

Date of Report: 11/02/2021



ALISAL FIRE BURNED-AREA (BAER) REPORT

Los Padres National Forest
Santa Barbara Ranger District
November 2, 2021



The US Forest Service Burned Area Emergency Response (BAER) team assesses the threats to life, property, cultural and natural resources from post-fire changes to the watershed that can cause erosion, sedimentation, rockfall, flooding, and debris flows. BAER members analyzed the entire Alisal Fire footprint for changes in watershed response and shared their data through Santa Barbara County Offices of Emergency Management (OEM) website for all entities affected by the fire. This report is a **brief synopsis** of BAER findings and the Forest Service's internal request for funding to treat values at risk **on Forest Service lands only**. It includes a summary of the technical reports generated by the BAER team and potential pre-rain mitigations for values managed by the Forest Service. Complete technical reports and maps are available through the OEM. Information generated by the BAER team is crucial for further analysis by other agencies affected by the fire to examine their values at risk occurring off-Forest. Pre-rain mitigation treatments on non-Forest lands are the responsibility of the managers/owners of those values. The Forest Service will continue to coordinate with SB County OEM to provide technical support and information.

PART I - TYPE OF REQUEST**A. Type of Report**

- 1. Funding request for estimated emergency stabilization funds
- 2. No Treatment Recommendation

B. Type of Action

- 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)
- 2. Interim Request #____
 - Updating the initial funding request based on more accurate site data or design analysis

PART II - BURNED-AREA DESCRIPTION**A. Fire Name: Alisal****B. Fire Number: CA-LPF-002822****C. State: California****D. County: Santa Barbara****E. Region: 5****F. Forest: Los Padres****G. District: Santa Barbara****H. Fire Incident Job Code: P5PBT9 (0507)****I. Date Fire Started: October 11, 2021****J. Date Fire Contained: 99% as of 11/02/2021****K. Suppression Cost: \$25 Million****L. Fire Suppression Damages Repaired with Suppression Funds (estimates):**

- 1. Fireline repaired (miles):**
13.3 miles total (4.7 Miles on NFS lands).
- 2. Other (identify):**
13.5 miles of handlines constructed and repaired. (2.9 Miles on NFS lands).

M. Watershed Numbers:

Table 1: Acres Burned by Watershed (HUC 7 level and HUC 5 level) Unburned acres within the fire perimeter were not included in acres burned.*

Pourpoint Watersheds (Ocean Discharge -PP1)	Total Pourpoint Acres	Total Pourpoint Acres Burned	Acres by Burn Severity			
			High	Moderate	Low	Unburned
Arroyo Hondo	2800.66	2595 (93%)	164 (6%)	1727 (62%)	704 (25%)	206 (7%)
Arroyo Quemado	1893.50	1846 (98%)	37 (2%)	985 (52%)	825 (44%)	47 (2%)
Canada Alcatraz	198.82	53 (27%)	0 (%)	6 (3%)	48 (24%)	146 (73%)
Canada de Guillermo	310.81	297 (95%)	0 (%)	138 (44%)	158 (51%)	14 (5%)
Canada de la Pila	425.54	274 (64%)	0 (%)	107 (25%)	168 (39%)	151 (36%)
Canada de la Posta	652.71	544 (83%)	3 (%)	209 (32%)	332 (51%)	109 (17%)
Canada de las Zorrillas	266.29	180 (68%)	1 (%)	53 (20%)	126 (47%)	86 (32%)
Canada del Capitan	3953.45	142 (4%)	0 (%)	19 (%)	123 (3%)	3811 (96%)
Canada del Cementerio	479.46	22 (5%)	0 (%)	2 (%)	20 (4%)	457 (95%)
Canada del Corral	4156.29	1630 (39%)	0 (%)	281 (7%)	1348 (32%)	2527 (61%)
Canada del Leon	189.70	110 (58%)	0 (%)	58 (30%)	52 (27%)	80 (42%)
Canada del Mollino	1003.36	297 (30%)	0 (%)	58 (6%)	239 (24%)	706 (70%)
Canada del Refugio	5150.01	2179 (42%)	6 (%)	713 (14%)	1460 (28%)	2971 (58%)
Canada del Venadito	1247.36	769 (62%)	0 (%)	136 (11%)	633 (51%)	478 (38%)
Canada San Onofre	1332.17	248 (19%)	0 (%)	82 (6%)	165 (12%)	1084 (81%)
Tajiguas Creek	3966.33	3391 (86%)	44 (1%)	1395 (35%)	1953 (49%)	575 (14%)
Unnamed45	125.14	117 (94%)	0 (%)	0 (%)	117 (94%)	8 (6%)
Unnamed46	294.30	52 (18%)	0 (%)	0 (%)	52 (18%)	242 (82%)
Beach WS *		935	0	18	917	130
Santa Ynez River *		30	0	12	17	22

* Watershed model was not run for these Watersheds.

Pourpoint Watersheds	Total Pourpoint Acres	Total Pourpoint Acres Burned	Acres by Soil Burn Severity			
			High	Moderate	Low	Unburned
Arroyo Hondo - PP2	2192.95	2037 (93%)	159 (7%)	1446 (66%)	433 (20%)	156 (7%)
Arroyo Hondo - PP3	906.98	758 (84%)	122 (13%)	472 (52%)	165 (18%)	149 (16%)
Canada del Corral - PP2	771.71	664 (86%)	0 (%)	155 (20%)	509 (66%)	108 (14%)
Canada del Refugio - PP2	3744.84	1398 (37%)	6 (%)	555 (15%)	836 (22%)	2347 (63%)
Canada del Refugio - PP3	2785.19	796 (29%)	6 (%)	401 (14%)	389 (14%)	1989 (71%)
Canada del Refugio - PP4	965.68	594 (62%)	0 (%)	157 (16%)	437 (45%)	371 (38%)
Canada del Venadito - PP2	484.49	383 (79%)	0 (%)	110 (23%)	273 (56%)	101 (21%)
Canada del Venadito - PP3	264.73	200 (75%)	0 (%)	24 (9%)	176 (66%)	65 (25%)
Tajiguas Creek - PP2	2473.59	2079 (84%)	37 (1%)	1091 (44%)	951 (38%)	394 (16%)
Tajiguas Creek - PP3	758.18	742 (98%)	28 (4%)	494 (65%)	220 (29%)	16 (2%)
Tajiguas Creek - PP4	1097.73	775 (71%)	6 (1%)	365 (33%)	404 (37%)	323 (29%)
Tajiguas Creek - PP5	605.21	587 (97%)	7 (1%)	258 (43%)	323 (53%)	18 (3%)

(See Figure 1)

