Post-Fire Archaeological Site Assessment for Portions of the Cedar Fire Burn Area within Cuyamaca Rancho State Park

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The 2003 Cedar Fire in San Diego County burned over 99 percent of the 24,681-acre Cuyamaca Rancho State Park. After the fire, archaeologists with the California Department of Parks and Recreation conducted archaeological monitoring, site assessment, and surveys of portions of Cuyamaca Rancho State Park. The fieldwork resulted in the recordation of over 129 newly identified sites, 29 newly identified isolates, and over 250 additional features at 62 previously recorded sites. Fire-induced damages to prehistoric and historic-era archaeological sites, features, and artifacts ranged from slight to severe. Damages to bedrock grinding features were the most dramatic, with some grinding slicks completely exfoliated off the parent rock. The loss of vegetation and groundcover increased post-fire damages from erosion. Fire-altered soils and ash, calcined bone, and burned rocks made it difficult to differentiate cultural from natural features in some instances. Overall, the sites exposed by the Cedar Fire resulted in a better understanding of site distribution and site types within Cuyamaca Rancho State Park, but the damages the fire caused also illustrated the need for improved recordation of site location, type, and condition prior to disasters, so that damages can be identified and assessed more effectively and efficiently.

The Cedar Fire began on October 25, 2003 in the hills northeast of San Diego, California. By the time it was contained in early November, it had burned across 280,278 acres of federal, state, and private lands in San Diego County (California Department of Forestry 2003). The fire affected approximately 24,600 acres of the 24,681-acre Cuyamaca Rancho State Park (Figure 1). In the days immediately following the fire, California Department of Parks and Recreation (CDPR) archaeologists were called upon to survey and monitor power-line repair work by San Diego Gas and Electric (SDG&E). Initial plans were to replace the power poles in their same locations, even though many of these poles were in interior areas of the park with no easy access. SDG&E proposed to grade access roads to each pole, but CDPR, with the support of local Native Americans, was able to convince SDG&E to move most of the lines out to Highway 79, thus removing them from the interior of the park and avoiding additional serious impacts to both cultural and natural resources.

Fieldwork

Approximately 130 acres were examined during the archaeological monitoring and surveying involved in the power-line work (Figure 2). As a result of this work, 23 sites and 12 isolates were newly identified and recorded, and five previously recorded sites were examined (Mealey 2003). All of the previously recorded sites were found to be much larger than originally thought, due to the identification of additional features and artifacts that had previously been covered by dense brush. Numerous bedrock outcrops throughout the project area were found to have sustained serious fire damage in the form of blackening, cracking, and spalling. These and other damages observed during the survey and monitoring of the SDG&E power lines, and the number of sites that were identified during these efforts, made CDPR realize that there was a need to complete additional post-fire survey and site assessment work.

Four areas were initially identified as being at higher risk for erosion or other fire damage, and these areas were examined during early 2004 (Figure 3). CDPR contracted with a Native American consultant to assist with portions of this site assessment work. Approximately 540 acres were surveyed and 76 resources, including 36 newly identified sites, five new isolates, and 35 previously recorded sites, were examined and recorded during this portion of the project (Mealey 2004).

Additional funds were obtained to continue this post-fire survey and site assessment work into 2005. Five additional areas of the park were selected to be examined during this portion of the project (Figure 4). The selection criteria for these areas included erosion potential, data gaps, and areas thought to be at higher risk for illegal artifact collecting. CDPR again contracted with a Native American consultant to assist with both the selection of areas to be examined and with the actual field work. During this phase of the project, approximately 525 acres were surveyed and 104 resources were examined and recorded, including 70 newly identified sites, 12 new isolates, and 22 previously recorded sites (Mealey et al. 2005). There was a dramatic increase in the numbers of previously unrecorded sites and features recorded during this portion of the project, with an average of 0.2 sites per acre and 12.7 features per site compared with 0.14 sites per acre and 4.8 features per site in the previous portion of the project. Due to this unexpected increase in sites and features, and the additional time required to record them, only three of the five proposed survey areas were actually examined (Figure 5).

