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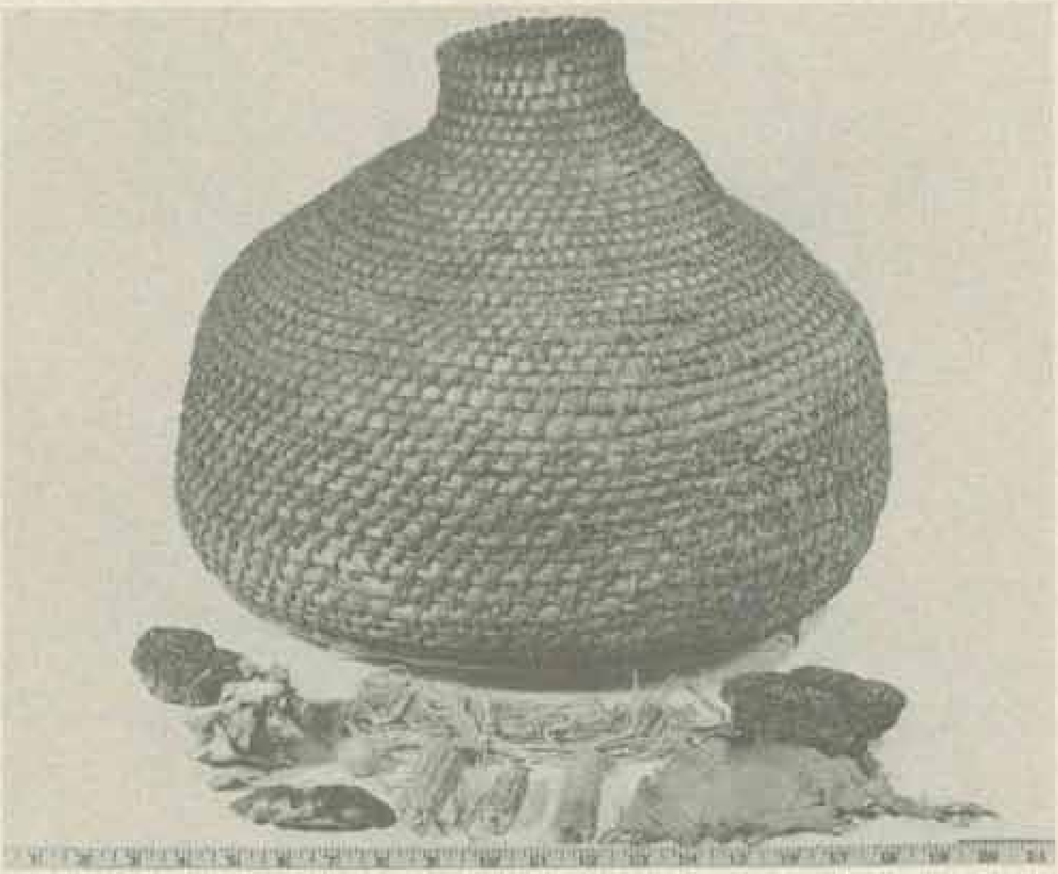

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Front Cover: Grass storage basket (see DeVed and DeVed this volume).
Inside: Rock art images by Julie Maurer

MESSAGE FROM THE EDITORS

Readers will notice that we have changed the format of *Utah Archaeology* from two columns to a single column. The format change should make the journal a little easier to read (and quite a bit easier to produce). We think the articles in this issue will be stimulating and interesting, and welcome your comments on any aspect of the publication. Many individuals contributed to *Utah Archaeology 1994*: we thank the authors for their cooperation and prompt responses to our requests; the peer reviewers for providing thoughtful critique and suggestions; the Editorial Advisory Board (Kenneth E. Juell, Bill Latady, Dave N. Schmitt, and Kenneth Wintch) for their reviews, recommendations, and help with the peer review process; and we especially thank Dave Schmitt and Renae Weder for their dedication, enthusiasm, and professionalism-- their contributions are enormous and greatly appreciated. A publication can only be as good as its contents, and we rely on contributions from USAS and UPAC members, and other interested persons for interesting, quality articles. We always welcome manuscripts, no matter how short or long, and encourage all readers to consider contributing to future volumes.

