Mechanical Treatment Impacts to Cultural Resources in Central Arizona: The Marden Brush Crusher

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Cultural resources are usually defined as the locations and contents of prehistoric and historic archeological sites, historic buildings and settlements, and areas which were the scene of important historic incidents, such as battlefields or exploration routes. This definition is legally adequate for management purposes, but does not take into account the value of these properties. First of all, they represent the history and cultural heritage of the nation—an important value in and of itself. However, the primary importance of cultural resources is that they are the physical remains of former times. They represent the interaction of humans with natural and cultural environments. By necessity, then, they contain representations of the relationships within and between cultural/technological systems and environmental systems. In other words, cultural resources can provide us with information on the development of human social, economic, political, and technological adaptations to changes in demography and natural environment. They can also provide us with information on environmental conditions at various times in the past and on the extent to which environmental changes and present conditions may have been affected by human activity. They do this by virtue of their being composed of cultural and natural materials which can be shown to be associated in both space and time. Thus, besides documenting the development of cultural systems, they also document the development of environmental systems, both of which can be useful as baseline or comparative data for the management and use of those same environments today. That is, they could if land managers and other resource specialists would begin to take cultural resources management and archeological research seriously.

Abstract: Forest Service management practices have the potential for impacting cultural resources in a variety of ways, ranging from complete removal to alteration of the environmental context of prehistoric or historic properties. Much of this impact is derived indirectly from activities designed not so much to manage the land surface (the location and contextual matrix of cultural properties) but the vegetation on that surface. This study examines one such activity—brush crushing—and its effects on archeological site integrity. Although much remains to be done, it demonstrates that mechanical manipulation of vegetation has the potential for serious disruption of cultural resources.

Present-day management of cultural resources on the National Forests of the United States is not directed toward the recovery and use of these kinds of data, despite the long-demonstrated similarity (at least in the Southwest) between prehistoric land use patterns—some of which succeeded and many of which failed—and historic and modern American land use patterns. Instead, the job of cultural resources management in the U.S. Forest Service is to integrate cultural resources protection from damage and loss with the more production-oriented management activities of the Forests and their users. This job consists primarily of identifying the cultural resources of a Forest and then working out ways to avoid damaging or destroying them while attempting to manage other resources.

Direct impacts to the land surface, and thus to the cultural resources on and below that surface, are easy to see and understand. Any form of construction or resource exploitation which involves the removal, relocation, or compaction of soils, sediments, or mineral materials, or which requires the modification of existing topography, has the potential to damage, destroy, or remove cultural properties and/or their artifactual content. Even the relocation of features and/or artifacts can significantly alter an archeological site, since it is from the spatial arrangement of artifacts and other cultural and non-cultural materials in surface and subsurface topographic contexts that behavioral and environmental patterns are identified. These patterns constitute the primary informational content of any prehistoric or historic archeological site. Since the goal of cultural resources management on Federal lands is ostensibly to protect and preserve this information, protection from impacts should be directed at preserving the integrity of behavioral contexts. Damage to individual artifacts is one type of impact to the data-producing value of a site, and, as such, it merits study and prevention (c.f. Gallagher 1978). However, it appears to be less of a factor in data loss than dislocation, as the patterns of behavior involved in making an artifact are much simpler and less informative about human organization and adaptation than are the

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behaviors which resulted in the eventual location of that artifact and its associations with other natural and cultural materials. It has been demonstrated by several experiments (DeBloois, Green, and Wylie 1974, Gallagher 1978) that tractor travel over an archeological site is extremely destructive to surface artifact spatial relationships and locations; markedly more so than to artifact integrity. Thus, surface disturbances such as road building, log skidding, scarification, fence building, machinery operations, pipeline trenching, posthole digging, stock tank construction, parking lots, recreation areas, etc. are all activities or facilities which could damage or destroy the contents and context of any cultural property they encountered. Less obvious potential impacts can also result from activities not specifically designed to modify the land surface, but rather to modify the vegetative cover of that surface. Examples of such practices include chaining, juniper pushing, crushing, or "roller chopping" as it is sometimes known, burning, and the use of herbicides in order to either change the composition of the vegetation or to eliminate or reduce cover to lessen fuel accumulation risks for fire management.

Several of these activities would seem to present fairly straightforward dangers to cultural properties. The violent uprooting of trees by chaining will necessarily damage any cultural features that might have trees growing on or near them. Others are less apparent or are indirect; both burning and herbicide use, by removing cover, may initiate erosion that could damage cultural properties. In addition, burning will destroy most standing historic structures, many of which are built primarily out of wood, and it may, under certain circumstances, affect the ability of some heat-sensitive cultural materials to be dated. Because of the lack of information about the effects of these vegetation manipulation practices, current Forest Service management policies, at least in the Southwest, generally assume that they will either damage cultural resources or that their indirect effects are not substantially more of a threat than natural processes. Thus, it is possible that some damages are being overlooked while other activities which may do no damage are being restricted. To provide efficient management of all resources, it would be best to know just what kinds of impacts can be expected from any particular kind of activity. It was in this context that the Prescott National Forest in Arizona requested a study of the impacts to be expected from their extensive and continuing program of chaparral conversion by mechanical treatment—specifically, the use of the Marden Brush Crusher.

Little systematic observation of mechanical treatment impacts to cultural resources has been made to date, other than for several of the more obvious ones—chaining (DeBloois, Green, and Wylie 1974) and scarification (Gallagher 1978). No study had been made for treatments specific to the chaparral vegetation type prior to this one. The purpose of this study, therefore, was to develop and describe a procedure by which any mechanical impact to surface or subsurface features and artifacts could be defined, and at the same time to identify the impacts of brush crushing on cultural properties. Specifically, three types of cultural property were selected to be observed for effect: surface artifact scatter, surface (low relief) architectural features, and subsurface artifactual materials. This study was made in the simplest manner possible, by means of "before and after" observational tests.