To facilitate the Post-Fire Site Assessment work, forms were developed based on CDPR's Archaeological Site Condition Assessment Records and the National Park Service's Burned Area Emergency Rehabilitation or BAER forms. CDPR's BAER form has places to record damages from the fire itself, fire-suppression activities, post-fire erosional threats and vandalism, as well as other damages and threats.

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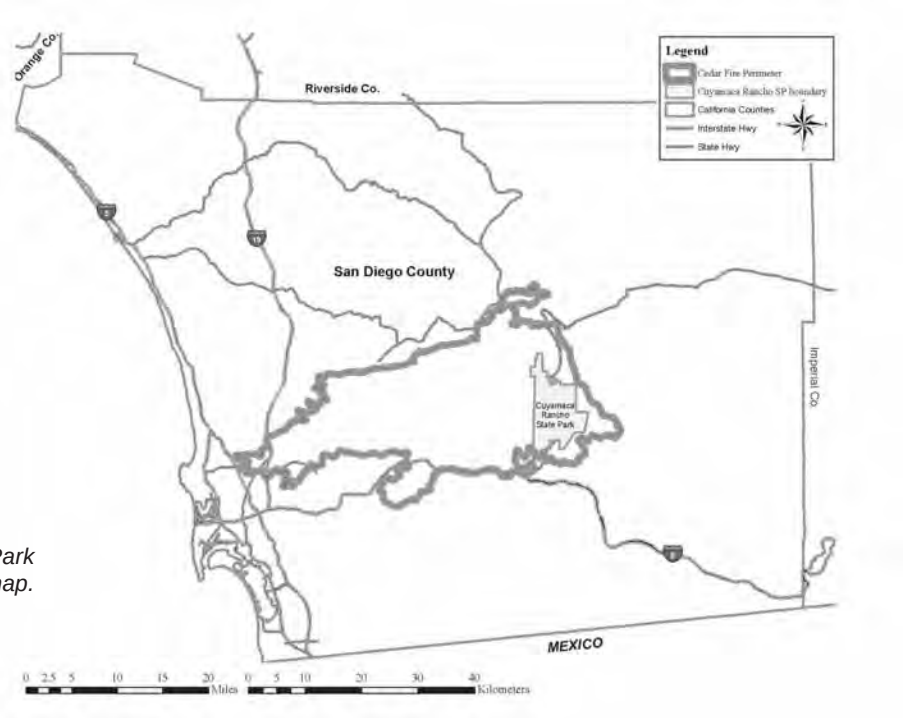


Figure 1: Cuyamaca Rancho State Park location and Cedar Fire perimeter map.

It also records the site burn severity, recommended preservation treatments, and other proposed future actions.

Findings

The Cedar Fire in Cuyamaca Rancho State Park was very intense in spots. The fire consumed all burnable material over large portions of the landscape, indicating how hot and how long the fire burned in some places. For the assessment work, a fire severity chart developed by Krista Deal, a U.S. Forest Service archaeologist, was used (Deal 2001). This chart categorizes a heavy severity fire as one with greater than 80 percent moderate to deep char and greater than 10 percent deep char. The level of charring is based on the consumption of available fuel, where a moderate char largely consumes woody material such as twigs, litter, and duff, leaving some branch wood and having little effect on the soil; and a deep char completely consumes litter, duff, twigs, small branches, and rotten logs, leaving a few deeply charred branches and visibly affecting the soils. The severity of the fire was also evidenced by many pieces of calcined bone, indicating temperatures over 600° C (Buenger 2003; Winthrop 2004).

Damages observed during the two portions of the site assessment project were similar to those observed during the SDG&E monitoring and survey work conducted in 2003. The most prevalent was the fire-blackening or charring of bedrock, although the blackening faded over the course of the two phases of the project due to natural weathering.

The next most common damage was thermally-induced bedrock exfoliation and spalling. The exfoliation and spalling ranged from minor to severe, with a few examples of extreme bedrock alteration that included reddening, blackening, cracking, and spalling (Figure 6). Features such as bedrock grinding slicks suffered the most from fire-effects to bedrock outcrops. There were several examples where the surface of the slick was partially or entirely removed by exfoliation caused by the fire.