Kevin T. Jones, UPAC editor
Robert B. Kohl, USAS editor

COWBOY CAVE REVISITED

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Cowboy Cave, a stratified Archaic cave site in southeastern Utah, has been a cornerstone in defining the Archaic occupational chronology of the Colorado Plateau. A review of the radiocarbon dates in relation to published artifact descriptions and unpublished feature data allow for a clarification of the site stratigraphy and sequence of occupation. Prehistoric occupation in Cowboy Cave was restricted to three periods, the Early Archaic, the Late Archaic, and the Terminal Archaic, each with a constellation of diagnostic artifacts. Although the site functioned primarily as a spring/summer seed processing locale, for a short period during the Early Archaic, it also functioned as a winter base camp. Some general observations about cave site excavations on the Colorado Plateau are also presented.

INTRODUCTION

In the 20 years since we participated in the excavation and analysis of Cowboy Cave, a stratified dry cave site in southeastern Utah (Jennings 1980), this site has played a pivotal role in defining the Archaic chronology and lifeway on the Colorado Plateau (Berry and Berry 1986; Geib 1993; Holmer 1978; Jennings 1978, 1989; Matson 1991; Schroedl 1976, 1992). Because it is one of the few stratigraphically excavated sites in the region, it is important that additional information and revised interpretations about the site be published.

Both of us participated in the original field excavation of Cowboy Cave in 1975 and both were involved in the analysis and report write-up. One of us, Schroedl, prepared the preliminary feature data and was Jennings' graduate assistant during the field excavations, while the other, Coulam, analyzed the floral samples. Because of our first-hand knowledge of the field excavations and laboratory analyses, it is appropriate that we present additional unpublished information on the cultural features and radiocarbon dates and provide new interpretations about the site.

In 1990, we contacted the University of Utah Archives and obtained copies of the field notes. We also reviewed some of the original analysis data held in Archives and reanalyzed some of the unfired clay artifacts curated at the Utah Museum of Natural History. In addition, Phil Geib provided us with information on recently radiocarbon dated sandals from Cowboy Cave.

The analysis of this published and unpublished data, critically filtered and tempered by an additional 20 years of archeological experience, allows us to provide new stratigraphic interpretations about the site that have far reaching implications. First, however, we will present a background discussion on the site and its original analyses to explain why new interpretations are justified.

BACKGROUND

During the summer of 1975, a University of Utah field school excavated Cowboy Cave and Walters Cave, two large, adjacent sandstone caves in southeastern Utah (Jennings 1980). The bulk of the fieldwork was concentrated in Cowboy Cave which had intact stratified deposits up to 2 m thick. Excavation in this cave covered approximately 110 m^2. About 93 m^3 of fill was excavated and screened. Because the site was dry, a full range of perishable and nonperishable artifacts was recovered, notably a series of diagnostic projectile points, distinct sandal types, unfired clay figurines, split-twig stick figurines, a cache of corn, and an abundance of other artifacts.

Based on the site stratigraphy, Jennings (1980:9-26) discussed five "units" that were identified in deposits. Unit I was precultural and contained a thick layer of dung from a variety of extinct Late Pleistocene fauna. Units II-V were believed to be separate cultural components. Within each of these units, a number of strata were defined. These strata consisted of layers of plant fiber, stalks, chaff, and, in some cases, windblown sand. A series of radiocarbon dates (see below) from the deposits showed these strata ranged in age from about 7430 B.C. to A.D. 640.

Cowboy Cave was one of many University of Utah field schools directed by Jesse D. Jennings during his tenure at the University of Utah (Jennings 1994). Critical to Jennings' teaching approach was allowing students to participate in the entire archeological process from site excavation, analysis, and the preparation of a final published report (Jennings 1994:218-219). Examples of his approach include Evans Mound (Berry 1972; Dodd 1982), Innocents Ridge (Schroedl and Hogan 1975), Sudden Shelter (Jennings et al. 1980), the Bull Creek sites (Jennings and Sammons-Lohse 1981), and Cowboy Cave. In all cases, students learned by the process of excavating, analyzing, and writing. Their efforts, for better or for worse, became part of the published archeological record of Utah.

Toward the end of the field excavations of Cowboy Cave, Schroedl, as Jennings' assistant, organized the field stratigraphic sequence into "occupational episodes" (Units I-V [site notes, F1, pp. 62, 79-80, and 86]). This sequence was used in the preliminary excavation report in 1975 (Jennings 1975).

