USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

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Hermits Peak-Calf Canyon Burned Area Emergency Response Phase 1 Assessment Report Summary

Executive Summary

Figure 1. High soil burn severity with Hermit Peak in the background.

Fire Background

The Hermits Peak fire started on April 6, 2022, from the Las Dispensas prescribed burn on the Pecos/Las Vegas Ranger District (PLVRD) of the Santa Fe National Forest (NF). Southwest Area Incident Management Team 1 (Type 1) assumed command of the fire on April 15. The Calf Canyon fire started on April 19, 2022, from a winter PLVRD pile burn project, and SWIMT 1 assumed command of this fire as well. The two fires merged on April 22 during high wind events and are managed as a single incident called the Hermits Peak-Calf Canyon (HPCC) fires. The fire was initially divided into three zones, each under management of a Type 1 team, on May 15, and on May 27, the fire transitioned back to two zones managed by two Type 1 teams. As of June 13, 2022, the fire has burned 320,495 acres and is 70% contained.

BAER Assessment

The Forest Service assembled a Burned Area Emergency Response (BAER) team on April 20, 2022, as HPCC fire managers increased its containment. The extreme wind events in late April resulted in rapid fire growth and the team was forced to delay its analysis. By mid-May, some areas of the fire were appropriate for BAER field analysis, and the team was reestablished on May 17, 2022, to begin assessment on the HPCC fires. Due to the fire's size and continuing active fire behavior, the BAER team divided the burned area into separate phases for analysis. The initial phase (Phase 1) examined the southern half of the burned area and

included the headwaters of the Gallinas River Watershed and the Tecolote Creek Watershed. The burned area assessed in Phase 1 covers 115,542 acres and includes 48,581 acres (42%) of National Forest System (NFS) lands, 66,216 acres (57%) of private property, and 745 acres (1%) of New Mexico state lands. Approximately 13,558 acres of the Phase 1 assessment area is in the Pecos Wilderness.

BAER team assessments consist of rapid evaluations of post-fire conditions of the burned landscape to determine the level of risk from potential flooding and debris flows to values on NFS lands. The team identifies 'BAER critical values' such as human life and safety, infrastructure, property, and critical natural and cultural resources. BAER teams also share information with local and federal agencies to identify risks to off-Forest resources (such as private property). Risks to BAER critical values are identified with the BAER risk assessment (Table 1), and the BAER team evaluates emergency stabilization treatments to reduce the risk to NFS values. Treatment actions must be evaluated based on: (1) the ability to be implemented in a timely manner, (2) effectiveness in reducing risk, (3) practical and technical feasibility, and (4) cost. BAER assessments are conducted quickly because treatments (including all phases of bidding, contracting, and implementation) must be completed before the first damaging storm. In New Mexico these storms typically occur in early to mid-July with the monsoon rainstorm cycle. The final soil burn severity (SBS) map was used to model changes in precipitation runoff and debris flow potential and identify risks to critical NFS values via the BAER risk assessment process (Table 1). This document summarizes the formal assessment in the FS-2500-8, Burned Area Report.

Table 1: BAER Risk Assessment.[1]

Probability of Damage or Loss	**Magnitude of Consequence**		
	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**

Soil Burn Severity Mapping

The BAER assessment focuses on NFS critical values to determine where post-fire precipitation events could increase water runoff, flooding, erosion and sediment delivery, where post-fire effects could impact critical threatened and endangered wildlife habitat, and where high-risk areas exist for the spread of invasive weeds. Post-fire water runoff changes with the severity of the fire – more severe fire conditions (i.e., hotter fire conditions) will alter the landscape in ways that enable more water runoff (increased flooding) and sediment mobilization (debris flow). The BAER team analyzed satellite reflectance images and collected field data from May 17, and May 22, 2022, to produce a SBS map (Figure 1), which categorizes the burned area as High, Moderate, Low, or Very Low SBS (Figure 2). Field validation of SBS was completed in May 22, 2022. Within the HPCC Phase 1 burned area, 24,374 acres (21%) were high SBS, 31,968 acres (28%) were moderate, 42,066 acres (36%) were low, and 17,134 acres (15%) were very low/unburned.