Fire damages to known rock art sites were minor within the areas examined during the post-fire site assessment work. Damages were limited to blackening, spalling of surrounding rock, and possible color changes of rock due to thermal alteration. One of the known rock art sites outside of the study area (CA-SDI-8862) was visited by a CDPR archaeologist who reported that the petroglyphs did not appear to have sustained damages during the Cedar Fire. However, it has been noted that at least one of the panels had previously been damaged by a large spall that may have occurred during a previous fire.

Historic-period sites also suffered damage and loss of wooden and organic items and features as a result of the fire. The 1924 Dyar House, 1940 Boy Scout Camp Hual-Cu-Cuish that was built by the Civilian Conservation Corps, remaining features of the 1870-1900s Stonewall Mine and Town site, and other historic-period park facilities suffered severe damage or destruction during the fire. Historic-period archaeological sites that sustained damages to wooden and organic features include the 1930s erosion control fences put in by the Civilian Conservation Corps, two bridge sites, a homestead site, and a newly recorded dugout structure pad.

Historic-period artifacts also incurred fire damage. Melted and fire-cracked glass and ceramic items were found at most historic-period sites. Studies conducted by Brent Buenger as a Ph.D. candidate in the Department of Anthropology at the University of Kansas demonstrated that glass cracks under temperatures ranging from 200 to 500° C, especially in cases of rapid heating (Buenger 2003), and glass melts between 593° and 1427° C (Winthrop 2004). This again indicates how hot the fire was in portions of the park.

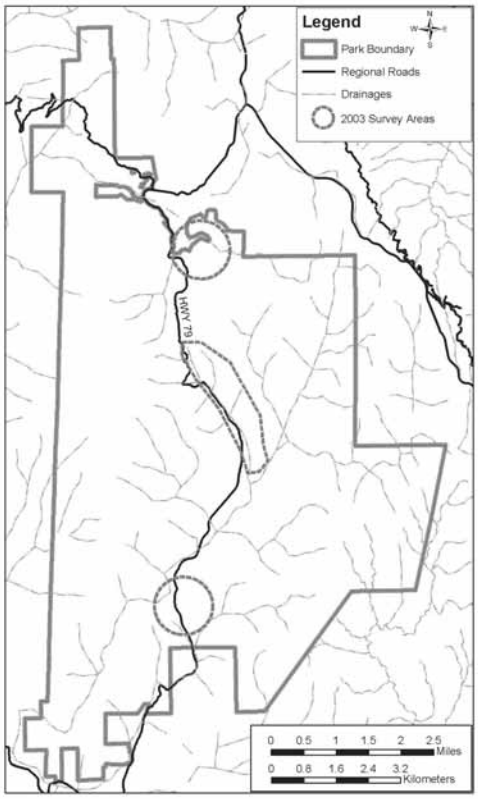


Figure 2: 2003 Survey Areas.

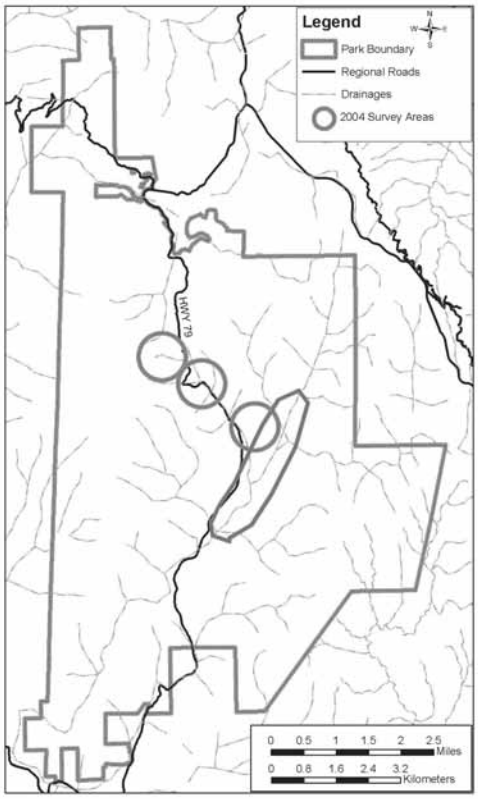


Figure 3: 2004 Survey Areas.