Schroedl, with his limited experience, used the depositional model from Sudden Shelter (cf. Schroedl 1976) to organize the stratigraphy at Cowboy Cave. At Sudden Shelter, the stratigraphy consisted of layers of sediment with high charcoal and artifact content alternating with sandy layers having lower artifact and charcoal content.

At Cowboy Cave, the stratigraphy consisted of numerous layers of plant stalks, stems, fiber, chaff, artifacts, ash, and charcoal. Occasional layers of fine, windblown sand were noted at the site and were easily identified as stratigraphic boundaries. Based on the Sudden Shelter model, Schroedl identified the sandy layers at Cowboy Cave (Strata IIa, IIIa, IVa, IVb, and Va) as the *initiating* stratigraphic boundary markers between the units. This was a preliminary organizing device since the field excavations were not yet completed in mid-July, 1975. Obviously, no artifact analyses had been initiated and only two radiocarbon dates from the cultural deposits at the site were available (UGa-637 and UGa-1053). Therefore, Schroedl's original sequence was based only on physical observations of the strata. The distribution of features, artifacts, and radiocarbon dates were not used to derive this sequence.

Jennings adopted Schroedl's stratigraphic model for the final report (Jennings 1980) and correlated the radiocarbon dates to this unit sequence (Jennings 1980:Tables 2 and 3). In the final report, he (Jennings 1980:20, 26) interpreted the sandy layers as *occupational hiatuses* in Cowboy Cave; "All units include an extensive sterile zone of pink sand, sealing each cultural unit from those above it and below it."

However, as the published artifact analyses in the Cowboy Cave report demonstrate, these strata (IIIa, IVa, IVb, Va, and the Surface Sand) were not sterile. In fact, as the feature data presented below clearly demonstrate, there are in situ features within these sand layers. The artifacts in these layers were not simply "pushed down into the

Table 1. Distribution of Features at Cowboy Cave by Stratigraphic Level

Stratig. Unit	Pits	Ash Pits	Slab-lined Pits	Surface Hearths	Firepits	Pit-structures	Slab-lined Hearths	Metate Concen.	Seed Processing	Surface Structure	Total
Surface Sand	4	-	1	-	1	-	1	-	-	1	8
Vd	-	1	1	-	-	-	2	-	-	-	4
Vc	3	-	1	-	-	-	-	-	-	-	4
Vb	13	9	3	1	1	-	-	-	2	-	29
Va	7	-	4	1	2	-	-	1	-	-	15
IVd	1	1	-	1	-	-	-	-	-	-	3
IVc	9	7	-	-	1	-	-	1	-	-	18
IVb	4	-	-	-	-	-	-	-	-	-	4
IVa	4	2	1	2	-	-	-	-	-	-	9
IIIk	-	2	-	1		-	-	-	-	-	3
IIIj	1	1	-	2	1	-	-	-	-	-	5
IIIh	1	-	-	-	-	4	-	-	-	-	5
IIIg	-	-	-	1	1	-	-	1	-	-	3
IIb	1	-	-	-	-	-	-	-	-	-	1
?	7	-	2	-	-	-	-	-	-	-	9
Total	55	23	13	9	7	4	3	3	2	1	120

loose upper sand zones when occupancy of the cave was renewed" (Jennings 1980:26) but were artifacts that were lost or discarded during the deposition of these layers.

Our analysis of the distribution the features, the radiocarbon dates, and the published artifact descriptions shows that each of the sand layers is associated with the preceding cultural occupation, rather than the succeeding one. This revised stratigraphic sequence is discussed after the presentation of the feature data and a discussion of the radiocarbon dates and diagnostic artifacts.

FEATURES

Features, at whatever scale, whether they are cliff dwellings, pitstructures, rooms, ramadas, storage pits, firepits, ash pits, or simply ephemeral stains, not only provide a context for interpreting associated artifact assemblages but also shed light on occupational patterns, site use and function, and subsistence techniques. Because of the critical importance of the Cowboy Cave features to our interpretations about the occupational sequence at the site, we researched the field notes to provide these data and correct some of the inaccuracies in the published report. For example, Jennings (1980:20) notes "The cedar-lined pits in Unit V were very numerous. Over 50 are recorded." Actually only 52 features including 2 seed processing areas and 1 metate concentration originate in Unit V. Of these, only 32 are pits or slab-lined pits, the remainder are ash pits, firepits, slab-lined hearths, and surface hearths. And the "slab-lined box or cist" in Unit V interpreted as a "storage cache, not involving actual residence in the cave" (Jennings 1980:20) is a feature associated with the looted remains of a surface room within the cave.

