Mitigation of Chaining Impacts to Archaeological Sites

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Abstract

Current strategies for protecting archaeological sites during implementation of brush management practices such as chaining are frequently inadequate. Potentially significant prehistoric remains are sometimes dealt with in a fashion conducive to their destruction. This conflict can be alleviated by developing a chaining program in which there is planned avoidance of cultural resources. This is accomplished through an intensive archaeological, soil, range, and visual assessment of project areas prior to chaining. The development of a chaining design by an interdisciplinary planning team and the "buffering" of sites during implementation of the range improvement can enhance all resources. Through careful planning, secondary impacts such as vandalism to prehistoric sites can be reduced as well.

The use of heavy equipment in brush management is an effective and frequently used method of increasing rangeland forage capacity. In particular, conversion of large stands of pinyon-juniper woodland to grassland habitat by bulldozing or chaining has been a common undertaking for the past 30 years. Specifications for brush management differ quite markedly among the various federal and state agencies concerned with range management, but it is rare that adequate consideration has been given to the preservation of archaeological sites or cultural resources within project areas. Cultural resources are non-renewable and individual sites represent unique measures of past human behavior. Once disturbed, neither the site nor the information contained therein can be replaced.

With increasing efficacy of the National Historic Preservation Act of 1966 and the resultant mandates to federal land management and assistance agencies, archaeology has become a valid multiple-use resource. Recognition of this has led to the hiring of 241 archaeologists by the Forest Service and the Bureau of Land Management (Rogge 1980), a proposal by the Soil Conservation Service to train its staff in cultural resource detection, and a review of archaeological site protection in range improvement areas at the 1981 National Association of Conservation Districts' pasture and range meeting at Cedar City, Utah.

Presently lacking, however, is a common body of "how to" material designed to protect these resources prior to, during and after implementation of range improvements such as chaining. This paper examines the state-of-the-art with particular reference to: (1) the types of archaeological sites most susceptible to adverse impacts of chaining; (2) the methods capable of reducing or eliminating disruptive effects of chaining; and (3) determining the significance of archaeological values in areas undergoing range improvement.

Impacts of Chaining on Archaeology

Archaeological sites of all types are likely to be impacted if located in areas to be chained, but greatest disturbance will occur to small and shallow sites containing fragile artifact patterns. Hayden (1965) describes fragile artifact patterns as sites with mate-

rials that lie without depth upon an existing natural surface, comprising a pattern of prehistoric activity which can be broken with any disturbance. Due to small size and lack of any apparent building rubble, these sites are frequently overlooked by the casual observer. Larger sites containing architectural remains and deep deposits can be disturbed when tree roots are brought to the surface, collapsing or exposing previously buried walls or rooms. Additional damage may occur if total site size is underestimated, leaving less obvious portions of the site to be chained. Frequently overlooked are refuse deposits and human burials.

There is little quantified data on the type or extent of impacts to archaeology occurring as a result of chaining. Federal and state land management agencies have not been concerned with cultural resources long enough to accumulate such information, and federal assistance agencies are only now being made aware of the problem. What information is available has been generated by the Forest Service in 2 short papers (DeBloois et al. 1974, Gallagher 1978).

The first study, a test of impacts of pinyon-juniper chaining on archaeology in the Manti-La Sal National Forest in southeastern Utah, was conducted by DeBloois et al. (1974). The test was designed to measure 3 factors of chaining disruption: tree uprooting, chain travel and location of caterpillar tractor paths. Impacts were discussed in terms of artifact breakage, horizontal displacement and subsurface churning. Four 1-m squares, each containing 32 color coded flint chippings placed on the ground surface of an actual archaeological site, were established to determine impacts of a single pass of the anchor chain. Results indicated that each test square was affected differently. Table 1 quantifies disturbance in terms of missing flakes.

In addition, 19 new flint chippings from the buried prehistoric site appeared on the ground surface of test squares, indicating that vertical movement had occurred. One further estimate of subsurface damage was provided by examination of tree root craters. A sample of 12 depressions caused by tree uprooting had a mean diameter of 11.7 m and an average depth of 50 cm. It was estimated that when trees were located less than 15 m apart, dislodging the roots would disturb all areas of a site to a minimum of 50 cm (DeBloois et al. 1974).