Figure 4: Proposed 2005 Survey Areas.

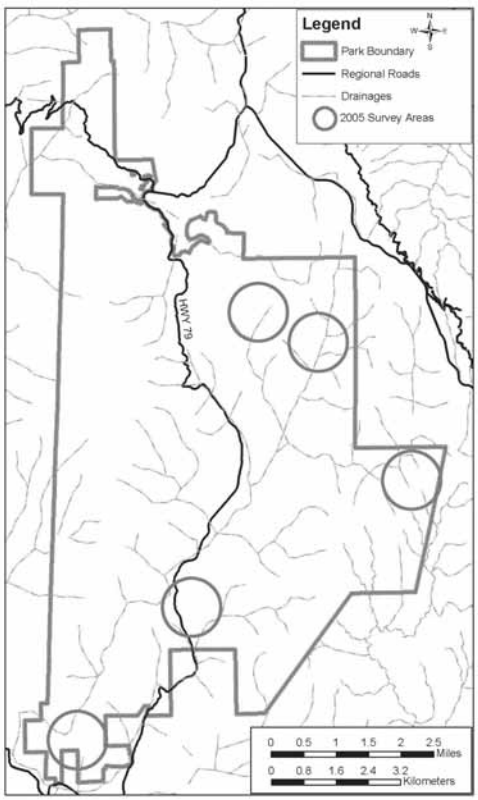
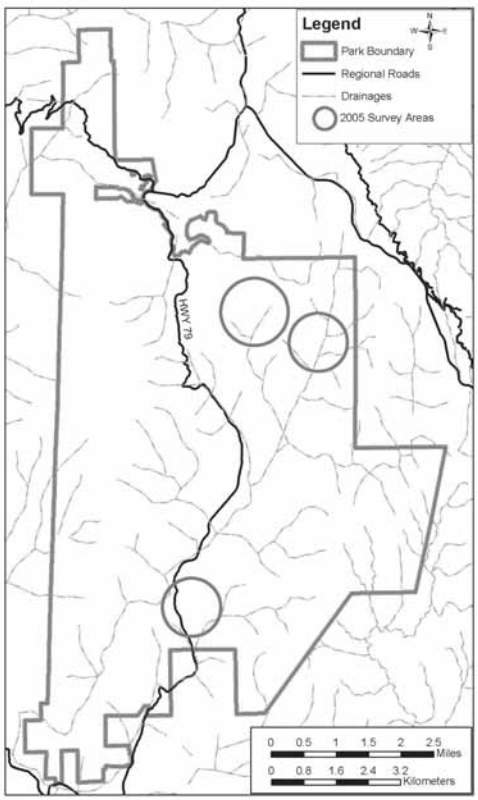


Figure 5: Actual 2005 Survey Areas.