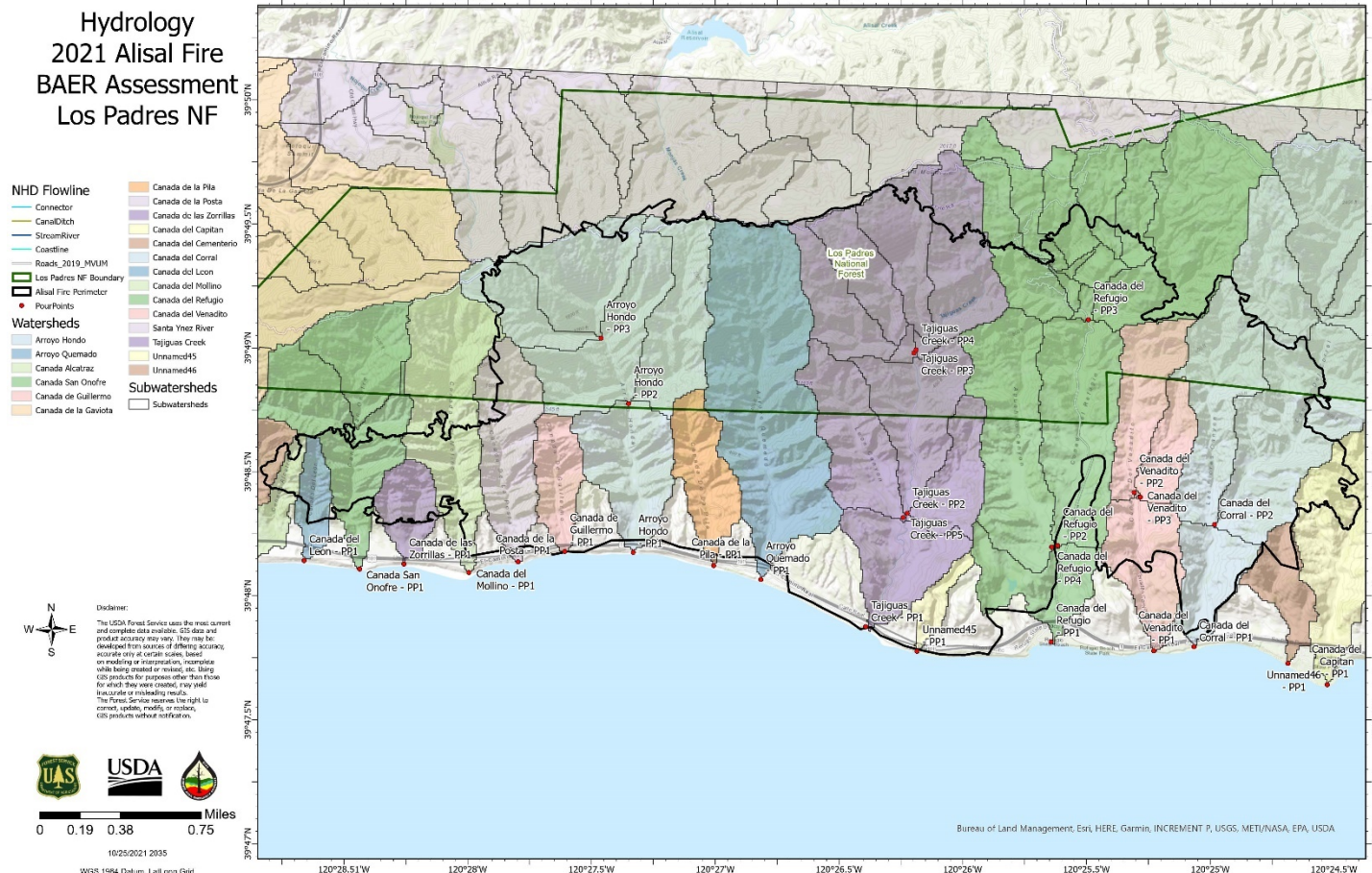


Figure 1: Watershed impacted by the Alisal Fire and hydrological model pourpoints

N. Total Acres Burned:

Table 2: Total Acres and percent (%) Burned by Ownership

OWNERSHIP	ACRES	PERCENT (%)
NFS	3,403	19%
PRIVATE/UNSPECIFIED	11,955	67%
CA STATE PARKS	301	2%
LOCAL GOVERNMENT	1,583	9%
OTHER STATE LANDS	604	3%
TOTAL	17,846	100%

O. Vegetation Types:

Soft and hard chaparral are present in bands along faulted and folded sedimentary rock formations across the landscape. South-facing slopes are mostly dominated by chaparral with oak woodlands, avocado and citrus orchards at lower elevations. Conifers exist in small patches along ridgetops and on north-facing slopes. Narrow riparian corridors contrast sharply with the otherwise dry landscape.

P. Dominant Soils:

There are four dominant soil map units in the burned area. These soils are strongly dependent on the underlying geology and the slope/aspect of the topography. The soils are situated on a west facing slope of the Transverse Ranges of Southern California. This is a rapidly uplifting block of complex Cenozoic sedimentary rock comprised of shales and sandstones; the soils developed in this geology and climate generally have formed shallow, rocky and variable soil textures based on

the age and parent material of the geology. Shallow soils, soils with high rock content and rock outcrops are common in this burned area.

Dominant Soil – Taxonomy

- Fine, smectitic, thermic Aridic Haploxererts
- Loamy-skeletal, mixed, superactive, thermic, shallow Entic Haploxerolls
- Loamy, mixed, active, thermic Lithic Dystroxerepts
- Loamy, mixed, superactive, thermic Lithic Haploxerolls

The dominant surface texture for soils in the upper watershed is fine sandy loam. Loamy skeletal soils mixed with bands and pockets of finer textured soils occur in the mid to lower watersheds. Soil textures are an important soil property for a variety of interpretations such as potential for damage by fire and inherent risk for erosion.

Q. Geologic Types:

Geomorphology and Geology: The Alisal Fire occurred on the south slopes of the Santa Ynez Mountains within the Transverse Ranges in Southern California. The Transverse Ranges are some of the most tectonically active mountains in the U.S. and are growing at a rate faster than they are eroding. The Santa Ynez Mountains parallel the south coast of Santa Barbara County and extend eastward into Ventura County. Unlike the Transverse Ranges to the east, this range is composed almost entirely of un-metamorphosed, mostly marine sedimentary rocks of Cenozoic and late Mesozoic age, elevated out of the ocean mostly on the Santa Ynez fault along or near the northern base of this range (Dibblee, 1982). In this area, various forms of land-sliding, rock-fall, debris flows and erosion are frequent events in the steep, geologically young mountains, and occur naturally even without the effects of fires. Fires can dramatically increase slope instability. Instability features associated with this area include landslides, debris slides and debris flows which threaten human and other life, can damage, and destroy homes, businesses and other infrastructure, block or carve out sections of roads, sever pipelines and other utilities, block stream channels, add large quantities of sediment to stream channels and water bodies, and disrupt the livelihood of workers and communities. The physiography of the region is dominated by extremely rugged slopes, all draining into sixteen major drainages (Figure 1) all flowing south directly into the Pacific Ocean.

