property fire	pre-exist
115	**Mobile Homes**		**36.25761**	**-121.42651**	**Severe Flooding and Loss of Egress**	**High**	**High**	**Mod**	**High**	**Low**
116	**Mobile Homes**		**36.25358**	**-121.43045**	**Severe Flooding**	**High**	**Mod**	**Low**	**High**	**Low**
117	**Ranch House**		**36.25328**	**-121.43169**	**Severe Flooding**	**High**	**Mod**	**Low**	**High**	**Low**
118	**Mobile Homes and Campers**		**36.24902**	**-121.42873**	**Severe Flooding and Loss of Egress**	**High**	**High**	**Low**	**High**	**Low**
119	Multiple Houses		36.24750	**-121.42851**	Flooding	High	Mod	Low	Mod	Low
120	**Pumps in Creek**		**36.23900**	**-121.43245**	**Severe Flooding**	**High**	**Mod**	**Low**	**High**	**Low**
121	**Multiple Houses**		**36.23940**	**-121.43708**	**Severe Flooding**	**High**	**Mod**	**Low**	**High**	**Low**
122	**Several House and Water Supply**		**36.23259**	**-121.46746**	**Severe Flooding / Loss of Water Supply**	**High**	**Mod**	**Low**	**High**	**Low**
123	**Three Houses**		**36.23220**	**-121.46903**	**Severe Flooding**	**High**	**High**	**Low**	**High**	**Low**
124	**Bridge with One Pillar**		**36.23550**	**-121.47739**	**Severe Flooding**	**Mod**	**Mod**	**Low**	**High**	**Low**
125	**More than ten houses**		**36.23465**	**-121.47046**	**Severe Flooding**	**High**	**High**	**Low**	**High**	**Mod**
126	Ford Dam		36.23509	**-121.47375**	Sever Fooding and Loss of Egress	Low	Low	Low	Mod	Low
127	**Nine houses**		**36.23514**	**-121.47388**	**Severe Flooding**	**High**	**High**	**Low**	**High**	**Low**
128	House/Office Marine Eco-Reserve		36.09265	**-121.61863**	Severe Flooding	Mod	Mod	Low	Low	Low
129	Water Supply for Three Houses		36.09830	**-121.62005**	Severe Flooding / Loss of Water Supply	High	Low	Low	Low	Low

SEAT Burn Site Evaluation Summary - Map Points

Fire Name : Basin/Indians Fires

Bold where risks are high

Site number	At-risk Feature	Location	GPS location WGS 84 Latitude	Longitude	Hazard	Likeli-hood	Risk to lives fire	Risk to lives pre-exist	Risk to property fire	Risk to property pre-exist
130	Water Supply for Houses		36.10584	**-121.62292**	Severe Flooding / Loss of Water Supply	High	Low	Low	Low	Low
131	Water Supply for House		36.11552	**-121.62941**	Severe Flooding / Loss of Water Supply	High	Low	Low	Low	Low
132	Water Supply for Six Houses		36.11847	**-121.63009**	Severe Flooding / Loss of Water Supply	High	Low	Low	Low	Low
133	**Retreat**		**36.12558**	**-121.63820**	**Severe Flooding**	**High**	**High**	**Low**	**High**	**Low**
134	Water Supply for Two Houses		36.13527	**-121.64690**	Severe Flooding / Loss of Water Supply	High	Low	Low	Low	Low
135	Water Supply for Multiple Houses		36.14291	**-121.65405**	Severe Flooding / Loss of Water Supply	High	Low	Low	Low	Low
136	House		36.14611	**-121.65759**	Flooding and Debri	High	Mod	Low	Mod	Low
137	**Point of interest**		**36.15924**	**-121.66947**	**Severe Flooding**	**High**	**Mod**	**Low**	**High**	**Low**
139	Culvert		36.19961	**-121.72005**	Flooding	High	Mod	Low	Mod	Low
140	**Residence/Business**		**36.20209**	**-121.72483**	**Flooding/Overtopping Culvert**	**High**	**High**	**Low**	**High**	**Low**
141	**House**		**36.20070**	**-121.72234**	**Flooding and Debri**	**High**	**High**	**Low**	**High**	**Low**
142	Culvert		36.20837	**-121.73396**	Overtopping and Debri	High	Mod	Low	Mod	Low
143	**Inn**		**36.21776**	**-121.74955**	**Severe Flooding / Loss of Water Supply**	**High**	**High**	**Low**	**High**	**Low**
144	**Library**		**36.22046**	**-121.75325**	**Flooding/Overtopping Culvert**	**High**	**High**	**Low**	**High**	**Low**
145	**Retreat**		**36.23388**	**-121.41961**	**Severe Flooding**	**High**	**High**	**Mod**	**High**	**Mod**

SEAT Burn Site Evaluation Summary - Map Points

Fire Name : Basin/Indians Fires

Bold where risks are high

Site number	At-risk Feature	Location	GPS location WGS 84 Latitude	Longitude	Hazard	Likeli-hood	Risk to lives fire	pre-exist	Risk to property fire	pre-exist
146	**Campground**		**36.33233**	**-121.79590**	**Sever Flooing and Debri**	**High**	**High**	**Low**	**High**	**Low**
148	**Small 70' Dam**		**36.33361**	**-121.79860**	**Severe Flooding**	**High**	**Mod**	**Low**	**High**	**Low**
149	Water Supply		36.32782	**-121.79766**	Severe Flooding / Loss of Water Supply	High	Low	Low	Mod	Low
150	**Culvert**		**36.34669**	**-121.80688**	**Flooding/Overtopping Culvert**	**High**	**Mod**	**Low**	**High**	**Low**
151	**Culvert**		**36.25132**	**-121.78578**	**Flooding/Overtopping Culvert**	**High**	**High**	**Low**	**High**	**Low**
152	**Culvert**		**36.2511**	**-121.78598**	**Flooding/Overtopping Culvert**	**High**	**High**	**Low**	**High**	**Low**
153	**Culvert under Hwy 1**		**36.25368**	**-121.78761**	**Flooding/Overtopping Culvert**	**High**	**Mod**	**Low**	**High**	**Low**
154	**Hwy 1 Potential Overtopping Area**		**36.25406**	**-121.78781**	**Flooding/Overtopping/ Erosion**	**High**	**High**	**Low**	**High**	**Low**
155	Waste Water Plant Leach Line		36.25855	**-121.78889**	Severe Flooding	High	Low	Low	Mod	Low
156	**Campground and Bridge**		**36.26781**	**-121.80552**	**Severe Flooding / Damage to Bridge**	**High**	**High**	**Low**	**High**	**Low**
157	**Los Padres Dam**		**36.4362**	**-121.70895**	**Overtopping of Dam**	**mod**	**Low**	**mod**	**Mod**	**Low**
156	**San Clemente Dam**		**36.3866**	**-121.66830**	**Overtopping of Dam**	**mod**	**Mod**	**Low**	**Mod**	**Low**
201	**Home**	**Gallery**	**36.201**	**-121.72500**	**Debris Flow**	**High**	**High**	**Low**	**High**	**Low**
202	Homes	Partington Ridge	36.189	**-121.69700**	Mud Slides	Mod	Mod	Low	Mod	Low
305	**Fish & Amphib**	**Post Creek Access Road Culvert**	**36.156**	**-121.66974**	**Debris Flow & Mud Slides**	**High**	**Low**	**Low**	**High**	**Low**