Our reanalysis of the field notes demonstrated that at least 120 cultural features representing 10 types were present in Cowboy Cave. The types discussed here are primarily descriptive types based on Schroedl (1980), Wilke and McDonald (1989), Gilman (1987), Bullard (1962), and Adams and Adams (1959). Pits are the most common type of feature, followed by ash pits, slab-lined pits, surface hearths, firepits, slab-lined firepits, pitstructures, milling stone concentrations, seed processing areas, and a surface room. Table 1 lists the frequency of features by strata in the site. This table demonstrates that features were present in all of the cultural sand layers (Strata IVa, IVb, Va, and the Surface Sand), except Stratum IIIa. Most of the feature types do not appear to be stratigraphically or chronologically restricted with the exception of the pitstructures and the surface room.

Information on each feature is either discussed in the text or presented in the appendix. Features are identified by an "F" number following Jennings' field note taking system (see Jennings [1994:277-278] for a discussion of this note taking system). Where possible, the dimensions and grid locations (e.g., 17R24, i.e., 17 units up, right 24 units) of each feature are presented. The absence of north-south measurements for many of the features indicates that these features were not readily recognized (see Jennings 1980:17). These features were only identified in profile and at least some of the fill in these features was excavated as earlier material. In addition, the discussion of artifacts included within features is incomplete. Where field notes and analysis notes specifically indicate the presence of artifacts, they are included in the discussions. However, we did not reanalyze the entire Field Specimen (FS) log to identify all artifacts recovered from features.

Pits

Pits are the most common type of cultural feature in Cowboy Cave with 48 identified from Stratum IIb through the Surface Sand and an additional 7 which could not be provenienced. Pits are defined as purposefully excavated concavities showing no fire oxidation, fire reddening, or blackening. Six pits contained a milling stone in the bottom and eight other pits contained one or two milling stone fragments. Most of the pits were lined with juniper bark. Large and small pits were evenly divided from Stratum IIb to the Surface Sand, but the greatest number of pits per stratum are concentrated in Strata Vb, Va, and IVc.

Ash Pits

While Bullard (1962:161) considers ash pits a distinctly Anasazi trait, ash pits are found throughout the prehistoric period on the Colorado Plateau and Great Basin (Fowler et al. 1973; Schroedl 1980); they were present in Strata IIIj, IIIk, IVa, IVc, IVd, Vb, and Vd.

Ash pits are generally described in the field notes as depressions or as small, circular, shallow pits filled with ash or charcoal, but with no evidence of in situ fire reddening or burning. If a pit was oxidized or burned, it was classified as a hearth. The distinguishing characteristic of ash pits was the presence of ash as a secondary deposit which ranged from dark gray to pure white. Some ash pits contained charcoal and ash; others just ash. Ash pits are generally described in the field notes as small, and this is confirmed by analysis of recorded dimensions. In diameter, ash pits range from a maximum of 15 to 45 cm with a mean diameter of 27 cm.

In Anasazi sites, ash pits are often found with burned or fire-cracked rocks in them, leading Bullard (1962) to suggest they are generally used for heating: stones are heated in outside fires, then brought inside habitation rooms and deposited in ash pits for heat. In Cowboy Cave, ash pit F119A from Stratum Vb contained two milling stone fragments and ash pit F173 from Stratum IVa contained an abrading stone, but the absence of fire-cracked rock or other stones in the ash pits indicates these features may not have functioned as heating pits at Cowboy Cave.

Cactus pads were present in ash pits F141 and F120A from Strata IIIk and Vb, respectively. Charred seeds were present in ash pit F155 from Stratum Vb. Ephedra was present in ash pit F199 from Stratum Vb. The presence of these plants may indicate ash pits were used to roast food, but analysis of bulk soil samples from these features would need to be conducted to determine feature function.

Slab-lined Pits

Slab-lined pits are the third most common cultural feature in Cowboy Cave. Slab-lined pits were restricted to Units IV and V. Seven of the 13 slab-lined pits came from Stratum Va or Vb. Strata IVa, Vc, and Vd and the Surface Sand each contained one slab-lined pit. Two additional slab-lined pits could not be unequivocally provenienced.