Bedrock within the boundaries of the Alisal Fire is underlain entirely by sedimentary rock formations, ranging in age from the oldest Eocene (~60 million years old) to younger Miocene (~25 million years old), and overlain by Quaternary alluvial and surficial sediments to present age. The majority of those rock types are of sandstone or shale composition with some conglomerate (Figure 2). Geological units in the area have been assigned to the following formations: Matilija Sandstone, Cozy Dell Shale, Sacate Sandstone, Gaviota Sandstone, Alegria Sandstone, Sespe Formation, Vaqueros Sandstone, Rincon Shale, and the Monterey Shale. These formations are listed in order of decreased age. In addition to these formations there are also Quaternary age materials including older alluvium from the Pleistocene, landslide rubble, and younger alluvium from the Holocene. Strata of all the other rock types typically dips steeply, usually towards the south and southwest, but sometimes overturned and dips towards the northeast. Numerous faults cross the fire area, trending east-west to northwest and include the Refugio fault and Santa Ynez fault that is just to the north of the burn scar.

Geology
2021 Alisal Fire
BAER Assessment
Los Padres NF



Disclaimer:
The USDA Forest Service uses the most current and available data available. USGS and other agencies may have more current data. This map is provided for informational purposes only. It is not intended for use in any legal proceeding. The Forest Service reserves the right to correct, update, modify, or delete this map without notice.

Geology

- + Anticline - concealed
- + Anticline - inferred
- Fault - concealed
- - - Fault - inferred
- Fault
- + Syncline - concealed
- + Syncline - inferred

Sandstone marker bed

- Qa - Alluvium, Holocene
- Qls - Unconsolidated older alluvial deposits, Pleistocene
- Tmi - Monterey Shale, Miocene
- Tr - Rincon Shale, Miocene
- Tvq - Vaqueros Sandstone, Miocene

- Tsp - Sespe Formation - siltstone and claystone, Oligocene
- Ta - Astoria Formation - sandstone and siltstone, Oligocene
- Tps/Tpl - Gavista Formation - siltstone and claystone, Eocene
- Tash/Tass - Sacate Formation - shale and sandstone, Eocene
- Tcd - Cozy Dell Shale, Eocene
- Tma - Matilija Sandstone, Eocene

- Trails_2019_MVUM
- Roads_2019_MVUM
- ▨ NON-FS
- ▨ UNPARTITIONED RIPARIAN INTEREST
- ▨ USDA FOREST SERVICE
- ▭ Alisal Fire Perimeter

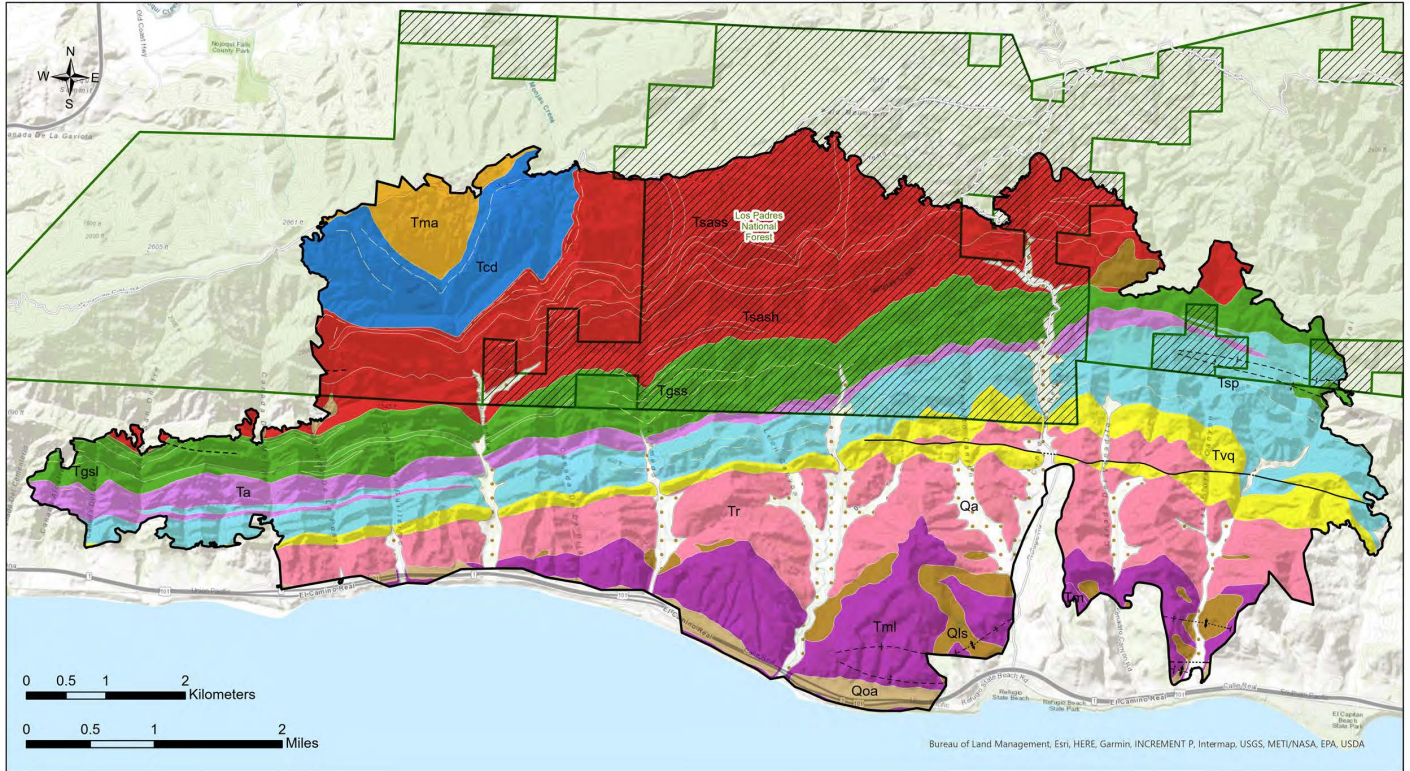


Figure 2: Geology map of the area impacted by the Alisal Fire

R. Miles of Stream Channels by Order or Class:

Table 3: Miles of Stream Channels by Order or Class

STREAM TYPE	MILES OF STREAM
PERENNIAL	26.46
INTERMITTENT	53.64
EPHEMERAL	0
OTHER (DEFINE)	