The area utilized for this study was a 60 acre parcel of Prescott National Forest land, located on the Walnut Creek Ranger District of that Forest near its Camp Wood Administrative Site. This area had been selected for conversion from a chaparral to a grass type vegetation and was surveyed for cultural resources clearance in 1978 (Wood 1978). The archeological survey also served to identify properties suitable for a test of the impacts to be expected from the mechanical treatment proposed for the parcel. The remainder of this paper will describe the results of the impact study carried out by myself and Harlow Yaeger of the Prescott National Forest in 1979 (Wood and Yaeger 1978, Wood 1979).

Vegetation in the study area was primarily turbinella oak and manzanita chaparral with a discontinuous overstory of alligator juniper, Emory oak, and an occasional pinyon, broken by stringers of ponderosa pine in the basins and drainages. The chaparral understory, locally quite dense, also contained some mountain mahogany, Fendler ceanothus, datil yucca, silktassel, beargrass, prickly pear and mammilaria cactus, and occasional patches of ring muhly and grama grasses. Substrate in this hilly area was primarily decomposed granite, ranging from rocky residual clay sediments to more homogenous loamy colluvium. Bedrock outcrops of granite were common.

The conversion project which took place in the study area involved the use of a Marden Brush Crusher, a non-motorized device consisting of two slightly offset tandem rollers fitted with hardened alloy "paddlewheel" blades. It is generally pulled as a trailer by a large bulldozer-type tractor. The twelve blades on each roller are of two different widths, providing an uneven gait, and the offset between rollers provides for additional churning of the surface and a variation in blade angles at contact. The combination of these features and a gross weight of 44,000 pounds (20,000 kg) results in the rapid removal of chaparral-type plants. However, this device can operate only in relatively low-slope areas without a substantial tree canopy, and where the ground surface is free of exposed bedrock or talus. Rocky surfaces tend to
The implementation and design of the study involved the construction of artificial test situations to simulate subsurface impacts. To do this, a series of test burials were laid out at various points in designated one-meter square test plots. The location selected as a control was a single room rock-outlined pit house habitation site. It was selected because it contained a well-defined architectural feature, surface artifact scatter, and showed a strong dichotomy between areas with and without brush cover and having rocky and fine-textured soils. These criteria were used for all test selections in the study. The only impacts expected here were time, rainfall, and the curiosity of other forest personnel.

In order to test impacts to subsurface materials and features, a series of control and test burials was laid out at various points; the control site and in a separate testing locus some distance away. The burial tests and controls were all placed according to the same criteria as the surface plots—brush cover and bare ground—with additional variations in depth and soil texture.

The crushing of test plots and burials was more or less a sample out of a normal crushing operation. Owing to unfortunately restrictive time and budget limitations (so what else is new?) the test loci could not be crushed entirely.
Factors in Assessing Impacts

Damage from the Marden device as observed here was dependent on four factors: 1) contact with the blades; 2) soil texture; 3) depth; and 4) artifact size. Contact with a blade invariably produced both surface and subsurface artifact damage or displacement. Rocky soils or soils with expansive clays produced the highest percentage of subsurface damage, while fine soils produced the most damage by displacement in surface inventories. However, it must be noted that the presence of residual clays and large numbers of rocks in a surface soil is usually a result of natural, in place development rather than cultural deposition, though this is not always the case. While it was expected that certain amounts of cover would act to provide a protective cushion over cultural surfaces and fill, the results of the tests indicate little or no difference due to cover. It can be said, then, that cover has no effect and is therefore not a factor in the amount of impact. The third factor, depth, proved highly useful, as damage was higher in shallow burials than in deep, and highest on the surface itself. Twenty-five percent of deep burials were impacted, seventy-five percent of shallow burials, and eighty percent of the surface inventory. Clearly, impact increases as depth decreases. Finally, there was the factor of artifact size. The ratio of large to small buried pots broken (by expansive clay) at the control locus was 3 to 1; at the test burial locus, it was 5 to 1. As well, only the larger surface artifacts were ever physically damaged. This too indicates a strong pattern—larger artifacts have a higher susceptibility to damage. In some cases this was apparently due to larger area of potential blade or rock contact, while in others it may have been due to the larger artifact’s having had less structural integrity or resistance to stress than a smaller one of the same materials. Unfortunately, these observations must remain tentative, as much more variability was encountered than expected in soil, surface, and brush composition. Still, it can reasonably be said that under the variety of conditions tested, nearly ninety percent of the cultural surface and fifty percent of the subsurface inventories were damaged by crushing.

SUMMARY AND CONCLUSIONS

Three direct impacts of brush crushing to cultural properties were identified from this study: 1) disruption of the spatial relationships of surface and subsurface artifacts; 2) disruption of structural elements in surface and subsurface architectural features; and 3) physical damage to surface and subsurface artifactual materials. The disturbance of artifactual distributions is seen as the most critical of these, since disrupting or destroying the spatial context of these remains severely limits any attempt to characterize and identify not only specific behaviors at sites but sites themselves and regional and the regional and chronological patterning of occupations and developments. Indirect impacts to these properties may also arise from erosion and, in some cases, from increased site visibility, which tends to invite
vandalism. This being the case, it must be recognized that the use of a Marden Brush-Crusher in areas containing cultural resources cannot be allowed without some measure of protection being given to those resources.

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LITERATURE CITED