The second study (Gallagher 1978) occurred during scarification and piling of slash in the Sawtooth National Forest. Piling slash after a timber sale can be considered similar to windrowing of pinyon-juniper debris after chaining. To test the impacts, a grid 16 m on a side was staked out and steel washers were buried in test holes every 2 m along the grid. Upon completion, a caterpillar tractor pushed all surficial slash and tree stumps into a long windrow off the grid area. This activity had a marked effect on both horizontal and vertical displacement of washers: 50% of the test holes suffered missing or displaced washers and 6 test holes could not be relocated.

In summary, disturbance was significant enough in both tests to break the initial pattern in which the "artifacts" were distributed. Inferences can be made between these experiments and similarly patterned archaeological sites. If chaining and windrowing of pinyon-juniper is undertaken without consideration of archaeol-

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Table 1. Chaining impacts to test squares containing flint chippings.

Disturbance	Percent missing flakes
Tree adjacent to flakes	53
Caterpillar path	72
Caterpillar turn	82

ogy, overall damage could be close to cumulative percentages obtained by combining both Forest Service studies: nearly 100% displacement of surficial artifacts could be expected, with close to the amount occurring at depths of up to 50 cm.

Mitigating Adverse Impacts to Archaeology

Although there appears to be an inherent conflict between maintaining the integrity of prehistoric sites and the need to increase rangeland forage capacity through pinyon-juniper chaining, there are readily available resolutions to this problem. Because land management is a multiple-use concept, interdisciplinary teams frequently implement planning decisions. When implementing a chaining program, a team consisting of an archaeologist, landscape architect, range specialist, and soils scientist should be established. By utilizing the advice of an archaeologist and landscape architect, cultural resources can be incorporated into an applied visual landscape management plan (cf. Williamson and Currier 1971), with little disruption. Landscaping of chainings are encouraged, because if range improvements follow legal boundaries rather than natural contours of the land, mitigation of impacts to archaeology will be more costly and time consuming.

After chaining is planned, but prior to actual implementation of the range improvement, the first step is to conduct an inventory of soils, water, vegetation, wildlife and visual resources. Only *after* this has been accomplished should an inventory of the archaeology be done. If it is determined that only a portion of the project area will respond successfully to the treatment, confining the archaeological survey to this area will greatly reduce costs and allow the archaeologist to concentrate efforts in areas deemed feasible for range improvement.

Predicting actual costs of an archaeological survey is beyond the scope of this paper, but some factors can be estimated. This includes the amount of acreage to be chained (necessarily the acreage to be surveyed by the archaeologist), size of survey crews, transportation costs, and time spent documenting and recording each site discovered. Less predictable are the number of sites to be discovered and the acreage covered per man-day. These last two items are dependent upon one another, because the "intensity" of an archaeological survey often determines how many sites will be found in a given area. Plog et al. (1978) examined 12 different surveys and found there was a positive correlation between total man-days expended/km² and the number of sites discovered. In other words, a casual walk through an area would encounter far fewer prehistoric sites than an intensive and systematically sweeping survey.

Determination of man-days for an archaeological assessment of a project area has to be set in a variable format rather than a fixed figure because the number of sites can vary extensively in areas of similar tree density and terrain. The range of coverage varies from 10 to 15 ha/man-day. The critical factor is site density, because an average of 30 min is spent documenting, mapping and marking sites with flagging tape so they can later be avoided during chaining. Spencer (1980) and Lindsay (1981; personal communication) reported that 10 and 15 ha/man-day respectively were covered in a region containing upwards of 20 sites/km². These figures appear average because Dalley (n.d.) and Chandler et al. (1980) stated that 10 and 11 ha/man-day were necessary to effectively survey for cultural resources.

Once the archaeological sites in the project area have been identified, various management alternatives can be reviewed and their potential effects determined. An interdisciplinary team may

again have to be consulted in order to develop the alternative which will accomplish the objective of the range improvement yet mitigate the identified impacts to the archaeology. The role of the landscape architect becomes important at this time in implementing a final chaining design or configuration that will avoid the archaeological sites yet maximize forage production.

When chaining configuration are designed, prehistoric sites should not be left in small isolated islands of standing trees. A few standing trees will serve as signals to grave looters and seldom will a site remain unvandalized if its presence is made known. Additionally, cattle congregating under a few isolated trees could result in vertical and horizontal displacement of artifacts. The destruction of stone foundations and rock alignments by congregating cattle has been documented (Lindsay 1981; personal communication).