[1] Threats to resources are based on the likelihood and consequence of an event. Threats that result in low or intermediate (white and yellow) risks are typically not considered for potential treatments. Treatments may be considered where threats that result in high or very high risks (red) are identified.

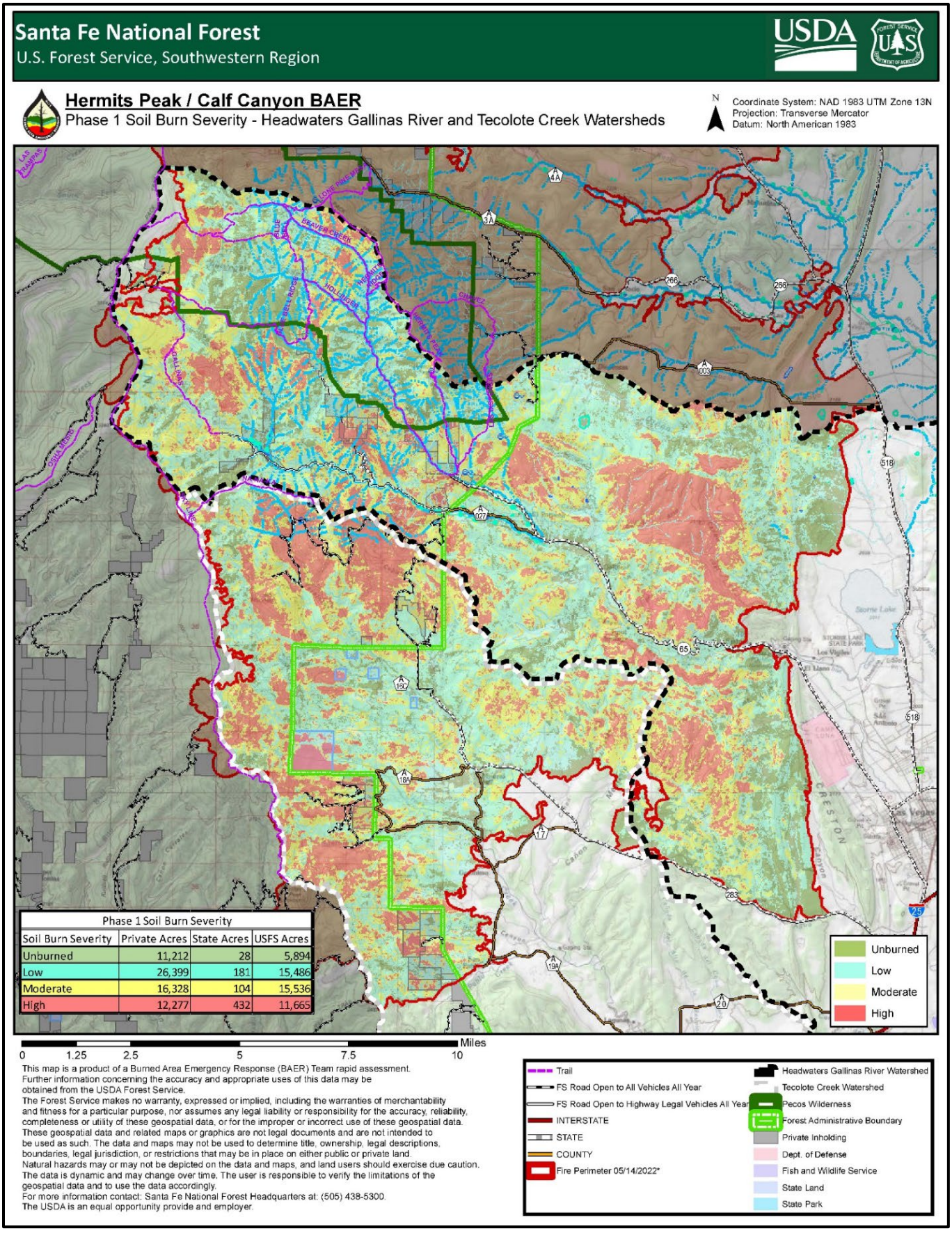

Figure 1. Soil Burn Severity map for the southern area (BAER Phase 1) of the Hermits Peak/Calf Canyon Fire.