SEAT Burn Site Evaluation Summary - Map Points

Fire Name : Basin/Indians Fires

Bold where risks are high

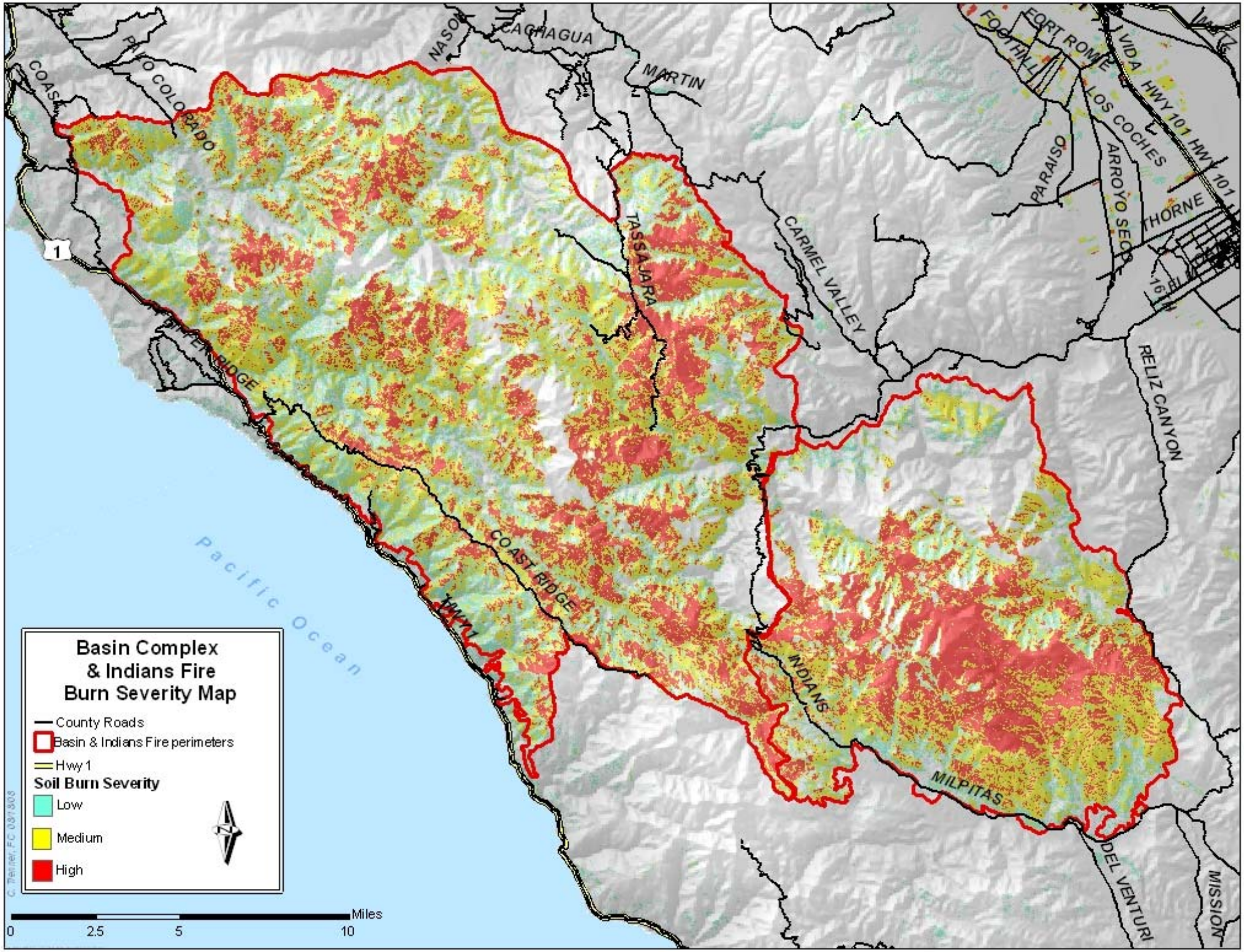
Site number	At-risk Feature	Location	GPS location WGS 84 Latitude	Longitude	Hazard	Likeli-hood	Risk to lives fire	pre-exist	Risk to property fire	pre-exist
306	**Fish & Amphib**	**Campground**	**36.242**	**-121.77340**	**Debris Flow & Mud Slides**	**High**	**Low**	**Low**	**High**	**Low**
307	Structure	Andrew Molera State Park - Below Site 399	36.291	**-121.84543**	Brush Blocking Culvert Outlet	High	Low	Low	Low	Low
308	**Fish**	**Big Sur and Juan Higuera Creek Fork**	**36.263**	**-121.79835**	**Debris Flow & Mud Slides**	**High**	**High**	**Low**	**High**	**Low**
309	**Fish**	**Castro Canyon and Hwy 1 Bridge**	**36.217**	**-121.75014**	**Debris Flow & Mud Slides**	**High**	**High**	**Low**	**High**	**Low**
310	**Fish**	**Grimes Point and Hwy 1 Culvert**	**36.217**	**-121.75045**	**Debris Flow & Mud Slides**	**High**	**High**	**Low**	**High**	**Low**
312	**Fish**	**Torre Canyon and Hwy 1 Bridge**	**36.195**	**-121.71072**	**Debris Flow & Mud Slides**	**High**	**High**	**Low**	**High**	**Low**
313	**Fish**	**Los Padres National Forest Arroyo Seco Area**	**36.195**	**-121.71091**	**Debris Flow & Mud Slides**	**High**	**High**	**Low**	**High**	**Low**
314	Homes	Arroyo Seco Rd.	36.242	**-121.43313**	Debris Flow & Mud Slides	Mod	Mod	Low	Mod	Low
315	**Homes**	**Lodge**	**36.254**	**-121.43040**	**Debris Flow & Mud Slides**	**High**	**High**	**Low**	**High**	**Low**
316	**Homes**	**Arroyo Seco Rd.**	**36.255**	**-121.42091**	**Debris Flow & Mud Slides**	**High**	**High**	**Low**	**High**	**Low**
317	**Homes**	**Arroyo Seco Rd.**	**36.263**	**-121.40753**	**Debris Flow & Mud Slides**	**High**	**High**	**Low**	**High**	**Low**
318	**Homes**	**Sycamore Flats**	**36.264**	**-121.39447**	**Debris Flow & Mud Slides**	**High**	**High**	**Low**	**High**	**Low**
320	**Fish**	**Partington Creek and Hwy 1 Culvert**	**36.265**	**-121.39288**	**Debris Flow & Mud Slides**	**High**	**Low**	**Low**	**High**	**Low**
321	**Homes**	**Burns Creek**	**36.144**	**-121.65428**	**Debris Flow, Mud Slides & Rock Falls**	**High**	**High**	**High**	**High**	**High**
322	**Homes**	**Retreat**	**36.124**	**-121.63533**	**Mud Slides**	**High**	**High**	**Low**	**High**	**Low**

SEAT Burn Site Evaluation Summary - Map Points

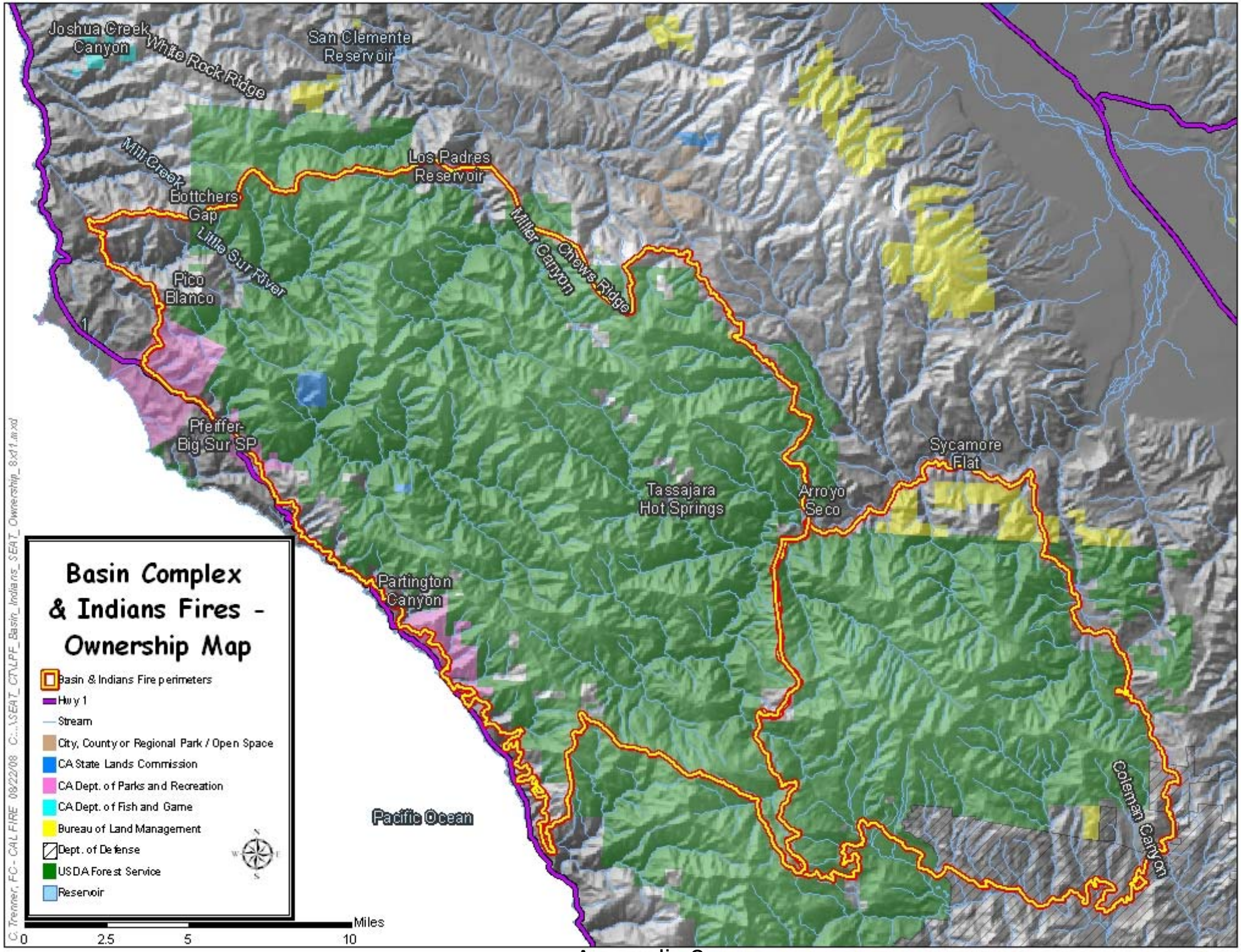
Fire Name : Basin/Indians Fires

Bold where risks are high

Site number	At-risk Feature	Location	GPS location WGS 84 Latitude	Longitude	Hazard	Likeli-hood	Risk to lives fire	pre-exist	Risk to property fire	pre-exist
325	**Structures**	**Campground**	**36.124**	**-121.63778**	**Debris Flow & Mud Slides**	**High**	**Low**	**Low**	**High**	**Low**
399	Fish	Northmost sub-watershed of Big Sur River			Mud Slides	High	Low	Low	Low	Low
801	Hutchinson's larkspur	N/A	36.24216	**-121.77211**	trail maintenance to clear debris or erosion	Low	No	No	No	No


Basin Complex
& Indians Fire
Burn Severity Map
County Roads
Basin & Indians Fire perimeters
Hwy 1
Soil Burn Severity
Low
Medium
High
Miles
0
2.5
5
10
Pacific Ocean
NASON
CACHAGUA
MARTIN
PILO COLORADO
COAST
FOOTHILL
FORT ROME
VIDA
HWY 101
LOS COCHES
PARAISO
ARROYO SECO
THORNE
TASSAJARA
CARMEL VALLEY
RELIZ CANYON
COAST RIDGE
HWY 1
INDIANS
MILPITAS
DEL VENTURI
MISSION
1