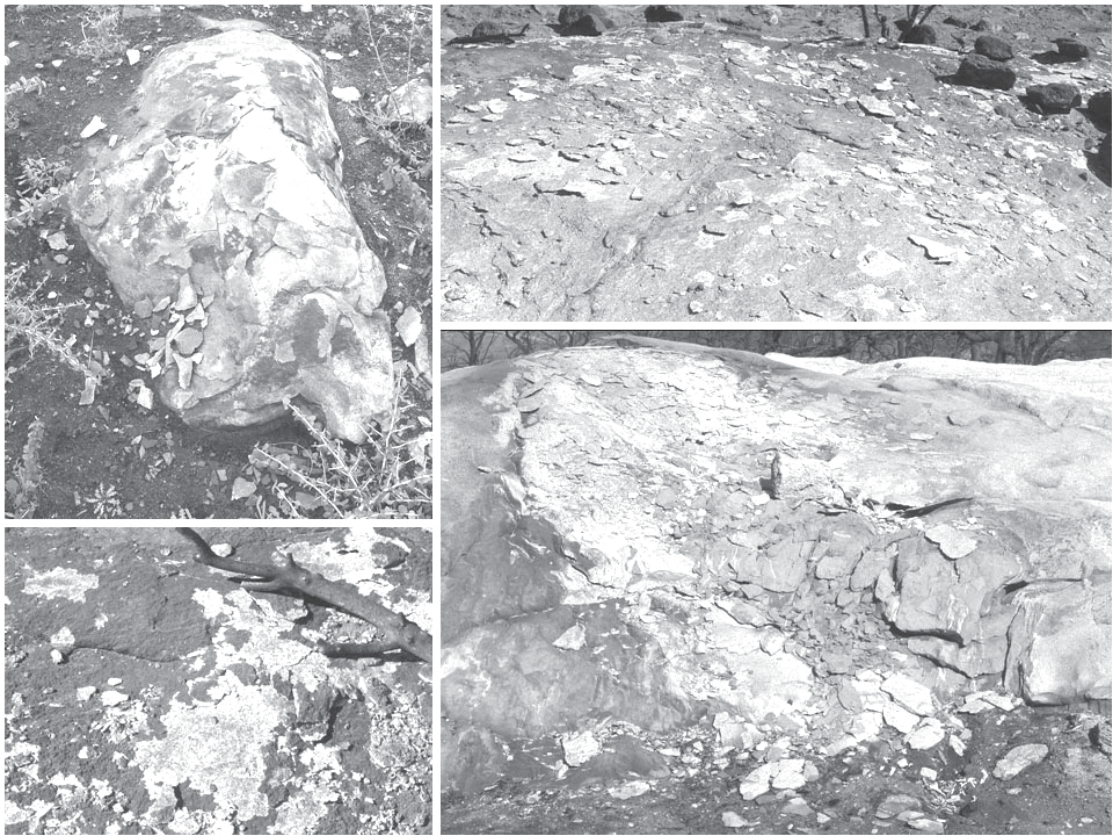


Figure 6: Examples of fire-induced bedrock exfoliation and spalling.

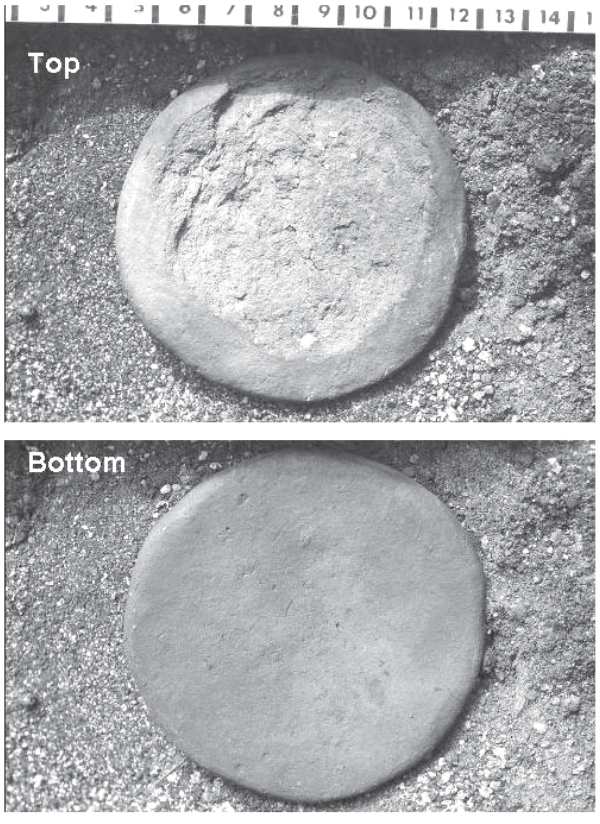
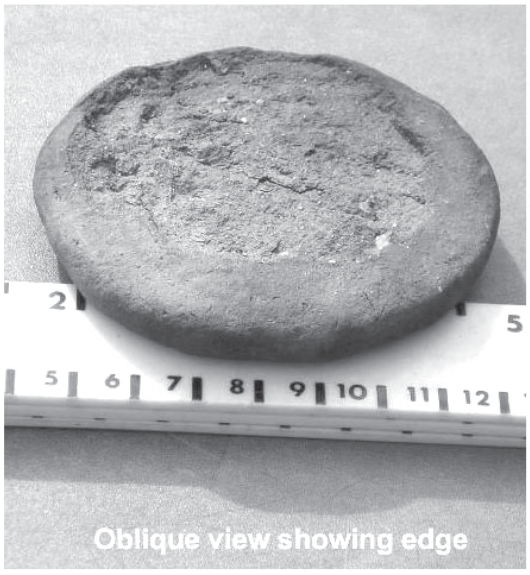