Table 2. Soil burn severity by land ownership.

Soil Burn Severity	NFS	Other Federal	State	Private	Total	% of HPCC Phase 1 Perimeter
Unburned	5,894		28	11,212	17,134	15
Low	15,486		181	26,399	42,066	36
Moderate	15,536		104	16,328	31,968	28
High	11,665		432	12,277	24,374	21
Total	48,581		745	66,216	115,542	100

Figure 2. Examples of low (top left), moderate (top right), and high (lower left) soil burn severity in the Phase 1 analysis area. These burn conditions, including remaining ground cover, soil integrity, hydrophobicity, remaining root structure, and surviving vegetation, assist to estimate the likelihood and intensity of future flooding, erosion, and debris flows.

Watershed Response

Soils

Soil productivity, or how well soil supports plant growth, is a non-renewable resource due to the exceptionally slow soil formation rate in the southwest. Post-fire soil erosion poses a significant threat to soil productivity. Moderate and high soil burn severities increase the potential for erosion and debris flows due to fire induced hydrophobicity (Figure 3), the loss of protective soil cover, the loss of soil porosity, the weakening or loss of soil structure, and the loss of soil stability due to root consumption. Nearly half (56,342 acres) of the burned area within the BAER Phase 1 assessment had high or moderate SBS. Approximately 19,400 acres of fire induced water repellent soils occur on lands administered by the United States Forest Service (USFS) in the Phase 1 burned area.

Figure 3. Strong hydrophobicity at a depth of 2 cm in a moderate soil burn severity field plot.

Baseline (pre-fire) erosion rates for soil types in the analysis area average less than one ton per acre per year. Modeling indicates the Phase 1 burned area will now average 18 tons/acre/year. This includes areas with moderate and high burn severity on steeper slopes, where 10,177 acres at 16-24 tons per acre per year and 7,478 acres will erode at 25-39 tons per acre per year. Nearly 30,000 acres are expected to have considerable/long term or irreversible soil erosion which will inhibit vegetation regeneration. Average sediment potential across moderate and high SBS is approximately 16,000 cubic yards per square mile.

Hydrology

Post-fire watershed conditions such as loss of groundcover and stabilizing vegetation, decreased soil porosity, and fire induced water repellency in soils are all factors that can increase the magnitude, frequency, and volume of stormwater runoff and produce debris-flows. Post-fire water flows have greater energy with which to damage resources within and downstream of the burn area and threaten life and property than do regular rainfall runoff events that occur over unburned areas. Additionally, high flows with increased concentrations of sediment and ash (bulking effect) can produce geomorphic changes such as aggradation, downcutting, and/or widening of stream channels that can significantly reduce hydrologic function.

Overall, about 49% of the BAER Phase 1 area of the HPCC fires burned in moderate and high SBS classes. The large contiguous areas of moderate and high SBS are contributing to the elevated watershed response. This analysis includes the Canovas Canyon – Gallinas Creek, Porvenir Canyon, and Cabo Lucero Creek – Tecolote Creek 6th code watersheds. All modeled subbasins and catchments show an extreme post-fire clear

water flow increase for annual and 2-year storm events. Canovas Canyon – Gallinas Creek HUC12, modeled to the forest boundary, shows that what would typically have been a 2-year storm now produces what would be a 100-year event at the outlet. Figure 4 shows modelled water flows in Gallinas Creek in response to a 2-year storm event.