Appendix 2


Basin Complex
& Indians Fires -
Ownership Map
Basin & Indians Fire perimeters
Hwy 1
Stream
City, County or Regional Park / Open Space
CA State Lands Commission
CA Dept. of Parks and Recreation
CA Dept. of Fish and Game
Bureau of Land Management
Dept. of Defense
USDA Forest Service
Reservoir
Miles
0
2.5
5
10
Joshua Creek Canyon
White Rock Ridge
San Clemente Reservoir
Mill Creek
Los Padres Reservoir
Bottchers Gap
Little Sur River
Miller Canyon
Chews Ridge
Pico Blanco
Pfeiffer-Big Sur SP
Tassajara Hot Springs
Arroyo Seco
Sycamore Flat
Partington Canyon
Pacific Ocean
Coleman Canyon
C. Trenner, FC - CAL FIRE 08/22/08 C:\...\SEAT_CTV\LPF_Basin_Indians_SEAT_Ownership_8x11.mxd

Appendix 3

CONTACTS

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California State Assembly

Daniel Lopez, Reporter, Monterey County - The Herald

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Jeff Cann, Associate Biologist (Wildlife), California Department of Fish and Game

Jeff Frey, Environmental Scientist, California Department of Parks and Recreation,

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Rob Thompson, Owner, Thompson Wildland Management

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Office of Emergency Services, Monterey County

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Ron Lemos, Division Chief, Carmel Valley Fire Protection District

Shawn Atkins, Interim Maintenance Manager, County of Monterey Resource Management

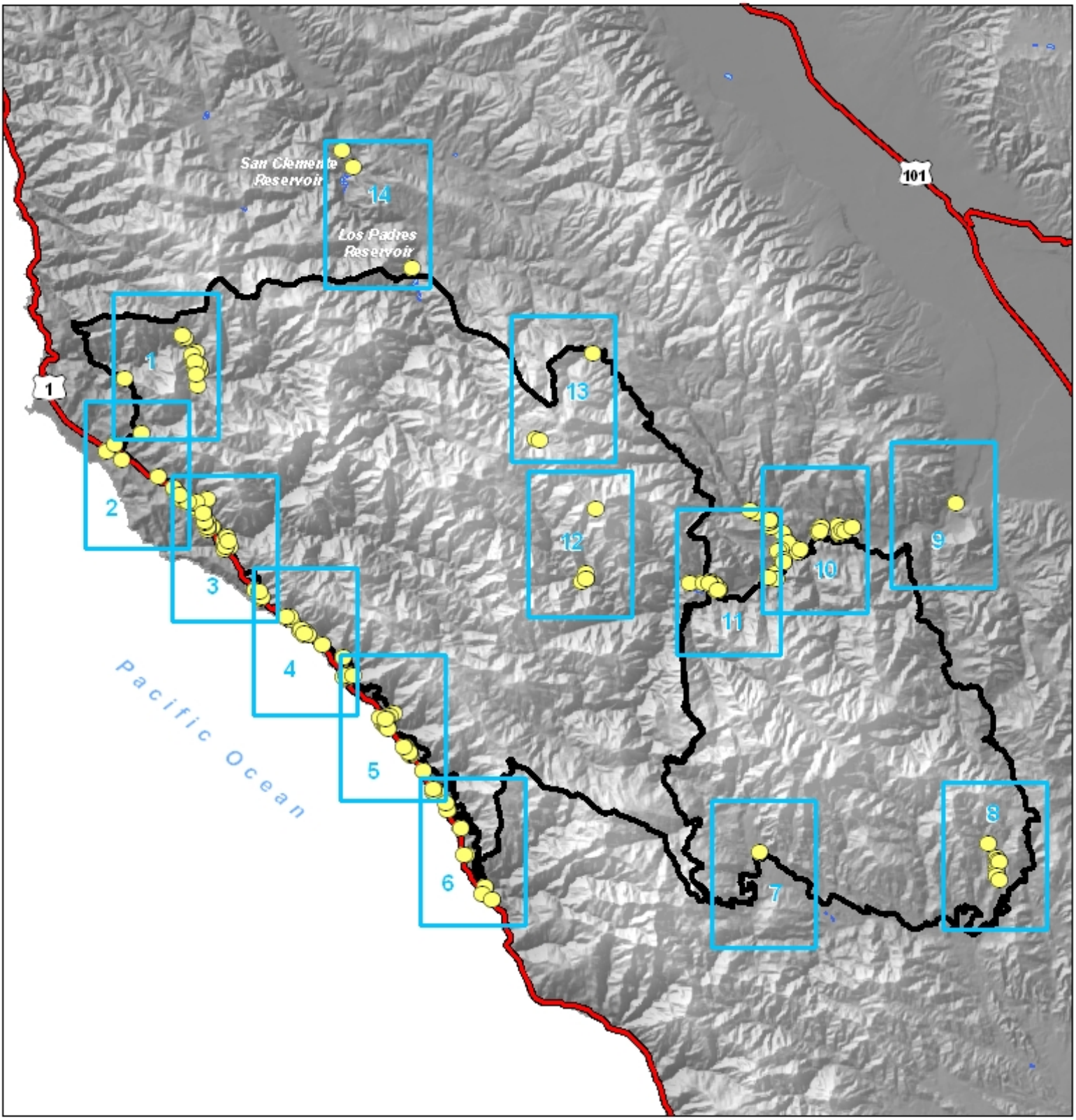
Steven J. Daus, Ph.D., President, Daus Environmental Services, Inc.

Sydney Read, Chief, Carmel Valley Fire Protection District

Terry Palmisano, Senior Biologist Supervisor, California Dept. of Fish and Game

Tom Murphey, Wildlife Biologist, Los Padres National Forest

Basin Complex / Indians Fire - SEAT
Burn Site Evaluation - Risk to Lives or Property - Map Index



Legend

- Sites at Risk
- Highway
- Basin & Indians Fire perimeters

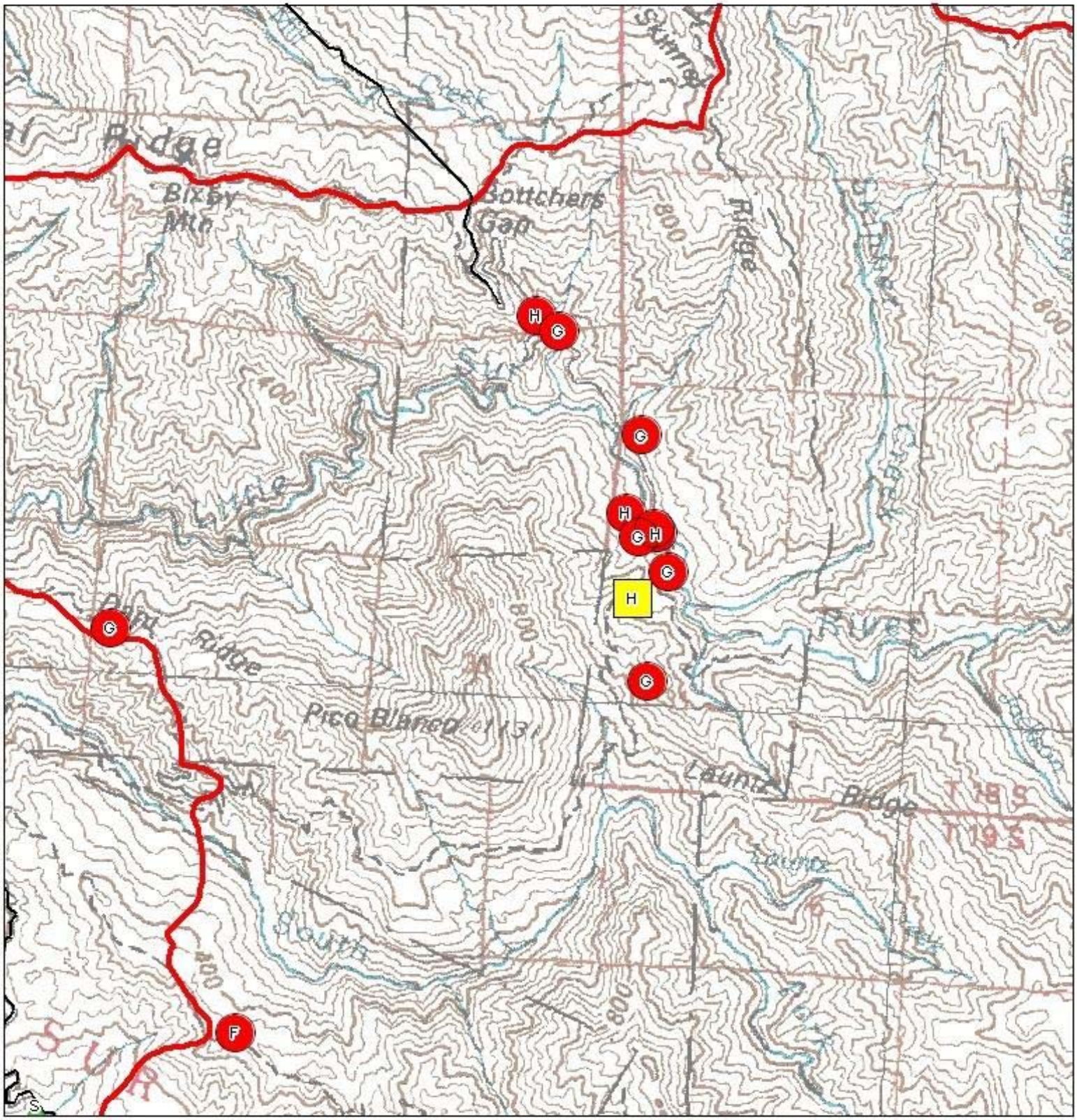
N W E S

SEAT - Monterey, C. Trenner, FC - CAL FIRE
Data Sources - CAL FIRE, CGS, OES, USFS - 08/24/08
NAD 27, California Teale Albers

Miles
0 2.5 5 10

Appendix 5

Basin Complex / Indians Fire - SEAT
Burn Site Evaluation - Risk to Lives or Property - Area 1