S. Transportation System:

Trails: National Forest (miles): 2.2
Roads: National Forest (miles): 5.9

Other (miles): 0
Other (miles): 0

PART III - WATERSHED CONDITION

Alisal Fire BAER Assessment

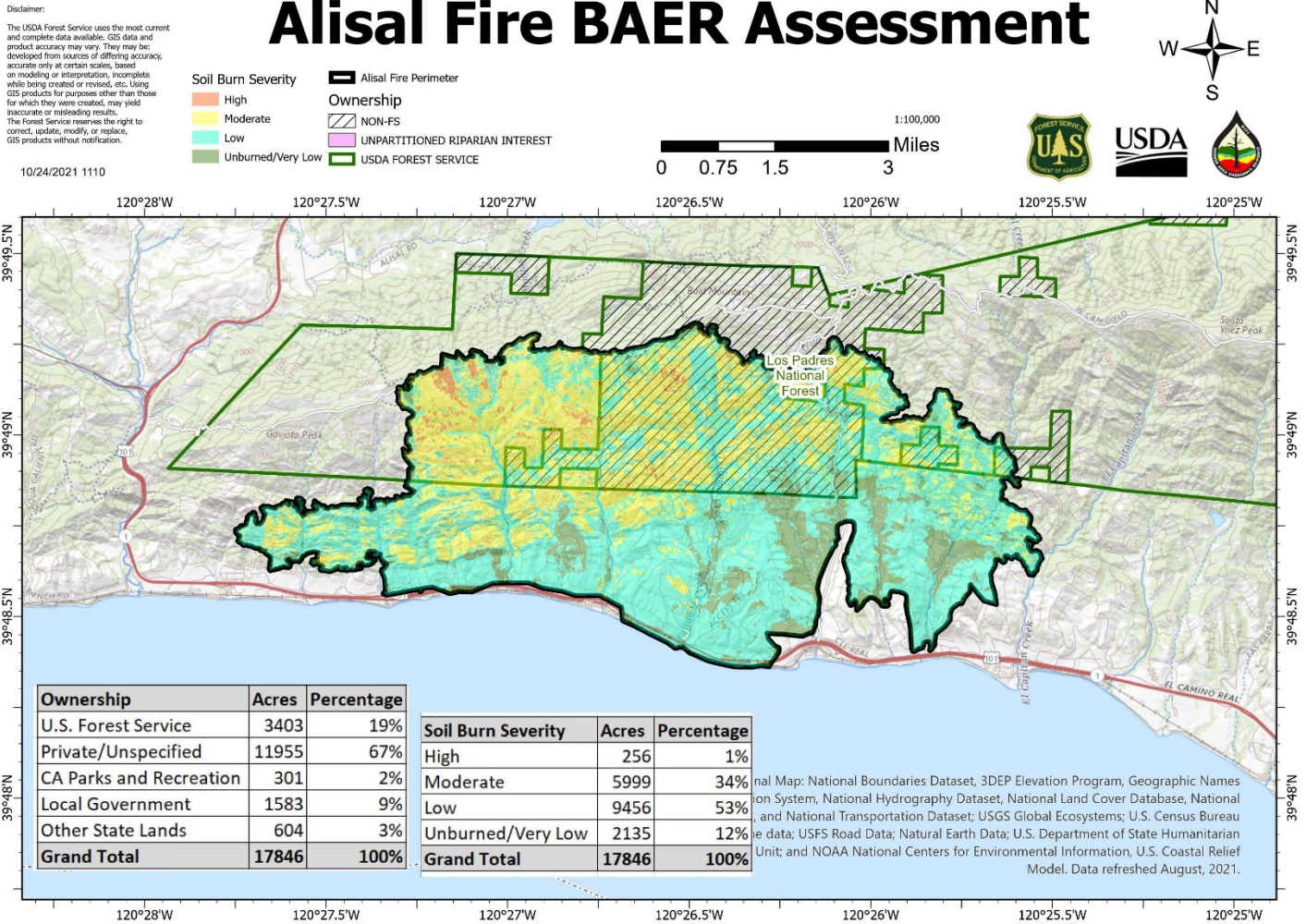


Figure 3: Soil Burn Severity Map of the Alisal Fire.

A. Burn Severity (acres):

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	Private	CA State Parks	Local Gov	State	Total	% within the Fire Perimeter
Unburned	232	1,620	44	174	49	2,135	12
Low	987	7,067	211	847	240	9,456	53
Moderate	2,003	2,987	46	555	303	5,999	34
High	180	58	0	7	12	256	1
Total	3,403	11,731	301	1,583	604	17,846	100

B. Water-Repellent Soil (acres on NFS lands):

The degree and extent of water repellent soils is largely unknown due to limited collection of field data for both burned and unburned conditions. The fire did not necessarily increase the extent of water repellency but likely did increase the strength of water repellency in moderate and high soil burn severity areas. The extent to which fire increased the

strength of water repellent layers is estimated to be at least **4,690** acres or 75% of the moderate and high burn severity areas. Soils in coastal chaparral ecosystems are naturally water-repellant. Background water-repellency (pre-fire) and fire induced water repellency is estimated to be approximately 50% of the entire burned area or **8,900** acres.

C. Soil Erosion Hazard and Erosion Potential

Soil erosion hazard ratings are currently unavailable in Web Soil Survey for the Los Padres National Forest. Erosion hazard ratings are an interpretation based on soil properties slope and bare ground. Actual potential for post fire erosion is better reflected by erosion model outputs summarized below.

The potential for soil erosion is expected to increase significantly based on removal of ground cover, fire damage to soil and formation of water repellent soils. High rates of erosion are expected to occur on steep slopes with moderate and/or high soil burn severity. In addition to water erosion associated with pending rainfall events with the next 3-5 years, high rates of dry ravel have been observed and are expected to continue contributing fine material to stream channels.

Erosion model outputs are generally used to compare pre-fire to post-fire conditions or to compare burned hillslopes and watersheds. Relative differences are generally more reliable than absolute values.

ERMiT allows users to predict the probability of a given amount of sediment delivery to the base of a hillslope following variable burns on forest, rangeland, and chaparral conditions in each of five years following wildfire. The ERMiT model can be accessed at <http://forest.moscowfsl.wsu.edu/fswepp/>. For this fire, input data for Batch ERMiT was exported from the WEPP-PEP tool.