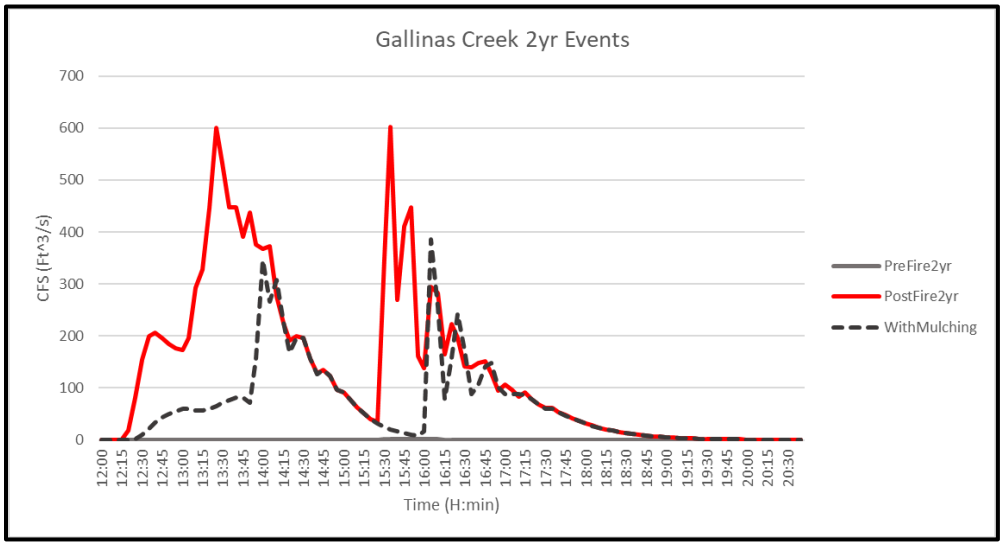

Figure 4. Modelled change in clear water flow in the Gallinas watershed in response to a 2-year storm event. The grey line (completely flat in this example) shows that water flow did not increase much over base flow in response to a monsoonal 2-year storm with pre-fire conditions. The red line shows water flow after the fire if no treatments occur. Note that the maximum flow rate is more than 600 CFS. The dashed black line shows water flow after the fire if high soil burn severity areas of the Gallinas watershed are treated with mulch. The mulching treatment reduces the peak flows produced by a 2-year summer convective storm event by 45%.

Debris Flow Hazard Assessment

The US Geological Survey (USGS) predicts the potential for debris flow using the SBS map, basin morphometry, soil properties, and rainfall characteristics. The preliminary model indicates a moderate to high level of debris-flow hazard for the Phase 1 area, including the Tecolote and Gallinas watersheds. Many stream reaches and drainage basins have a greater than 40% likelihood of debris flow occurrence at a very modest rainfall intensity. A few drainage basins are estimated to have a high to very high level of debris flow hazard, with debris flow likelihood exceeding 60% and 80%, respectively. These highest hazard areas occur in several sections of the assessed burn area, including: Cañon Del Aqua and Cañon Alto northwest of Montezuma; in small drainages above Gallinas Creek near Trout Springs; above Forest Service Road 263 and Gallinas Creek near Canovas Canyon; and in sections of Burro, Hollinger, Tecolote and Porvenir Canyons.

Critical Values

Roads and Bridges

There are approximately 45 miles of open NFS Roads (NFSRs) within the Gallinas and Tecolote Watersheds. Fifteen miles of roads were surveyed, including 16 bridges, ditches and culverts in each surveyed road, and non-system roads were not evaluated. The watersheds burned in the HPCC fires will experience increased water runoff, sediment/ash laden runoff, and debris flows creating a future concern for roads, bridges, culverts and the associated channels along the drainage paths of the burned watersheds. Increased water flows may cause the capacity of crossings and drainage features (culverts) to be exceeded, and the transported sediment and debris may cause culverts, bridges, and other drainage features to become overwhelmed and ultimately fail (Figure 5). These impacts may cause uncontrolled flow to overtop the road and damage the road prism with

potential for structural failure of roads within the affected watersheds. There are 14 bridges on NFSR 263, all intact with only minor damage at one wingwall support. There is one bridge on NFSR 156 that received no damage from the fire and one bridge on NFSR 261 that was destroyed by the fire (Figure 6).