Level of Risk

Higher Moderate Lower

Fire perimeter

G - Geology
H - Hydrology
F - Fisheries
S - Soils
B - Botany

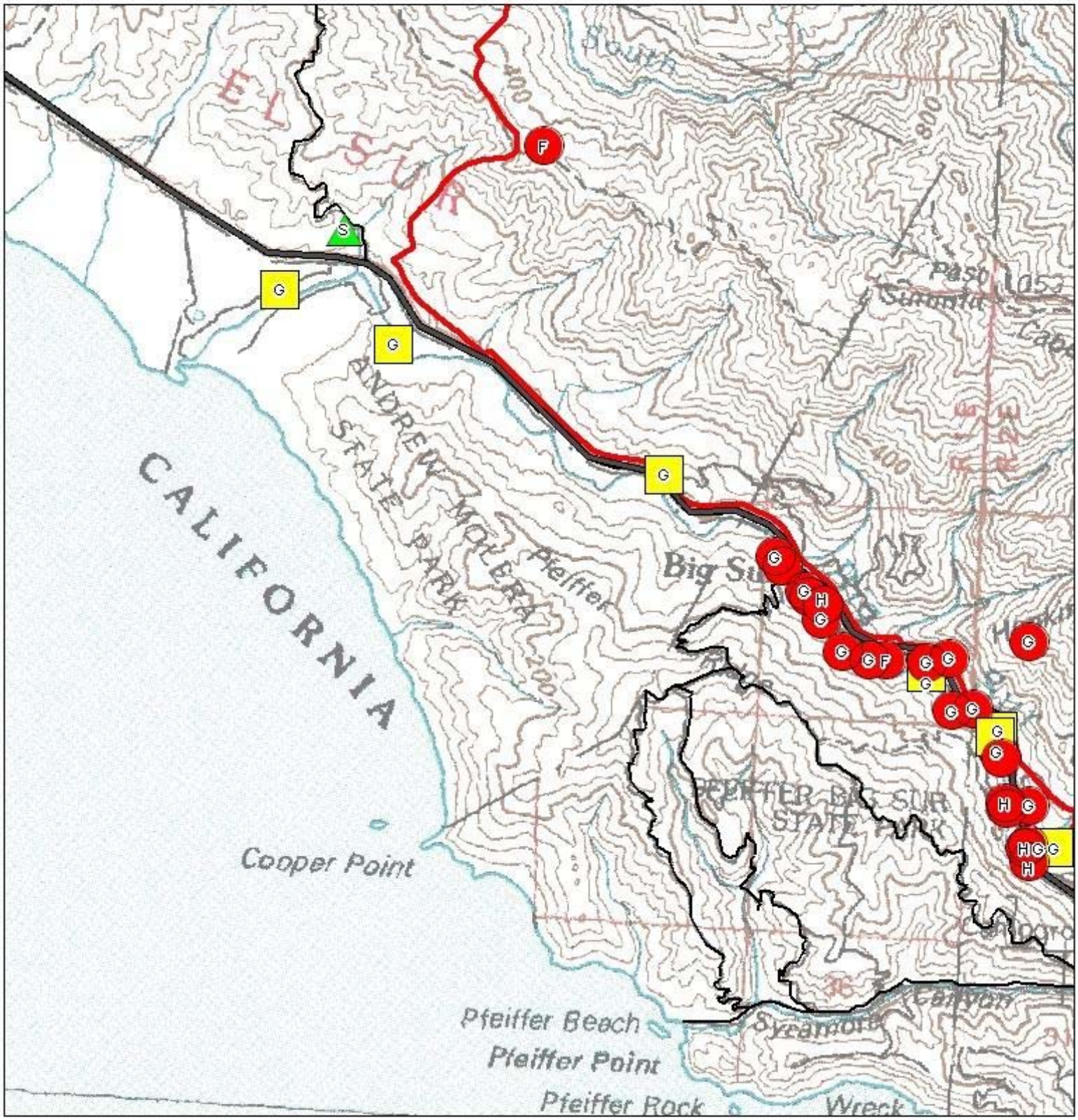
N W E S

SEAT - Monterey, C. Trenner, FC - CAL FIRE
Data Sources - CAL FIRE, CGS, OES, USFS - 08/24/08
NAD 27, California Teale Albers

0 0.25 0.5 1 Miles

Appendix 6

Basin Complex / Indians Fire - SEAT
Burn Site Evaluation - Risk to Lives or Property - Area 2



Level of Risk

Higher Moderate Lower

Fire perimeter

G - Geology
H - Hydrology
F - Fisheries
S - Soils
B - Botany

N W E S

SEAT - Monterey, C. Trenner, FC - CAL FIRE
Data Sources - CAL FIRE, CGS, OES, USFS - 08/24/08
NAD 27, California Teale Albers

0 0.25 0.5 1 Miles

Appendix 7

Basin Complex / Indians Fire - SEAT
Burn Site Evaluation - Risk to Lives or Property - Area 3

Level of Risk

Higher Moderate Lower

Fire perimeter

G - Geology
H - Hydrology
F - Fisheries
S - Soils
B - Botany

SEAT - Monterey, C. Trenner, FC - CAL FIRE
Data Sources - CAL FIRE, CGS, OES, USFS - 08/24/08
NAD 27, California Teale Albers

Miles
0 0.25 0.5 1

Appendix 8

Basin Complex / Indians Fire - SEAT
Burn Site Evaluation - Risk to Lives or Property - Area 4

Level of Risk

Higher Moderate Lower

Fire perimeter

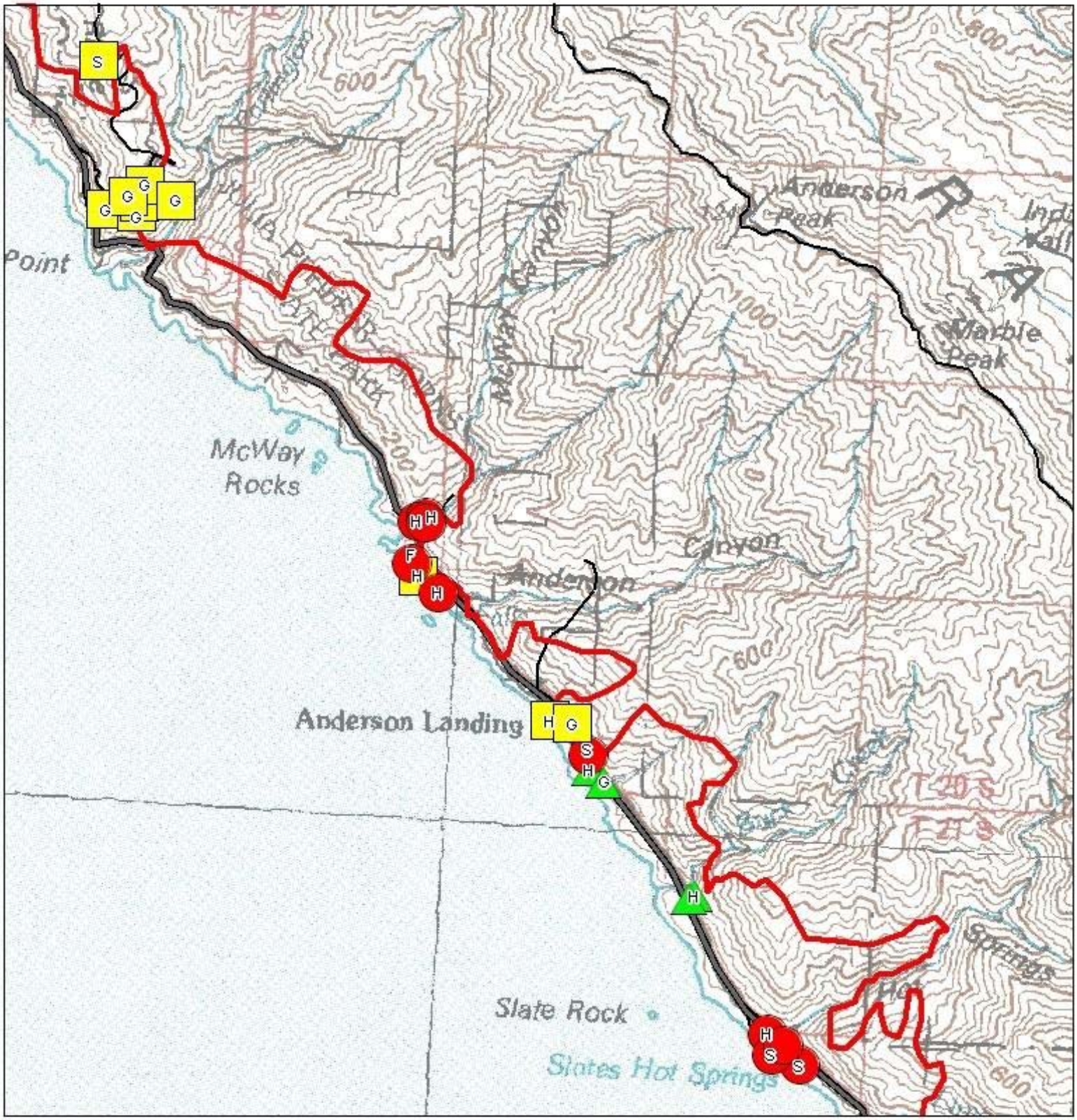
G - Geology
H - Hydrology
F - Fisheries
S - Soils
B - Botany

SEAT - Monterey, C. Trenner, FC - CAL FIRE
Data Sources - CAL FIRE, CGS, OES, USFS - 08/24/08
NAD 27, California Teale Albers

0 0.25 0.5 1 Miles

Appendix 9

Basin Complex / Indians Fire - SEAT
Burn Site Evaluation - Risk to Lives or Property - Area 5