ERMiT model outputs for the first year following the fire for this burned area assessment are based on the rainfall event (3-year storm) described in the Table below. According to the model, there is a 33% probability this storm will occur and generate erosion in the first year following the fire.

Storm Characteristics and Model Outputs

Storm Runoff inches	Storm Precipitation inches	Storm Duration hours
0.61	1.72	5.32

Model Outputs

- Hillslopes in Arroyo Quemado watershed show rates of erosion ranging from **0.15 to 10 tons/acre** with an average of **3 tons/acre** for the entire watershed
- Hillslopes in Tajiguas Creek watershed show rates of erosion ranging from **0.06 to 19 tons/acre** with an average of **3.5 tons/acre** for the entire watershed
- Hillslopes in Arroyo Hondo watershed show rates of erosion ranging from **0.22 to 17 tons/acre** with an average of **3.8 tons/acre** for the entire watershed
- Hillslopes in Refugio watershed show rates of erosion ranging from **0.00 to 14 tons/acre** with an average of **1.14 tons/acre** for the entire watershed

In these watersheds, the potential for sediment delivery from burned hillslopes to stream channels is high. Sediment loaded/stored in stream channels is available to be mobilized in response to rainfall events. Based on the erosion model results and assuming high connectivity between hillslopes and stream channels, average sediment potential is estimated to be **3,360 cubic yards/square mile**.

Rates of erosion are predicted to be low in unburned areas that have vegetative cover. Rates of erosion will increase significantly to on steep shrub dominated hillslopes that were mapped at moderate soil burn severity. Extensive removal of ground cover and increased formation of water-repellent layers occurred in these areas. Recovery of these areas is likely to occur within 3-5 years following the burn.

D. Estimated Vegetative Recovery Period (years):

Vegetative recovery primarily depends upon annual precipitation which can be extremely variable, but usually after 5 -7 years post burn erosion, runoff rates as well as debris flow potential approaches pre-burn levels. However, dangerous debris flow potential can linger for 2-3 years and should be evaluated during the second and third winters following the burn in order to determine the risk to recreationists entering this burn scar in the future.

E. Estimated Hydrologic Response (brief description):

The Alisal Fire occurred in a Mediterranean climatic region where a majority of precipitation occurs in the cool season, between October and April, in association with mid-latitude cyclones (frontal systems). Warm season thunderstorms are very uncommon, though possible. Average annual rainfall is approximately 15-17 inches at sea level, increasing to 24-27 inches in the upper portions of the burned watersheds along the crest of the Santa Ynez Mountains. Atmospheric rivers, narrow corridors of high- water vapor transport in the atmosphere that occur within mid-latitude cyclones, can produce long-duration, high volume rainfall events in this region capable of causing major flooding in burned and unburned areas. Embedded areas of convection within frontal storms (which may or may not feature atmospheric rivers) are common in this area and capable of producing short-duration, high-intensity rainfall conducive to post-fire hydrologic hazards.

Given the large percentage of moderate soil burn severity on steep slopes within the western half of the Alisal Fire, watershed response will be moderate to high across these burned catchments, with the greatest responses anticipated in the Arroyo Hondo, and Arroyo Quemado catchments. Hydrologic modeling based on the 5-year recurrence interval stream flow event suggests 2.3x peak flow for Arroyo Hondo and 1.9x peak flow for Arroyo Quemado. The table below includes modeling results for all catchments within the burn area.

Canada del Refugio catchment has a County road that traverses the stream channel multiple times. Hydrologic modeling based on the 5-year recurrence interval stream flow event suggests 1.3x peak flow for Canada del Refugio due to the large, unburned portion of the upper watershed. Santa Barbara County is aware of the risk to the public and will act as they deem appropriate.

In the assessment, dry ravel was observed to be pre-loading in transport-dominated channels. Any sediment and woody debris in those channels may be mobilized in post-fire flows increasing runoff volume and possibly impacting access roads and other values at risk. Dry ravel, lack of ground cover and surface roughness, and reduced infiltration especially in the moderate and high soil burn severity areas all contribute to increased watershed response. Larger flows have been known to entrap riparian vegetation, transporting it downstream as increased bulk.

Watershed Name (outlet at the ocean)	Drainage Area (acres)	High Severity Burn Acres	Mod Severity Burn Acres	Low Severity Burn Acres	% Watershed Burned	% Flow Increase above Normal
Arroyo Hondo	2801	163.59	1727.19	704.21	93%	126%
Arroyo Quemado	1893	36.79	985.02	824.58	98%	93%
Canada de Guillermo	311	0.30	138.09	158.26	95%	73%
Tajiguas Creek	3966	44.20	1394.58	1952.56	86%	66%
Canada de la Posta	653	3.06	208.89	331.63	83%	58%
Canada del Leon	190	0.00	57.60	52.16	58%	48%
Canada de la Pila	426	0.00	106.75	167.55	64%	43%
Canada de las Zorrillas	266	0.99	53.21	126.27	68%	40%
Canada del Refugio	5150	6.03	712.87	1459.69	42%	26%
Canada del Venadito	1247	0.00	136.33	632.98	62%	25%
Unnamed45	125	0.00	0.00	117.03	94%	19%
Canada del Corral	4156	0.00	281.22	1348.45	39%	16%
Canada del Mollino	1003	0.08	57.85	239.22	30%	13%
Canada San Onofre	1332	0.30	81.95	165.45	19%	11%
Canada Alcatraz	199	0.00	5.75	47.50	27%	9%
Unnamed46	294	0.00	0.00	51.92	18%	4%
Canada del Cementerio	479	0.00	2.32	19.64	5%	1%
Canada del Capitan	3953	0.00	18.98	123.01	4%	1%

The 2016 Sherpa Fire, which lies to the east of and has some overlap with the Alisal Fire, experienced a significant damaging debris flow on January 20, 2017 in El Capitan Canyon. Rainfall intensities associated with this event were 2.05 inches in 60 minutes and 0.75 inches in 15 minutes at the Santa Barbara County Public Works Refugio Pass gauge. This event highlights the susceptibility to post-fire debris flow hazards in this area.

During the BAER assessment period, on the morning of October 25, 2021, moderate-to-high intensity rainfall occurred over the burn area. The Refugio Pass gauge recorded maximum rainfall intensities of 0.91 inches in 60 minutes, 0.55 inches in 30 minutes, and 0.35 inches in 15 minutes, which were the highest among available gauges in and around the burned area. A field visit following the storm showed evidence of a period of peak runoff potential sediment-laden flows in Arroyo Hondo, indicated by splash marks approximately 5 ft above the channel bottom at the bridge to the caretakers' home near the mouth of the canyon.