Figure 7: Brownware olla lid showing potlidding.



Native American artifacts were damaged by the fire as well, mostly from blackening and thermal-alteration including color change. It is more than likely that surface artifacts were affected by the fire such that obsidian hydration bands were damaged or destroyed (Schroder 1999). A few pieces of spalled pottery were observed, but it was difficult to determine if the spalling occurred during the Cedar Fire, during a previous wildfire, or even during the original firing process (Figure 7).

Other site damages from the fire included tree and branch fall onto features, which ranged from minor to severe. Post-fire branch fall rarely damaged features, but it often covered them up, and at some sites, it made positive identification of previously recorded features impossible. Tree and branch fall that occurred during the fire itself, when burning branches or trees fell onto bedrock grinding features, generated the most severe damage. The heat from the burning wood usually resulted in increased spalling of the bedrock. There was at least one site where a burning tree trunk fell onto a bedrock grinding slick, and the resulting spalling completely exfoliated the slick.

Stump holes from burned-out tree stumps and their root systems can cause post-fire damage and displacement of artifacts when the root cavities cave in, and soils and artifacts erode into the pit left by the stump. However, the largest threat to sites, especially during the first year after the fire, was the overall loss of vegetation. The loss of brush and groundcover increased erosion and opened features and artifacts up to the threat of vandalism. Post-fire erosion and runoff was a problem at many sites, especially after a heavy storm in December of 2003 and the near-record rainfall of the winter and spring of 2004/2005. Impacts from erosion included mud flows, siltation, and erosional pedestaling of artifacts.

The burned nature of the soils, rocks, and other features made it difficult to distinguish some cultural resources from natural ones. There were certain artifact and feature types such as fire-affected rocks, hearths, roasting pits, midden soils, and burned bone that could not be identified because of fire alterations, charring, and ash accumulation in the soil.

The abundance of burned bone, especially small fragments with few or no distinguishing characteristics, made it difficult for field staff to identify areas with possible human cremains. The majority of this burned bone is probably animal, either from those killed in the fire, or from animals that died naturally prior to the fire, leaving behind bones that were subsequently burned. However, without faunal experts on hand to analyze small, burned fragments of bone, it was often impossible to tell. This difficulty in distinguishing natural burned bone from human cremains and evidence of cultural animal use, can lead to misinterpretation of site use and significance.

Research into the effects of fire on archaeological sites has found that typically only surface and near -surface artifacts are affected (Buenger 2003; Deal 2002; Winthrop 2004). However, at sites with only surface components, fire can significantly change how future research will interpret such sites and the materials they contain. Wildfires can change artifacts, features, and natural items such that they can be misinterpreted, misidentified, or missed entirely. Historic-period trash dumps may appear to have been burned historically, and fire can destroy artifacts or affect their rate of deterioration. Fire impacts to groundstone artifacts and features may affect the preservation of pollen, phytoliths, and protein residue, or may exfoliate them away altogether. Heat from a high intensity wildfire could also affect stone tools and other lithic artifacts such that they would have the appearance of being "heat-treated" and may mislead future research at many of the sites. Obsidian artifacts may be altered by a fire such that obsidian hydration tests would give inaccurate results (Deal 2002; Loyd et al. 1999; Waechter and Foster 2003). Ceramic artifacts could also be fire-altered so that they appear to have been subjected to a higher firing temperature or multiple firings, and the effects of fire-heating may corrupt thermoluminescence results (Buenger 2003; Winthrop 2004).