Level of Risk

Higher Moderate Lower

Fire perimeter

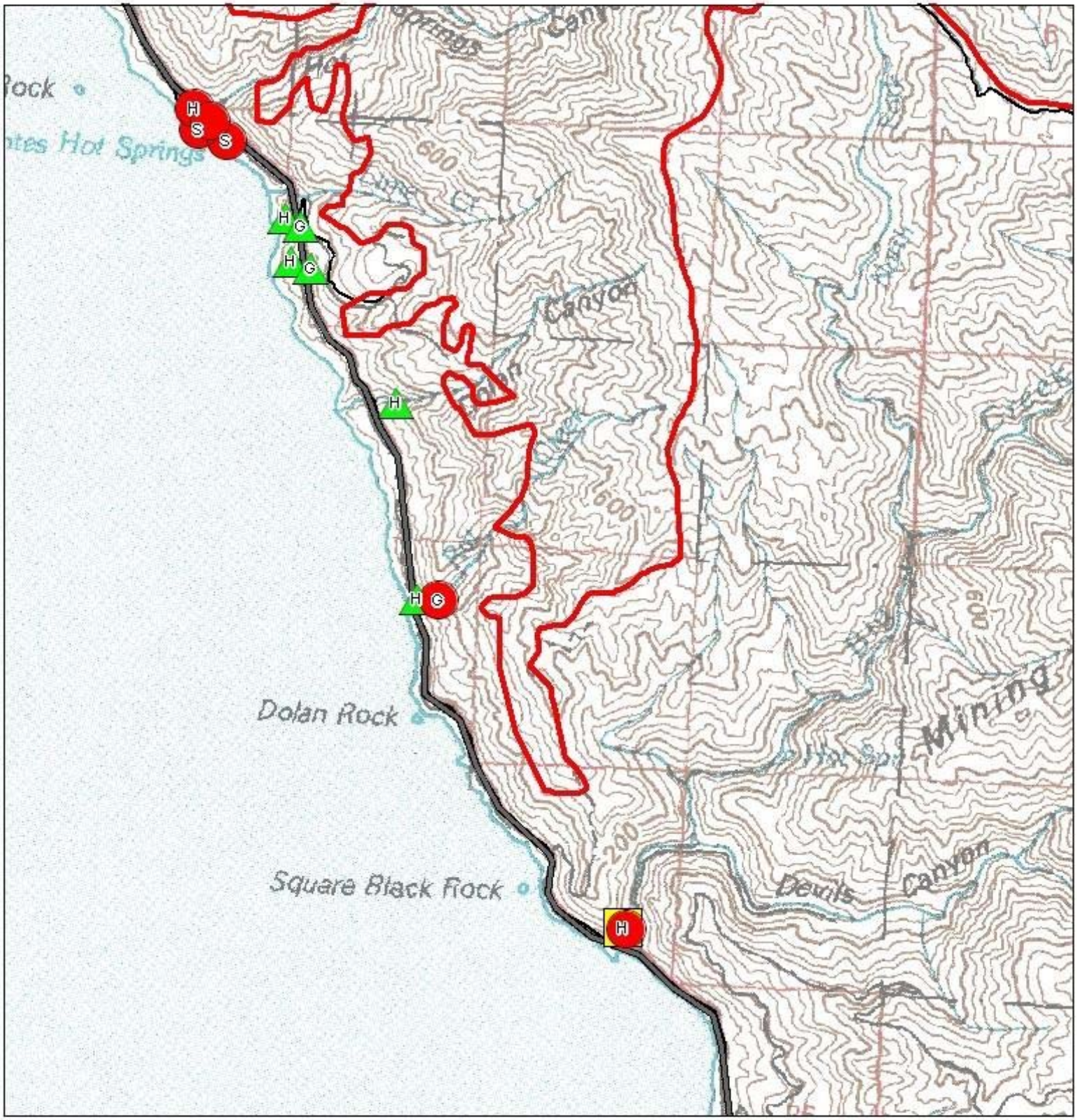
G - Geology
H - Hydrology
F - Fisheries
S - Soils
B - Botany

SEAT - Monterey, C. Trenner, FC - CAL FIRE
Data Sources - CAL FIRE, CGS, OES, USFS - 08/24/08
NAD 27, California Teale Albers

0 0.25 0.5 1 Miles

Appendix 10

Basin Complex / Indians Fire - SEAT
Burn Site Evaluation - Risk to Lives or Property - Area 6



Level of Risk

Higher Moderate Lower

Fire perimeter

G - Geology
H - Hydrology
F - Fisheries
S - Soils
B - Botany

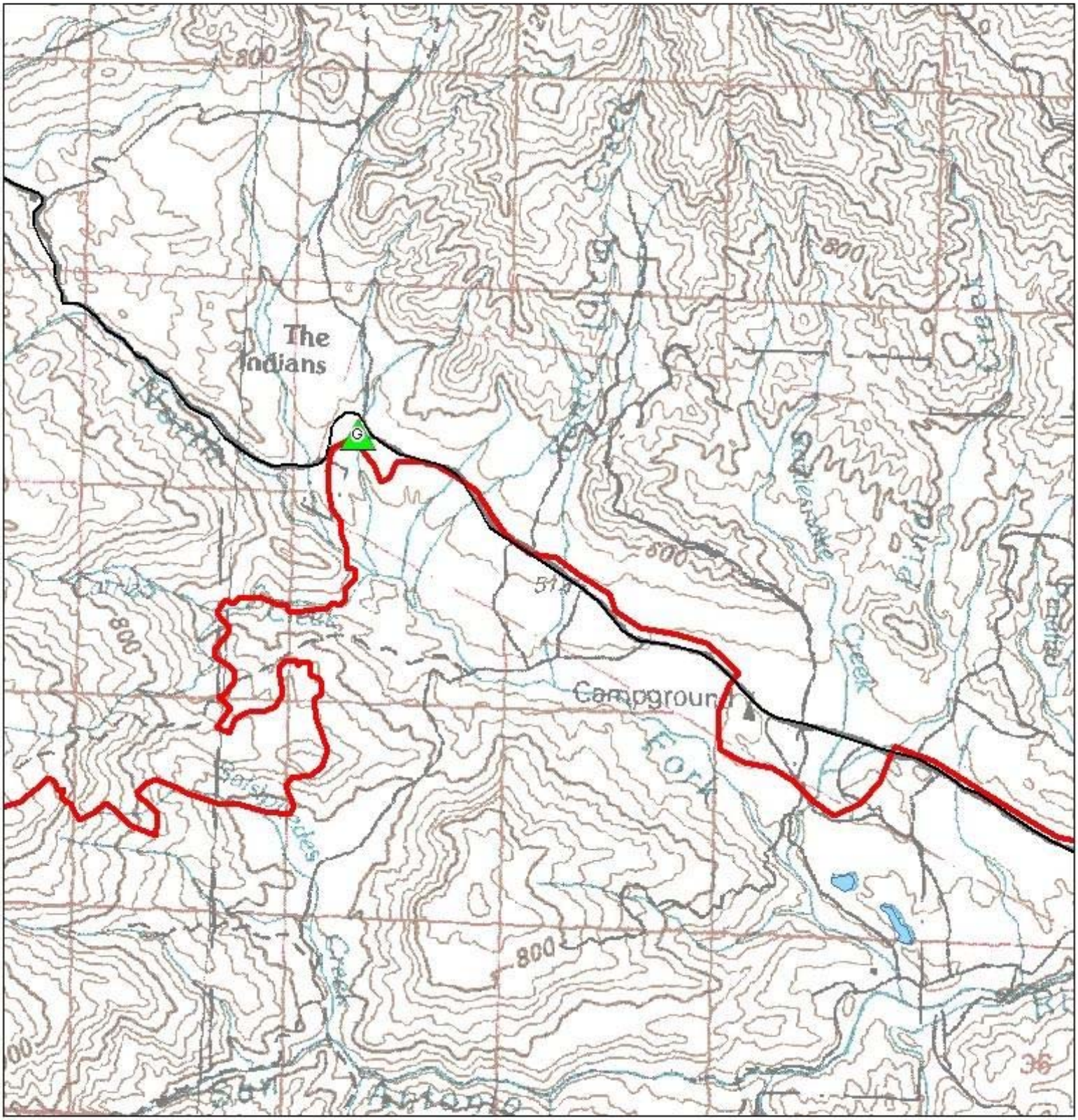
N W E S

SEAT - Monterey, C. Trenner, FC - CAL FIRE
Data Sources - CAL FIRE, CGS, OES, USFS - 08/24/08
NAD 27, California Teale Albers

0 0.25 0.5 1 Miles

Appendix 11

Basin Complex / Indians Fire - SEAT
Burn Site Evaluation - Risk to Lives or Property - Area 7