Channel crossings, floodplains, and depositional fans have an inherent risk of flooding which will be exacerbated by the fire. In areas downstream of the fire, aggradation can increase the probability of lateral channel migration, braiding, and flooding. Lateral channel migration can erode cut banks and undercut slopes, including terraces where infrastructure such as homes and roads might be located. Changes in hydrologic processes can also lead to slope instability and result in post-fire debris flows, mudflows, and other mass wasting.

Watershed response within the burn area will pose a very high risk to life and safety if recreationists are allowed to enter this area during storm activity. The combination of increased flows, sediment loads, and woody debris increase the volume of post-fire flows, which make any creek crossing or camping in low lying areas very dangerous. Bulking and increased flows may cause channels to flood, divert, or migrate to areas that do not usually flood. The greatest sediment yields from burned watersheds are expected during the first year after the fire.

Water Quality: Wildfires primarily affect water quality through increased sedimentation. As a result, the primary water quality constituents or characteristics affected by this fire include color, sediment, suspended material, and turbidity. Floods and debris flows can entrain large material, which can physically damage infrastructure. The loss of riparian shading and the sedimentation of channels by floods and debris flows may increase stream temperature. Fire-induced increases in mass wasting along with extensive vegetation mortality can result in increases in floatable material such as large woody debris. Post-fire delivery of organic debris to stream channels can potentially decrease dissolved oxygen concentrations in streams. Fire-derived ash inputs can increase pH, alkalinity, conductivity, and nutrient flux (e.g., ammonium, nitrate, phosphate, and potassium), although these changes are generally short lived.

F. Debris Flow Potential:

Based on USGS debris flow modeling it appears that under conditions of a peak 15-minute rainfall intensity storm of 28 millimeters per hour (1.1 inches/hour), relatively few channels in the burn area present high probabilities (60-80% & 80-100%) of initiation of debris flows. The few channels that do present those high probabilities are mostly located in the headwaters of Arroyo Hondo and Arroyo Quemado. Other watersheds that present high probabilities to a lesser degree than the first two include: Canada del Refugio, Tajiguas Creek and Canada del la Pila.

Under this same magnitude of storm, predicted volumes in the main channels of these watersheds range for the most case from 1K-10K cubic meters. The few drainages that do present high predicted volumes of debris flows (10K-100K cubic meters) include mostly: Arroyo Hondo and Arroyo Quemado and segments of Tajiguas Creek. At the headwaters of Canada del Refugio, a couple of channels present predicted volumes of 10K-100K cubic meters. Otherwise, most other channels in the burn area present lower predicted volumes of 1K-10K cubic meters.

In regard to combined hazard, most channels in the burn scar present a moderate to low combined hazard. The one watershed that does present higher combined hazard is Arroyo Hondo. The relatively moderate results of the USGS debris flow model are mostly correlated to very few areas in the burn scar that experienced a high soil burn severity and relatively less acres in the fire parameter that experienced moderate soil burn severity in comparison to other recent fires in this area (Sherpa Fire, 2016 and Whitter Fire, 2017). It is our opinion that even though the USGS debris flow model predicts a relatively moderate response of the burn landscape to initiations of post-fire debris flows, the geological and physical conditions in this area still present a potential for devastating debris flows which could be initiated by a short duration, high intensity storm.

PART V - SUMMARY OF ANALYSIS

Introduction/Background

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

Table 5: Critical Value Matrix

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

1. Human Life and Safety (HLS):

Based on the potential for debris flows, flooding, rock falls, etc., the BAER team identified a serious risk to the public, employees, special use permittees, and cooperators within and immediately downstream of the Alisal Fire area during and immediately after rainstorms. FS critical values such as trails are at risk of erosion and runoff impacts. Use of these areas

would put life and safety at risk to post-fire threats. Post-fire watershed response may threaten infrastructure downstream and downslope of the burn area and impact low water crossings. Impacts to access could leave the public and forest users stranded, possibly exposed to poor weather, in areas with poor cell coverage, and/or areas subject to rockfall, flooding, and debris flows, especially if they try to evacuate or pass through during or immediately after storms. Impacts from the post-fire environment on human life and safety is considered LIKELY with MODERATE to MAJOR consequences. This results in a HIGH to VERY HIGH risk to human life and safety from post-fire threats.

Closure of the burn area on National Forest Lands is recommended to prevent long-term exposure to risk and protect life and safety. Because of the VERY HIGH risk of these post-fire threats, it is recommended that the burned area closure applies to the public, FS staff during storm events, and trails and roads leading into or passing through the burn area. Anyone who attempts to access channels and low-lying areas within and downstream of the burned area during or immediately after a storm is at a VERY HIGH risk of injury or death. Risks associated within the burn scar should be re-evaluated prior to lifting the closure. People living, traveling, recreating and working in downstream areas, outside of National Forest Service lands should follow directions from local, County government (Santa Barbara County, Office of Emergency Management (OEM)) and keep tune to warnings coming out of the National Weather Service.

2. Property (P):

Since the Alisal Fire burned a remote and relatively small area on NF lands (19% of total burn area), very few BAER Critical Value's (BCV's) were identified on NF lands. In regard to property, the only items that were identified and assessed on NF lands in the burn scar were portions of Forest Road 5N19.4 and 5N19.5, which is the west end of West Camino Cielo Road, and the recently opened Baron Ridge / Arroyo Quemado Trail.

The segment of road that is on Forest Service land is a Santa Barbara County Road and is maintained by the County. The road is a ridge road that was the north boundary of the fire. The fire-line did cross the road in a few locations for a few hundred feet. The amount of burned area above the road is minimal. There is a slight possibility that some debris and mud will come onto the road, but this segment is behind three locked gates and safety issues or road damage is not expected. There are no drainage features (overside drains, culverts) on this road that need to be protected or upsized. Based on assessment done by a BAER Team road engineer, the road segments are not at risk of substantial damage, and thus no funds are requested.

The segment of trail that is on Forest Service land is a newly constructed system trail, and most of it resides in areas of moderate soil burn severity or within the watershed of such areas. Without drainage improvements, increased runoff may result in loss of trail tread from erosion on steep segments. MODERATE damage is LIKELY, and MAJOR damage is POSSIBLE. The trail is therefore at HIGH risk of damage from post-fire storms. Storm-proofing treatments are recommended.

Downstream of FS lands in and below the burn scar many structures and facilities were identified as critical values. Since these critical values are off NF lands, a detail assessment was carried by the WERT Team. Mitigations and treatments are described in detail in the Final WERT Team Report. Continued vigilance regarding National Weather Service flood warnings and evacuation orders coming out of Santa Barbara County OEM should be maintained due to impacts of the Alisal Fire.