These problems can be alleviated by designing a chaining in which most of the sites are incorporated into the body of remaining pinyon-juniper forest and not left within isolated vegetative units. An effective technique which can be used in areas of high site density is the "blocking up" of several sites into large groves of standing trees. Both these alternatives are illustrated in Figure 1. Effective use of these techniques would dissuade potential vandals, disperse congregating cattle, and provide a natural appearance to the project area. If it is not possible to incorporate sites into the remaining pinyon-juniper forest, they should still be marked with flagging tape prior to chaining, after which, trees remaining on the sites should be immediately burned or cut by hand to protect them from vandalism.

While flagging sites during the archaeological survey and when actually implementing the range improvement, a minimum buffer zone of standing trees and undisturbed soils should remain around each site. Dalley (n.d.) suggests that a minimum of .80 ha (2 acres) is necessary to totally avoid a site. Although wall rubble may be readily apparent, the very existence of such a structure may indicate that buried rooms or human skeletal remains are 15 to 20 m distant with little or no apparent surface indication. Because large areas of a site may not be obvious from casual observation of the ground surface, determination of a buffer zone requires the expert judgement of an archaeologist familiar with the prehistory of the

FIGURE 1

Chaining design avoiding archaeological sites and meeting visual resource objectives.

region. Buffer zones will vary with site size, so no arbitrary unit of protective cover should be determined prior to actually conducting the cultural resources survey. This will allow the archaeologist a necessary amount of flexibility when in the field.

When chaining is actually implemented, the presence of an archaeologist in the project area is again important. With the dust and confusion of chaining, signal flags and site markers are easily missed (DeBloois et al. 1974). During one recent chaining, the absence of an archaeologist in the project area for 1 day saw the destruction of a previously identified archaeological site and the flagged buffer zone removed on 3 more (Dalley n.d.). Furthermore, an archaeologist could be quick to recognize previously unidentified sites and adjust the chaining design accordingly.

Significance of the Archaeology

Finally, there is the question of significance of the archaeological values found within project areas. When this is asked, there will likely be a discussion of "trade offs" between the archaeologist and other management personnel. Yet "significance" remains ill-defined and misunderstood by archaeologists and land use planners alike. Ideas range from the academic conviction that all sites were created significant and all warrant preservation, to the planners' view that archaeological sites are somehow ranked with most consigned to the bulldozer and only a few worthy of preservation. Standards established by the archaeological community provide no answers to this question because some archaeologists are interested only in extremely large pyramids while others find answers to their research questions in small scatters of flint chippings—the fragile pattern areas discussed earlier in this paper. It is safe to say that significance will vary with the perspective of the evaluator and the objective of the land management agency.

The legal aspects of significance provide a partial answer. Section 106 of the National Historic Preservation Act (1966) states in part that:

The . . . Federal agency having direct or indirect jurisdiction over a proposed federal or federally assisted undertaking . . . shall, prior to the approval of the expenditure of any federal funds on the undertaking, or prior to the issuance of any license, . . . take into account the effect of the understanding on any district, site, building, structure or object that is included in or eligible for inclusion in the National Register.

Sites already on the National Register are usually well known and documented; what is important here are sites that may be *eligible* for inclusion on the Nation's list of historic places, but are not actually listed on the Register. The regulation 36 CFR part 60, an interpretation of the National Historic Preservation Act, lists the

criteria for eligibility. This rule states in part that sites are eligible if they:

. . . embody the distinctive characteristics of a type, period, or method of construction . . . or that have yielded, or may be likely to yield, information important in prehistory or history.

Because this definition of significance is the one that determines eligibility for inclusion on the National Register, it is necessarily a key measure in the environmental evaluation process conducted prior to project implementation.

Most frequently, however, it is the consensus of the planning team that determines what sites will be saved and which will be sacrificed. Besides compliance with the law, an assessment of public and ethnic significance should be conducted as well. Questions of public visitation to sites in the project area and their relationship to living Native American groups should be addressed. In sum, it should be the interdisciplinary planning team that determines the future of the archaeology in project areas, based upon applicable laws, the perceived "significance" of the sites, and just as importantly, the economics of the management practice.

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