Level of Risk

Higher Moderate Lower

Fire perimeter

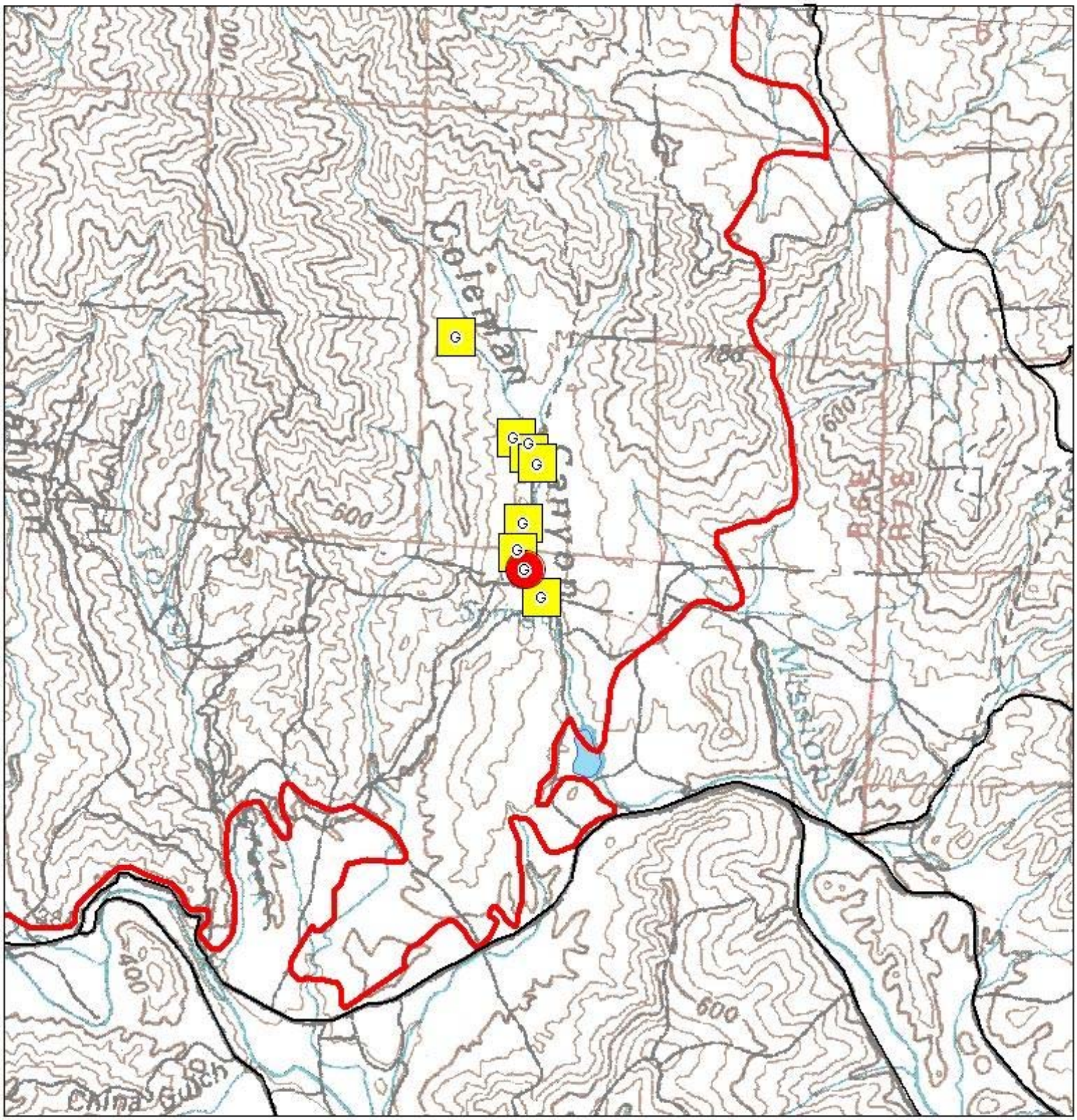
G - Geology
H - Hydrology
F - Fisheries
S - Soils
B - Botany

N W E S

SEAT - Monterey, C. Trenner, FC - CAL FIRE
Data Sources - CAL FIRE, CGS, OES, USFS - 08/24/08
NAD 27, California Teale Albers

Miles
0 0.25 0.5 1

Basin Complex / Indians Fire - SEAT
Burn Site Evaluation - Risk to Lives or Property - Area 8



Level of Risk

Higher Moderate Lower

Fire perimeter

G - Geology
H - Hydrology
F - Fisheries
S - Soils
B - Botany

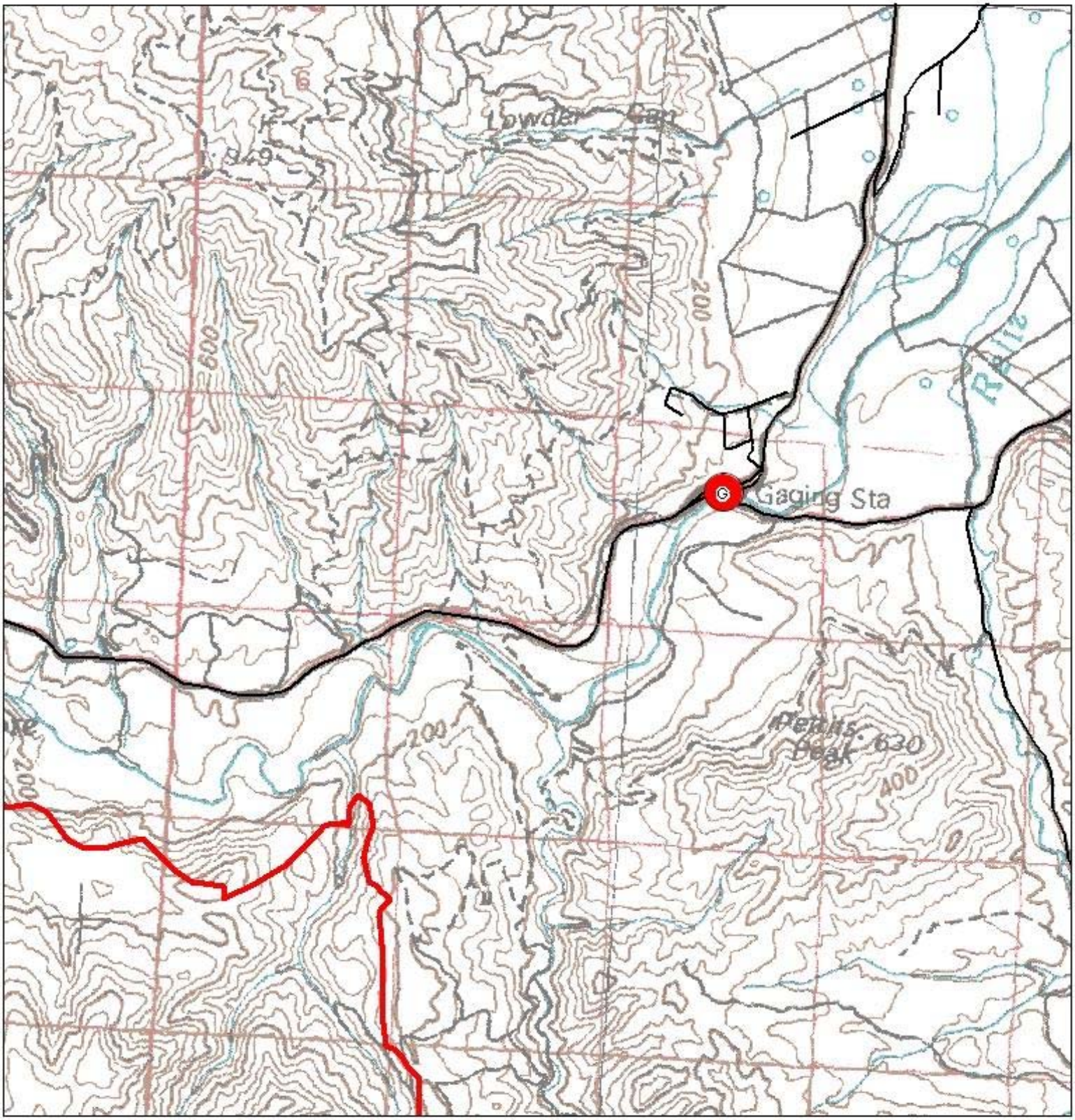
N W E S

SEAT - Monterey, C. Trenner, FC - CAL FIRE
Data Sources - CAL FIRE, CGS, OES, USFS - 08/24/08
NAD 27, California Teale Albers

Miles
0 0.25 0.5 1

Appendix 13

Basin Complex / Indians Fire - SEAT
Burn Site Evaluation - Risk to Lives or Property - Area 9



Level of Risk

Higher Moderate Lower

Fire perimeter

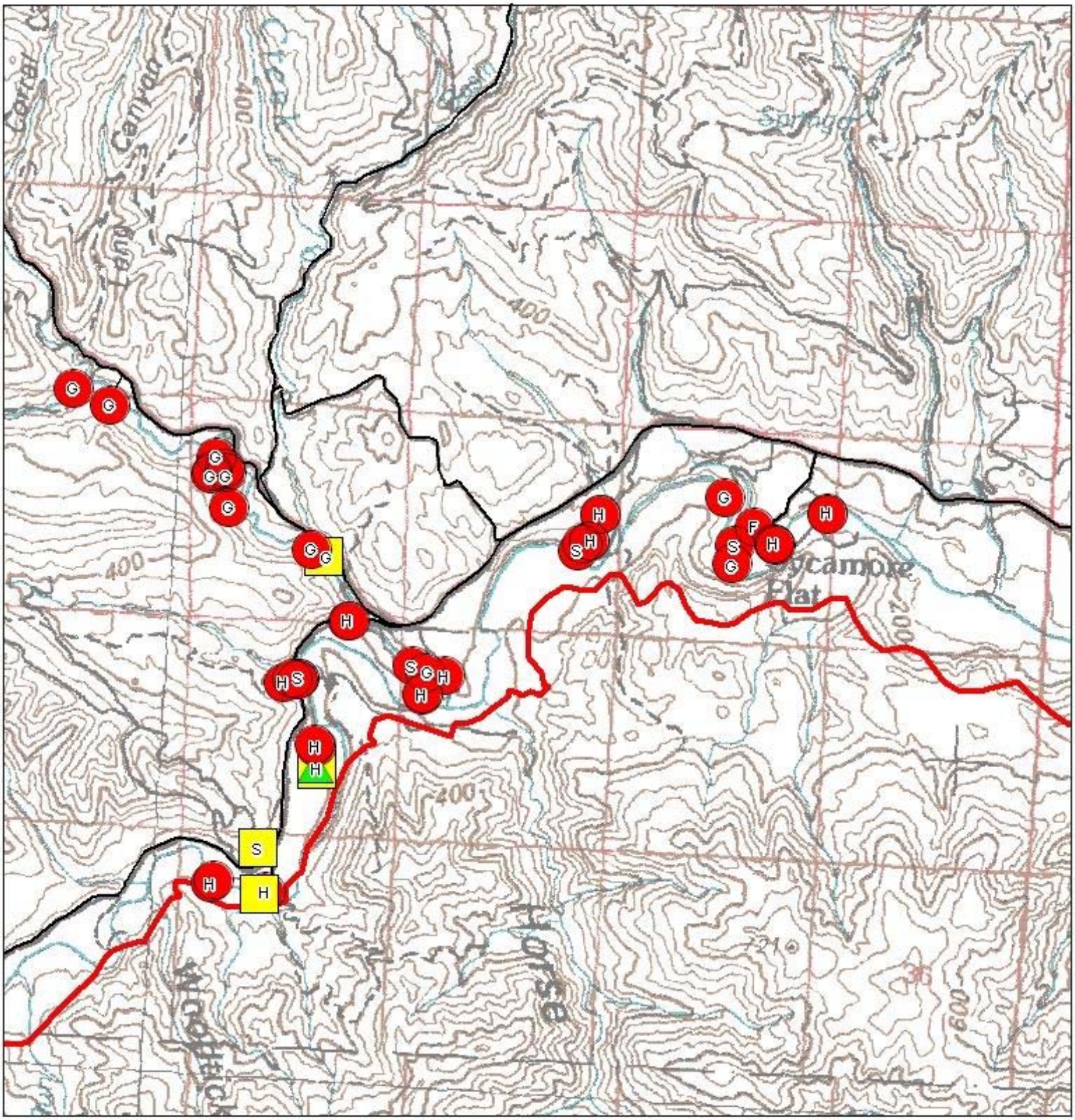
G - Geology
H - Hydrology
F - Fisheries
S - Soils
B - Botany