3. Natural Resources (NR):Soil Productivity:

It was determined that there is a likely probability of some damage or loss to soil productivity, but the magnitude or consequence was deemed minor which rates risk as **Low**. Therefore, no treatments are being recommended to specifically address soil productivity as a critical value.

Overall, detrimental impacts to soil productivity as a by-product of soil loss in certain areas within the fire perimeter are expected, but these impacts will be localized and recoverable with time. Given more than two-thirds of the existing vegetation is chaparral and its ability to regenerate successfully after fire, vegetative ground cover should recover relatively well within 2 to 7 years across a large portion of the landscape impacted by the Alisal Fire.

Fisheries and Wildlife:

Critical habitat exists for Steelhead trout (*Onchorhynchus mykiss*) Southern California DPS along San Onofre, El Capitan, Arroyo Hondo and Refugio Creeks. Arroyo Hondo Creek is still known to be occupied habitat and likely to have populations of steelhead present. Habitat occupancy in Arroyo Hondo was confirmed as recently as 2014 (CNDDDB 2021). Other areas of critical habitat on El Capitan and Refugio Creeks were impacted by post-fire effects following the 2016 Sherpa Fire. Steelhead may be present in the lagoons near the mouth but are not known to be present further up in the watersheds.

Locally, California red-legged frog (CRLF) have been detected along Canada del Refugio Creek ('del Refugio) outside the LPNF boundary as recently as 2012 by biologists conducting survey work for Santa Barbara County. However, due to high stream gradients (10.4%) along the segment of 'del Refugio within LPNF managed lands it is considered very unlikely that CRLF would occupy portions of the creek, or that PCEs would be present. California red-legged frog were also detected along the lower extent of Tajiguas Creek, as recently as 2001, in Leon Canyon, in Arroyo Quemado Creek in 2008, and in Arroyo Hondo Creek as recently as 2014. (NRIS Wildlife 2018, CNDDDB 2021). Inspection of Arroyo Hondo Creek during a site visit indicated that habitats below the LPNF boundary are good and that suitable breeding and developmental habitat may extend upwards into the LPNF boundary. Refugia habitats are very likely also present on LPNF lands as well.

California red-legged frog critical habitat occurs in several sub-watersheds within the fire-affected area, including 'del Corral, 'del Venadito, 'del Refugio, Tajiguas Creek, Leon Canyon and Arroyo Quemado. A total of 9,113 acres (3,688 hectares) of critical habitat in Unit STB-6 were impacted by the fire.

Probability of loss to both SC steelhead, California red-legged frog and their respective critical habitats was considered Very Likely with Moderate to Major consequences, resulting in a Very High risk to both Southern California steelhead, California red-legged frogs and their respective critical habitats. However, it is considered infeasible for BAER treatments to effectively prevent debris flows, landslides, mass wasting events and sedimentation which are expected to result post-fire. The upper portion of Arroyo Hondo Creek is expected to be highly impacted by post-fire effects, but soil stabilization options are impractical due to steep slopes which make treatments impractical.

Treatment of all possible federal acres would have a negligible effect on reducing the resulting impacts from geology, hydrology and soils due to extremely steep slopes and proportions of moderate and high burn severity within the fire.



Photo of riparian habitat in Arroyo Hondo Creek.

Impacted stream systems are expected to be significantly impacted as a result of post-fire effects. Natural recovery of this system is projected to take 3-7 years, while sediment loads and debris flows are pushed downstream towards the ocean, and hydrophobic soils are broken down. However, recovery times are highly dependent on local precipitation. As elevated sediment loads and debris flows are processed through the river systems, breeding pools and emergent vegetation (CRLF) and deeper pools and redds (steelhead) are expected to reestablish along the stream channels.

Native Vegetation:

Approximately 4.74 miles of dozer lines were placed on Los Padres National Forest lands and it is crucial to prevent further spread of invasive plants into these areas. These dozer control lines have been used in many fires, including the recent Sherpa Fire, but new invasive plant introductions will not be detectable until one growing season, so additional survey and treatment will need to occur in 2022.



Photo of a contingency dozer line for the Alisa Fire near Gaviota Peak.

Many invasive plants weeds are known to occur within the Alisa Fire area, but there are five that dominate the landscape (Table 6).

Table 6: Invasive plants known In, and Adjacent to the Alisal Fire Area

Scientific Name	Common Name
<i>Centaurea solstitialis</i>	Yellow starthistle
<i>Carduus pycnocephalus</i>	Italian thistle
<i>Centaurea melitensis</i>	Tocalote
<i>Cirsium vulgare</i>	Bull Thistle
<i>Foeniculum vulgare</i>	Wild fennel
<i>Spartium junceum</i>	Spanish broom
<i>Cortaderia selloana</i>	Pampas grass

Below is a short species summary for each of these weeds:

- Yellow star-thistle is known from the north edge of the fire and most likely is present elsewhere. It has been observed along West Camino Cielo in a patchy distribution all along the contingency dozer lines.
- Italian thistle is present in the more shaded areas and was found along West Camino Cielo and the contingency dozer lines.

- Tocalote has a scattered distribution across the fire area.
- Bull Thistle is a weed of wet areas that is known from springs and seeps within and near the fire perimeter.
- Fennel is found throughout the area, especially along roadsides and cut banks in the north and west parts of the fire.
- Spanish broom is found to the east of the fire perimeter along the travel corridors and contingency dozer lines.
- Pampas grass was noted outside the northwest corner of the fire on private land.

Probability of impacts to native vegetation resulting from invasive plants was considered Likely, with Moderate consequences. This resulted in an overall risk ranking of Likely to High to native vegetation communities which may occur due to the proliferation of invasive plants which commonly occurs after wildfires.

4. Cultural Resources:

The burn area is prehistorically attributed to the Barbareño and Iñez Chumash, who occupied the area prior to European contact and settlement. These groups are considered part of the larger Chumash culture that inhabited this portion of the California coastal mountains from Malibu to San Luis Obispo including the Northern Channel Islands. The highly populous and successful Chumash are known to have had one of the most complex social, political, and economic systems in California at the time of European contact. Prehistoric site types include shell middens, chipped-stone lithic scatters, rock shelters, rock art, occupational sites and sacred sites based on aural histories. Early Euro-American land use includes homesteading, mining, and cattle grazing. Examples of such past land use can be found within and near the burn area.