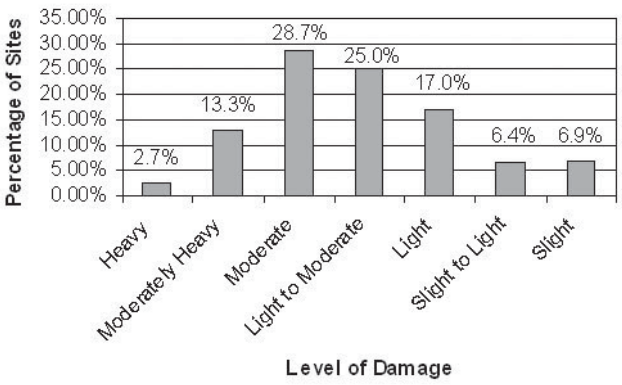
More confusing and sometimes more difficult to distinguish are those natural features that come to resemble cultural features due to the effects of a fire. Features that were difficult to distinguish within a year of two after the fire may become even more deceptive as the evidence of the wildfire fades from the landscape over time. Clusters of fire-affected rocks, especially when mixed with charcoal, burned soil, and ash, are often indistinguishable from certain types of hearths or fire pits. Areas of ash mixed with darkened soil can approximate ashy midden soils. Small calcined bone fragments can easily be mistaken for cremains. Large trees can push rocks into a circle around their trunks such that when the tree is burned away, a feature with the appearance of a rock circle or rock-lined pit may be left behind.

CONCLUSIONS

The site condition assessment work examined 33 percent of the known sites in Cuyamaca Rancho State Park, but only 4.8 percent of the park land. Of the examined sites, 28.7 percent showed moderate damage from the fire and 25 percent showed light to moderate damage, while only 2.7 percent showed heavy damage (Figure 8).

The most severe damage was caused by fire-induced bedrock spalling and exfoliation. Some outcrops were observed with their entire surface layer exfoliated around them, while others sounded hollow from exfoliated surface layers that had not yet come off. Although many may believe bedrock grinding features are some of the more durable

Figure 8: Overall post-fire site damages.



types of prehistoric features, the site assessment work has shown that bedrock features can be exceedingly fragile. This brings up the questions: how many of these features once existed, and how old are the ones that remain? It also demonstrates the possibility that our understanding of site distribution and the use of the landscape may be skewed. Of the 191 sites that were examined during the 2.5 years of post-fire work, 137 contain bedrock grinding slicks, and 47 of those consist solely of bedrock grinding features without any other associated features or artifacts. If fire-induced exfoliation were to remove the slicks from the archaeological record, there would be a much different picture of how people interacted with the landscape and its resources.

The loss of thick vegetation as a result of the Cedar Fire enabled the field crews to identify and record many new sites and features. Those involved in this project were surprised at the abundance of archaeological resources within this region and how intensively these areas appear to have been used over many thousands of years. The involvement of a Native American consultant throughout much of the project gave special insight and a much better understanding of the complex relationship between the landscape, the people who lived here, and the resources they used. There are broad areas and corridors that could be considered archaeological districts or cultural landscapes, but so far none of these have been well-defined or recorded. It will take additional efforts to fully understand these special areas, how they relate to each other and to the overall landscape, and how to best define their boundaries.

The sheer numbers of previously unrecorded sites and features that were identified during the post-fire site assessment work—158 newly recorded sites and isolates, and over 250 additional features at 62 previously recorded sites—and the severe damage that was observed, also reiterate how vital it is for land managing agencies such as California Department of Parks and Recreation to conduct regular surveys and inventories of parks and other public lands. Agencies need to become more proactive instead of reactive. Surveys and inventories are necessary, prior to disasters, to document what cultural resources exist on these public lands before they are damaged or destroyed.

In spite of the various post-fire projects by CDPR staff, less than 10 percent of Cuyamaca Rancho State Park was examined after the fire. There are still many areas that we know little or nothing about, and unknown numbers of sites and features that could have been damaged, altered, or destroyed by the Cedar Fire. We are far from finished with Cuyamaca Rancho State Park.

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