SEAT - Monterey, C. Trenner, FC - CAL FIRE
Data Sources - CAL FIRE, CGS, OES, USFS - 08/24/08
NAD 27, California Teale Albers

Miles
0 0.25 0.5 1

Appendix 14

Basin Complex / Indians Fire - SEAT
Burn Site Evaluation - Risk to Lives or Property - Area 10



Level of Risk

Higher Moderate Lower

Fire perimeter

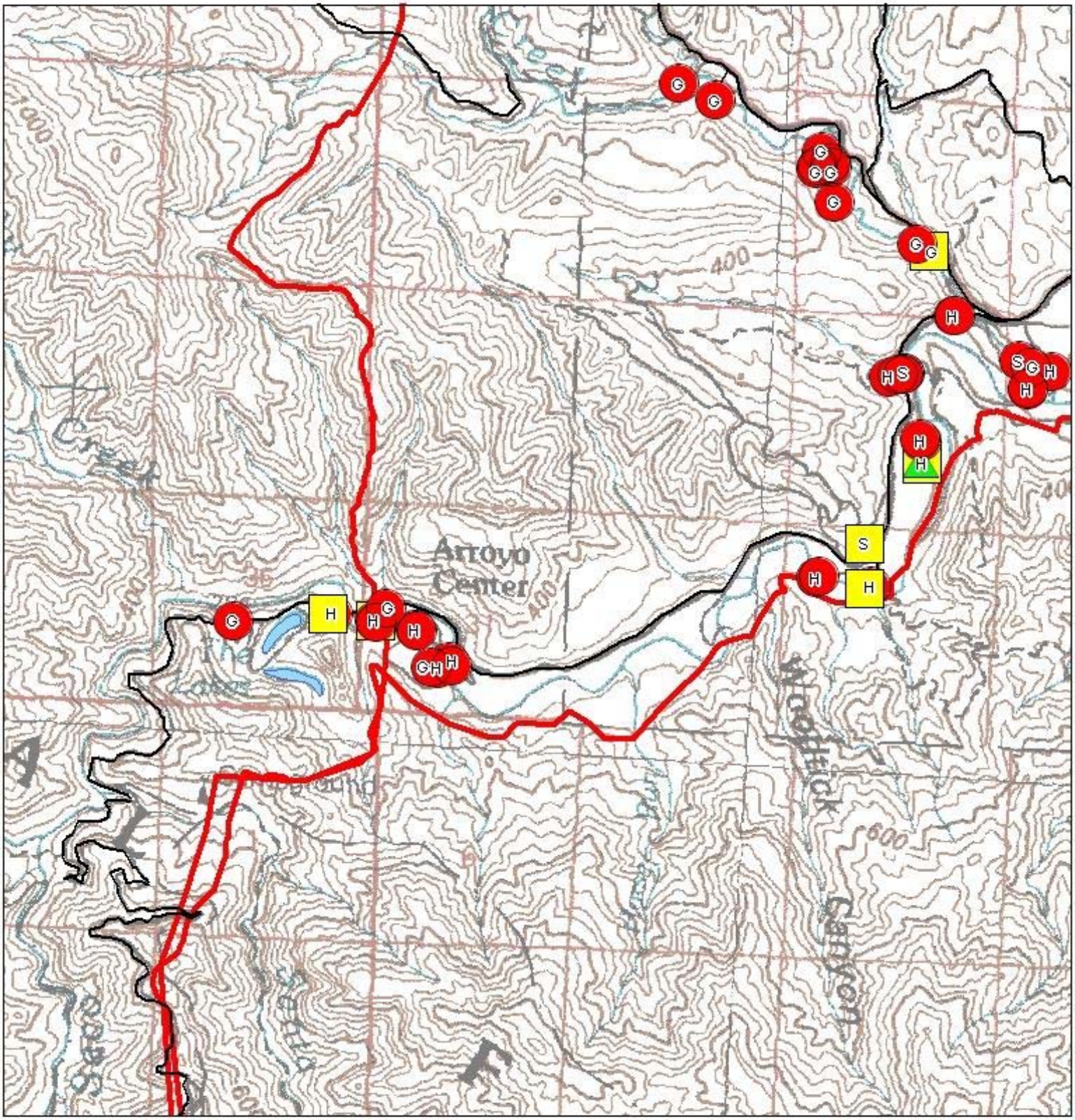
G - Geology
H - Hydrology
F - Fisheries
S - Soils
B - Botany

SEAT - Monterey, C. Trenner, FC - CAL FIRE
Data Sources - CAL FIRE, CGS, OES, USFS - 08/24/08
NAD 27, California Teale Albers

Miles
0 0.25 0.5 1

Appendix 15

Basin Complex / Indians Fire - SEAT
Burn Site Evaluation - Risk to Lives or Property - Area 11



Level of Risk

Higher Moderate Lower

Fire perimeter

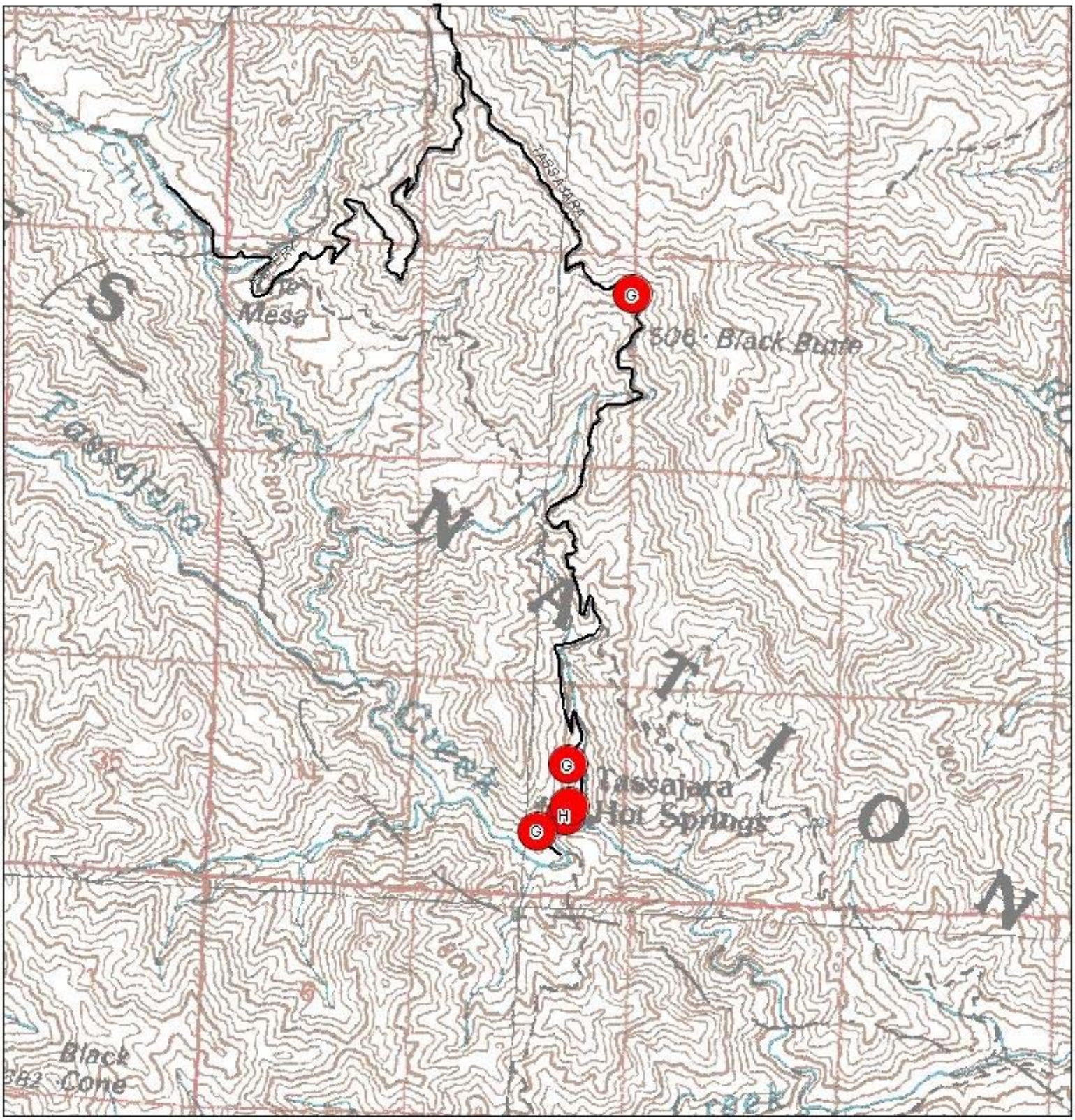
G - Geology
H - Hydrology
F - Fisheries
S - Soils
B - Botany