Cultural resource values at risk include Native American and historic archaeological sites as well as modern ceremonial and gathering locations. Many of the values are fragile and their loss considered irreversible and irretrievable. Those values are information and data contained in the archaeological sites regarding Native American and historic populations, environments, climates, and land use as well as tangible cultural items associated with the history of southern California. Wildfires clearly have the potential to damage or destroy cultural resources through: (1) direct effects of the fire; (2) ground disturbing suppression or repair activities; and (3) erosive soil movement caused by subsequent storm precipitation. These impacts may destroy prehistoric and historic resources or alter the context of surface and subsurface deposits vital to scientific analysis or interpretation. Wildfires also increase the accessibility and visibility of archaeological site locations making them more susceptible to vandalism, looting, and unauthorized recreational activity.

Ten archaeological sites are recorded within or immediately adjacent to the burn area within the forest's congressional boundary. Of these, six are situated on private inholdings. The four remaining cultural resources that are on forest land include the ruins of an adobe homestead, bedrock mortars, couples, lithic debitage, and a historic inscription. Known historic properties on federal land within the Alisal Fire footprint are UNLIKELY to be adversely affected by post-fire storms. The risk is therefore INTERMEDIATE to LOW, and no treatments are recommended. The homestead and historic inscription are just outside the eastern burn perimeter and the two remaining sites are along the crest of the Santa Ynez Mountains within low severity burn of the fire. There are no immediate cultural resource concerns within the Alisal Fire; no funding for BAER treatment is requested.

B. Emergency Treatment Objectives:

To protect the public from injury or death resulting from exposure to post-fire hazards, to protect trail infrastructure accelerated erosion, and to protect watersheds from the spread of noxious weeds.

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

- Land:** N/A
- Channel:** N/A
- Roads/Trails:** 80%
- Protection/Safety:** 80%

D. Probability of Treatment Success

Table 6: Probability of Treatment Success

	<i>1 year after treatment</i>	<i>3 years after treatment</i>	<i>5 years after treatment</i>
Land	85%	80%	75%
Channel	N/A	N/A	N/A
Roads/Trails	95%	90%	85%
Protection/Safety	95%	90%	85%

E. Skills Represented on Burned-Area Survey Team:

- Soils
- Hydrology
- Engineering
- GIS
- Archaeology
- Weeds
- Recreation
- Fisheries
- Wildlife
- Other:

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Team Members: *Table 7: BAER Team Members by Skill*

Skill	Team Member Name
<i>Team Lead(s)</i>	Jonathan Yonni Schwartz
<i>Logistics</i>	Erin Noesser
<i>GIS</i>	Monica Pina
<i>Soils</i>	Eric Schroder
<i>Archaeology</i>	Steve Galbraith
<i>Weeds/Fisheries/Wildlife</i>	Patrick Lieske
<i>Recreation</i>	Mike Heard, Kip Valesano, Diane Cross, Bryan Conant
<i>Geology</i>	Jonathan Yonni Schwartz, Tori Stempniewicz
<i>Hydrology</i>	Charles Jachens, Nina Oakley
<i>Road Engineer</i>	Foster Kuramata
<i>PIO</i>	Cathleen Thompson
<i>Inter-agency Coordinator</i>	Jonathan Yonni Schwartz

F. Treatment Narrative:

Land Treatments:

Invasive Plant

1. Treatment Type

The treatment is invasive plant detection surveys of all roads, dozer lines, drop points, and safety zones affected by the Alisal Fire on NFS lands. These areas will be surveyed for evidence of introduction or spread of invasive plants. If any new or outlying populations are found, these will be mapped and documented for future treatment and where possible hand treatments will be applied at the same time the surveys are conducted. Approximately 4.7 miles of dozer lines were established on the Los Padres National Forest during this fire.

2. Treatment Objective

Evaluate and control the potential for invasive plant establishment and spread, in all areas affected by the Alisal Fire suppression activities.

3. Treatment Description

Inspect all areas and monitor for newly established invasive occurrences or the introduction of new non-native invasive species. Monitoring will include documentation and hand pulling small new weed occurrences at the time of inspection. New weed occurrences will be pulled to root depth, placed in sealed plastics bags, and properly disposed.

Documentation of new infestations will include:

- GPS negative and positive inspection results
- Incorporate data into GIS spatial database - NRIS
- Establish photo points
- Map perimeter of new infestation
- Estimate number of plants per square meter
- Treatment method
- Dates of treatment
- Evaluate success in subsequent inspection

Inspections and monitoring should be accomplished during April/August 2022. Based upon the first year's survey, additional surveying may be requested for up to three years. BAER funding is only requested for the first year after fire.

Channel Treatments: None

Roads and Trail Treatments:

Roads: None

Trails: To mitigate the threat of loss of trail tread due to erosion from high levels of runoff, the following treatments are proposed for the Baron Ridge / Arroyo Quemado Trail: (a) cleaning and improvement of 40 existing drains; (b) installation of 10 armored drains to prevent head cutting and loss of trail tread; (c) installation of 47 additional drains; (d) installation of a total of 102' of non-structural wall at five banked turns to prevent loss of the outside edge. This work will be accomplished by an AD or partner crew, with administrative support from an AD employee and field oversight by a staff member.

Interagency Coordination and Administrative Management

Forest BAER Coordinator will continue investing time in interagency coordination and administrative management of BAER Implementations.

Protection/Safety Treatments:

Closure: To mitigate the threat to human life and safety from post-fire hazards, it is recommended that the burned area – including the portions of West Camino Cielo Road (Forest Road 5N19) and the Baron Ridge / Arroyo Quemado Trail) that reside therein – be closed via a Forest Order until at least the end of the first winter following the fire. Closure sign should be installed (e.g., on signboards) where the road intersects the fire perimeter and at the termini of the trail. In order to promote compliance with the closure, it is recommended that all closure signs clearly state the reasons for the closure.

At the end of the first winter, and prior to the expiration of the closure, conditions should be evaluated to determine if additional time is needed to provide for user safety or resource protection. If additional time is needed, it can be obtained through an extension of the original Forest Order mandating an area closure and leaving existing closure signage in place.

Either in conjunction with the closure, or prior to lifting the closure, it is recommended that burned area warning signs be installed at entry points to burned area.

Cultural Resource Protection: no treatments are recommended.

I. Monitoring Narrative:

It is proposed that Forest volunteers conduct routine patrols in the burned area to monitor effectiveness of the closure and to educate any visitors that are encountered on the hazards. It is also proposed that volunteers conduct post-storm patrols on treated section of the Baron Ridge / Arroyo Quemado Trail in order to gauge the effectiveness of the treatments. This approach has proven to be of value after previous fires and incurs no cost to the agency.

Appendix A: Treatment map for Alisal Fire BAER Assessment

Recommended Treatments
2021 Alisal Fire
Los Padres NF