Figure 5. Plugged culverts can lead to a road being overtopped by flood waters.

The road prism may become impassible to vehicles and in extreme cases may be completely washed out due to fill slope failure. Road prisms may also be damaged due to falling rock and debris making the road impassible. Public safety hazards are significantly increased due to flash flooding, where road segments lie within the floodplain, fallen trees, destabilized rock slopes, damage to traffic safety structures and signs.

Figure 6. Burned infrastructure that may mobilize during a storm.

Common BAER emergency treatments could include signs warning travelers of the increased danger, closures of maintenance level 2 roads during monsoon season, storm inspection and response, creating armored dips, clean ditches to handle increased flows, and removing debris from stream channel.

Recreation

Recreation resources located within or near the fire perimeter on NFS lands include 3 campgrounds, 3 picnic sites, 2 trailheads, 1 trail footbridge, 18 recreation residence cabins, and 2 creeks eligible for Wild & Scenic River designation. Post-fire effects to recreation sites vary by site.

Facilities such as campgrounds and picnic sites (Figure 7), particularly those in moderate and high burn severity, are affected by numerous hazard trees throughout the sites. Facilities that are within the floodplain or are immediately downhill from moderate and high severity burn areas could experience downhill debris flow. The road bridge to El Porvenir was burned and unusable so alternate access will need to be established before any treatments can occur. Trails situated along ridges are less likely to experience damaging erosion from flooding, but trails located next to streams, within narrow canyons, or on hillsides are likely to sustain damage. Fire effects to trail recreation include impeded trail access due to downed trees, damage to trail treads, debris rolling onto trails, and flooding from streams next to trails.

Figure 7. Burned recreation infrastructure at Big Pine Day use site.

Botany

The HPCC fires burned through multiple native plant communities. Ponderosa Pine forests was the dominant vegetation type at 6,000-7,500 feet in elevation. Dry mixed conifer occurs generally above 7,500 feet or higher on southerly facing aspects. Wet Mixed Conifer Forests occur at elevations between approximately 9,000 and 11,000 feet. Spruce Fir forests occurs primarily in the highest elevations, generally above 9,500 feet.

Fire suppression activities may result in the spread of noxious invasive plants. The unknowing introduction and dispersal of invasive weeds into areas disturbed by fire suppression and repair has the potential to establish large and persistent weed populations. Aggressive invasive plants (i.e., scotch thistle, bull thistle, oxeye daisy) are present in isolated populations within and adjacent to the burned area, primarily on travel routes and trails. These infestations are near sensitive plants and Mexican Spotted Owl (MSO) designated habitats. Invasive plants are highly adapted to take advantage of early seral conditions created after fire and can out compete native plants for resources.

Wildlife and Fisheries

There are no aquatic federally listed species or critical habitat within the Phase 1 BAER assessment. The threatened Mexican Spotted Owl (MSO) and its habitat was affected by the fire. The fire has impacted 11 Protected Activity Centers (PAC), with 8 of these in the Phase 1 assessed watersheds. Of the 22 PACs on the PLVRD, only 18 were functional, thus the fire has burned over half of the functioning PACs on the PLVRD. In

the Phase 1 assessed area, there is approximately 41,490 acres of MSO delineated habitats that were impacted by the fire, including 8 MSO PACs. Of these, 30,911 acres are federally designated critical habitat.

Figure 8. Mexican Spotted Owl

High and moderate SBS are likely to have altered MSO habitat to an extent that would result in those areas being no longer suitable habitat, with the majority of the large overstory conifers killed and many pre-fire snags and downed logs largely consumed by fire. High and moderate soil severity burn patches may have short term benefits by increase foraging habitat for MSO, however for MSO to persist long term they require a portion of the remaining habitat to be suitable for nesting and roosting. MSO habitat is predominantly upland habitat not readily impacted by post-fire flooding events. However, riparian recovery habitat may be impacted by flooding events, and areas of high and moderate SBS are susceptible to erosion that could remove soil productivity. Secondary fire effects such as altered tree regeneration, plant succession, and changes in site productivity can be anticipated primarily for moderate to high SBS in mixed conifer, spruce-fir, and Ponderosa pine habitats.