SEAT - Monterey, C. Trenner, FC - CAL FIRE
Data Sources - CAL FIRE, CGS, OES, USFS - 08/24/08
NAD 27, California Teale Albers

0 0.25 0.5 1 Miles

Appendix 16

Basin Complex / Indians Fire - SEAT
Burn Site Evaluation - Risk to Lives or Property - Area 12



Level of Risk

Higher Moderate Lower

Fire perimeter

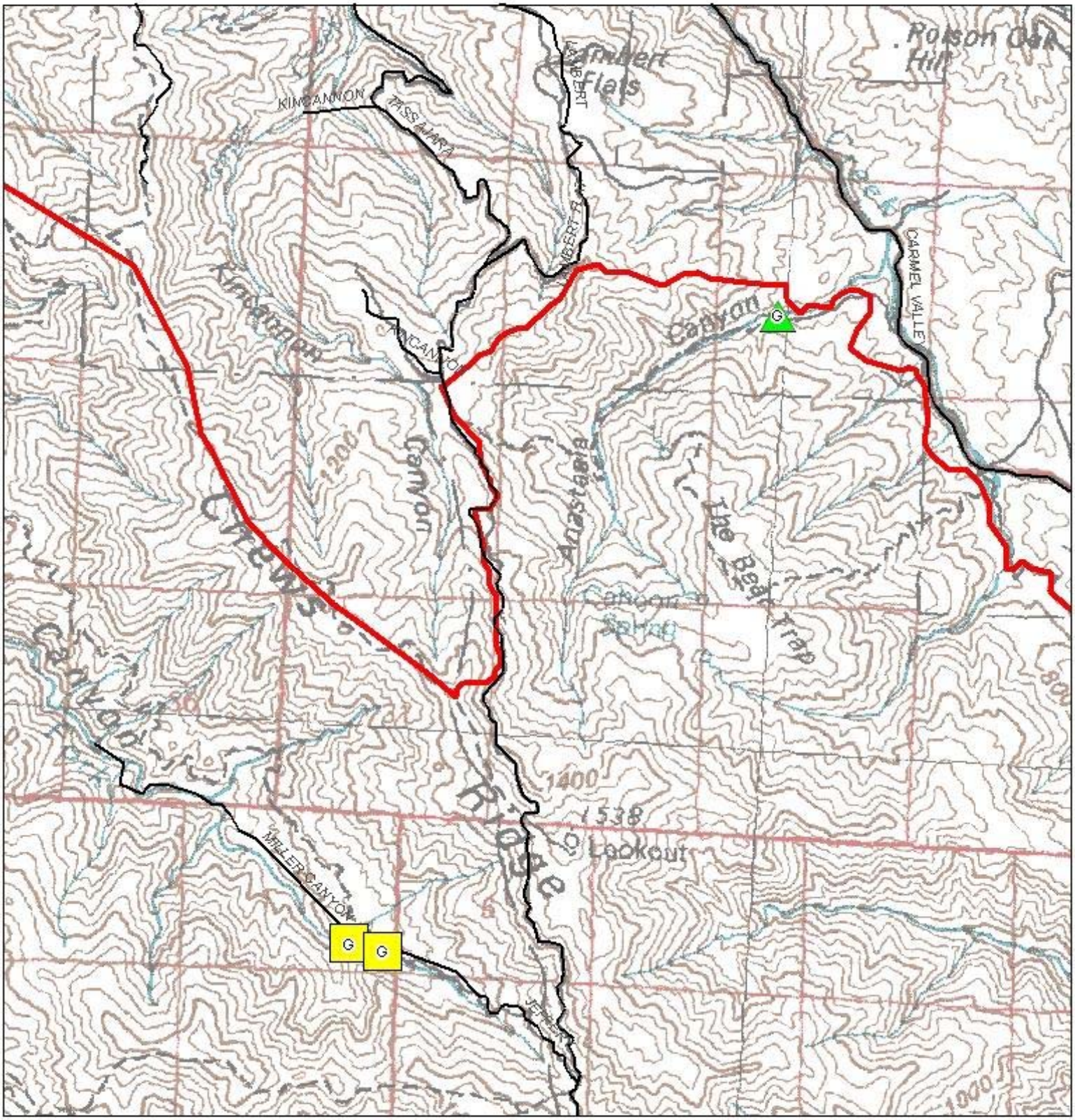
G - Geology
H - Hydrology
F - Fisheries
S - Soils
B - Botany

SEAT - Monterey, C. Trenner, FC - CAL FIRE
Data Sources - CAL FIRE, CGS, OES, USFS - 08/24/08
NAD 27, California Teale Albers

0 0.25 0.5 1 Miles

Appendix 17

Basin Complex / Indians Fire - SEAT
Burn Site Evaluation - Risk to Lives or Property - Area 13



Level of Risk

Higher Moderate Lower

Fire perimeter

G - Geology
H - Hydrology
F - Fisheries
S - Soils
B - Botany

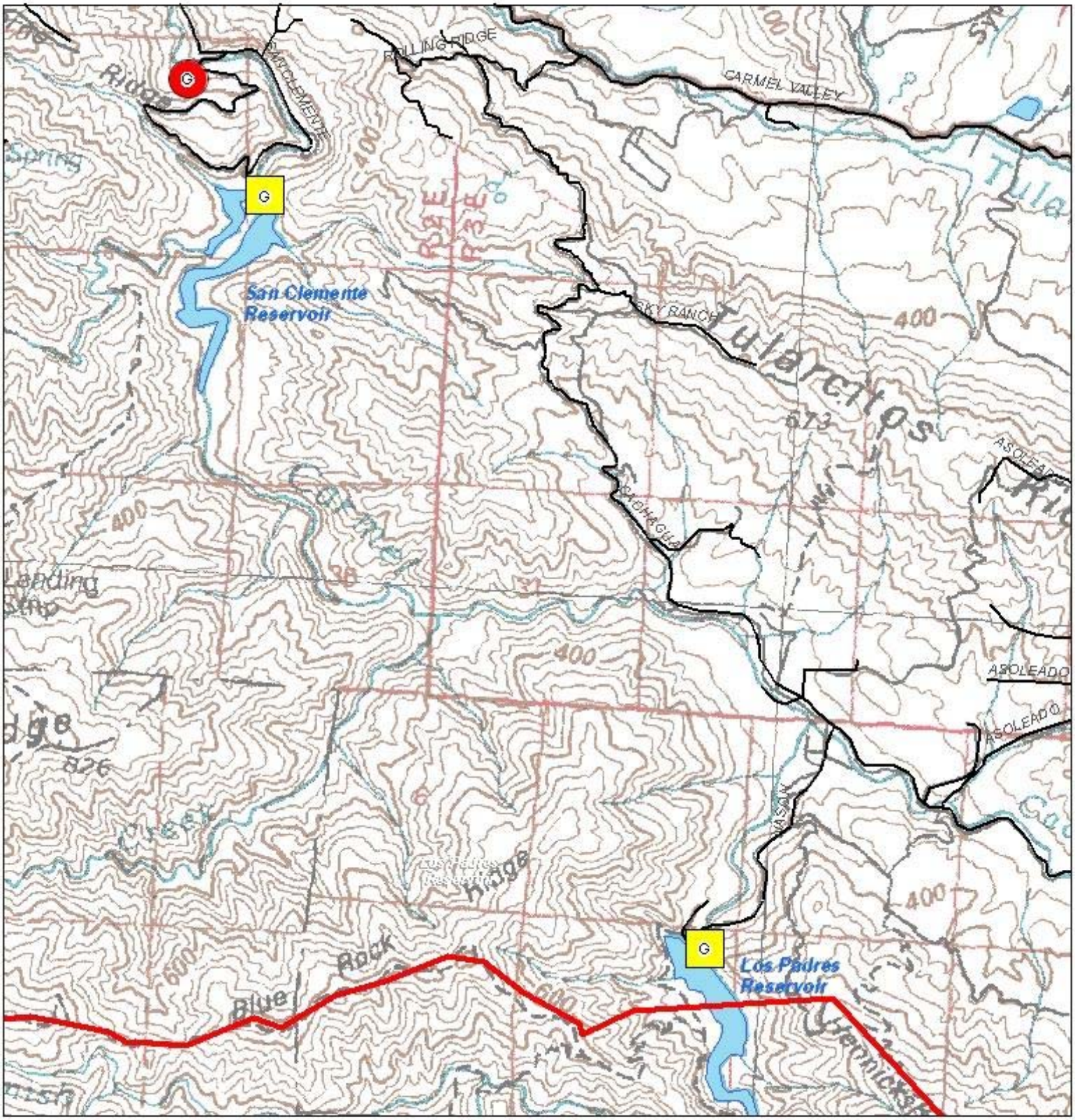
N W E S

SEAT - Monterey, C. Trenner, FC - CAL FIRE
Data Sources - CAL FIRE, CGS, OES, USFS - 08/24/08
NAD 27, California Teale Albers

Miles
0 0.25 0.5 1

Appendix 18

Basin Complex / Indians Fire - SEAT
Burn Site Evaluation - Risk to Lives or Property - Area 14



Level of Risk

Higher Moderate Lower

Fire perimeter

G - Geology
H - Hydrology
F - Fisheries
S - Soils
B - Botany

N W E S

SEAT - Monterey, C. Trenner, FC - CAL FIRE
Data Sources - CAL FIRE, CGS, OES, USFS - 08/24/08
NAD 27, California Teale Albers

0 0.25 0.5 1 Miles

Appendix 19