Cultural Resources

Cultural resources or historic properties consist of archaeological sites, historic buildings, and traditional cultural properties (TCPs). Significant heritage sites are those listed, or are potentially eligible for listing, on the National Register of Historic Places (NRHP) and are considered nonrenewable and irreplaceable resources. Post-fire erosion threats to cultural resource sites in high to moderate severity burns have been well documented. Sites with surface vegetation removed by wildfire are vulnerable to erosion, slumping, trampling and, with increased ground visibility, artifact looting and theft. Storm runoff, particularly after severe summer monsoons, may wash away significant portions of heritage sites or bury them with mud and debris. Post fire erosion threats include: the development of gullying or riling that can expose and remove subsurface cultural deposits or burials; increased levels of sheet-wash eroding archaeological features and/or removes artifacts from site locations and fire-killed trees that fall and up-end root systems can result in the destruction of archaeological features/architecture, displace artifacts (e.g. Figure 9), and contribute to the exposure of subsurface archaeological deposits including human remains.

Figure 9. Historic concrete acequia headgate.

A total of 72 cultural resources were located within the Phase 1 assessment area. Of these, 51 were considered BAER critical values (i.e., sites eligible for listing in the NRHP or unevaluated sites). These include 10 prehistoric and historic artifact scatters, 23 historic FS infrastructure (e.g., cabins/habitations/homesteads, administrative sites, roads, campgrounds, etc.), 3 historic irrigation ditches/acequias, 5 rock shelters and/or cobble alignments, 3 historic mines, and several historic trails and associated features belonging to a possible traditional cultural property.

Partner Efforts

In addition to identifying and recommending treatments to reduce post-wildfire effects to critical values on NFS lands, BAER team members met and communicated with other federal agencies such as US Geological Survey (USGS), Natural Resources Conservation Service (NRCS), and National Weather Service (NWS). Team members also met with non-federal partners such as the State of New Mexico Forestry Department-EMRD and New Mexico Acequia Association to understand additional post-fire needs that are outside of the scope of the Forest Service BAER program and shared their analysis and data.

Conclusion

The BAER team identified threats to critical values on NFS lands based on a rapid assessment of the area burned by the HPCC fires. The team's findings provide the information needed to recommend emergency treatments for managing unacceptable risk to critical values.

BAER treatment recommendations must undergo an internal review at the local Forest Service Supervisor's Office, Regional Office, and Washington Office, depending upon total treatment funding amounts. The BAER team's recommended emergency treatment objectives include:

- Implementing an administrative closure of the burn area to protect human life and safety from post fire hazards. Posting hazard warning signs to control public access and to inform the public of hazards that exist within the burned area.
- Facilitating the implementation of early warning systems (precipitation gauges or similar). Although the USFS does not install or maintain early warning systems, the forest should facilitate the expedited clearances and permits for partner agencies to install and maintain early warning systems for

downstream entities and infrastructure prior to high-risk precipitation events.

- Implementing hillslope treatments to reduce the adverse consequences of post-fire effects to municipal supply waters on NFS lands, outstanding national resource waters, eligible Wild and Scenic Rivers, hydrologic function and soil productivity from runoff and sedimentation. Hillslope treatments may also accelerate MSO habitat stabilization, provide ground cover to assist in protection of native plant communities from invasive species, and will accelerate vegetative growth around cultural resource sites and prevent further loss of soils around these heritage features.
- Protecting high value USFS roads through storm proofing, culvert cleaning, and strategic armoring to facilitate effective function of NFS investments during events with increased flows, and sediment delivery.