Slab-lined pits are defined as excavated basins wholly or partially lined with sandstone slabs or milling stones. Only 5 of the 13 slab-lined pits were completely lined or enclosed with sandstone slabs. These five complete slab-lined pits include two square or box-shaped cists and three circular slab-lined cists.

The two square or box-shaped slab-lined pits are typical Anasazi-style storage bins (Bullard 1962). Corners of both storage bins (F94 in Stratum Vb and F148 in the Surface Sand) were sealed with jacal and juniper bark, but these, like all other slab-lined pits in the site, were empty, leaving their function unknown.

Three completely enclosed circular cists were excavated: F97 in Stratum IVa, F100 in Stratum Va, and F193 in Stratum Vb. None of these circular cists, nor the other partially lined slab-lined circular pits, had sealed or chinked corners.

While not completely lined, eight pits appeared to have been intentionally or purposefully lined with three or more slabs of sandstone. In these pits, the stones appeared to have been placed on the bottom and sides of the pits to form a rock lining. It is possible that some of the "missing" slabs from these pits had been collected and reused prehistorically.

Many of the sandstone slabs within the 13 slab-lined pits were whole or partial milling stone fragments. Ten of the 13 slab-lined pits were lined with at least one or more whole milling stones or milling stone fragments. Three slab-lined pits were lined with only unworked sandstone.

Surface Hearths

Surface hearths or fire areas are the fourth most common type of cultural feature in Cowboy Cave with nine of them identified in Units III, IV, and V. Surface hearths are defined as unprepared or amorphous areas of burned, heated, or reddened deposits (i.e., casual surface fire areas, cf. Schroedl 1980:31-32). With only one or two fire areas present in Strata IIIg, IIIj, IIIk, IVa, IVd, Va, and Vb, there is no clustering of these features within particular strata at the site.

Firepits

Firepits are the fifth most common cultural feature at the site with seven firepits identified in Strata IIIg, IIIj, IVc, Va, and Vb and the Surface Sand. Two firepits are in Stratum Va, the other units contain only one firepit. Firepits are defined as excavated pits with evidence of in situ fire reddening or burning. Only two firepits contained fire-cracked rock: F143 from the Surface Sand and F132 from Stratum Va. None contained groundstone.

Slab-lined Firepits

Only three slab-lined firepits were recorded at the site. Slab-lined firepits are formally defined as excavated basins wholly or partially lined with pieces of sandstone slabs or milling stones and exhibiting at least some in situ heating or burning. Slab-lined firepits include F93 from the Surface Sand and F64 and F73 from Stratum Vd. Although Schroedl (1980) believed that slab-lined firepits were diagnostic of the Middle Archaic period, it is now clear that slab-lined firepits continue through the archeological record up through the Formative and Prehistoric.

Pitstructures

Large depressions along the east and west sides of the cave were recognized during the excavation, but their form, shape, and function were not clearly understood at the time, so they were incorrectly and variously described in both the preliminary and final report as "scooped out troughs" (Jennings 1975:9), "cooking/living zones," "habitation locations" between ridges (Jennings 1980:17), and "scooped-out zone" (Jennings 1980:Figure 14). A careful reexamination of field notes in relation to information on Archaic pitstructures (Janetski et al. 1991; Metcalf and Black 1988; Rood 1990; Wheeler and Martin 1982) leads us to conclude that within Unit III there were four pitstructures that were repeatedly cleaned out and reoccupied during the Early Archaic (Figure 1). Because these pitstructures were not recognized as discrete features during the excavation of Cowboy Cave, information about these structures is scattered throughout the field notes. We have assigned letters A-D to the structures. All four of these structures occur in the Early Archaic component at the site.

In Southwestern architectural typology, pithouses are defined as residential structures consisting of an excavated subsurface pit whose sides form the lower wall of a superstructure or roof (cf. Eddy 1966:353; McGregor 1974:153). The term pitstructure can include both true pithouses and houses which are built in shallow pits, both with roofs or superstructures. The four pitstructures in Cowboy Cave are not true pithouses since they lack superstructures. Gilman's (1987:539) definition of a pitstructure on the other hand, is simply a structure whose floor is excavated below the ground surface. Her definition fits the four structures in Cowboy Cave. The structures are created by digging a large, circular to oval-shaped depression in the fill of the cave near the cave's side walls, then piling the resulting backdirt around the excavated depression.

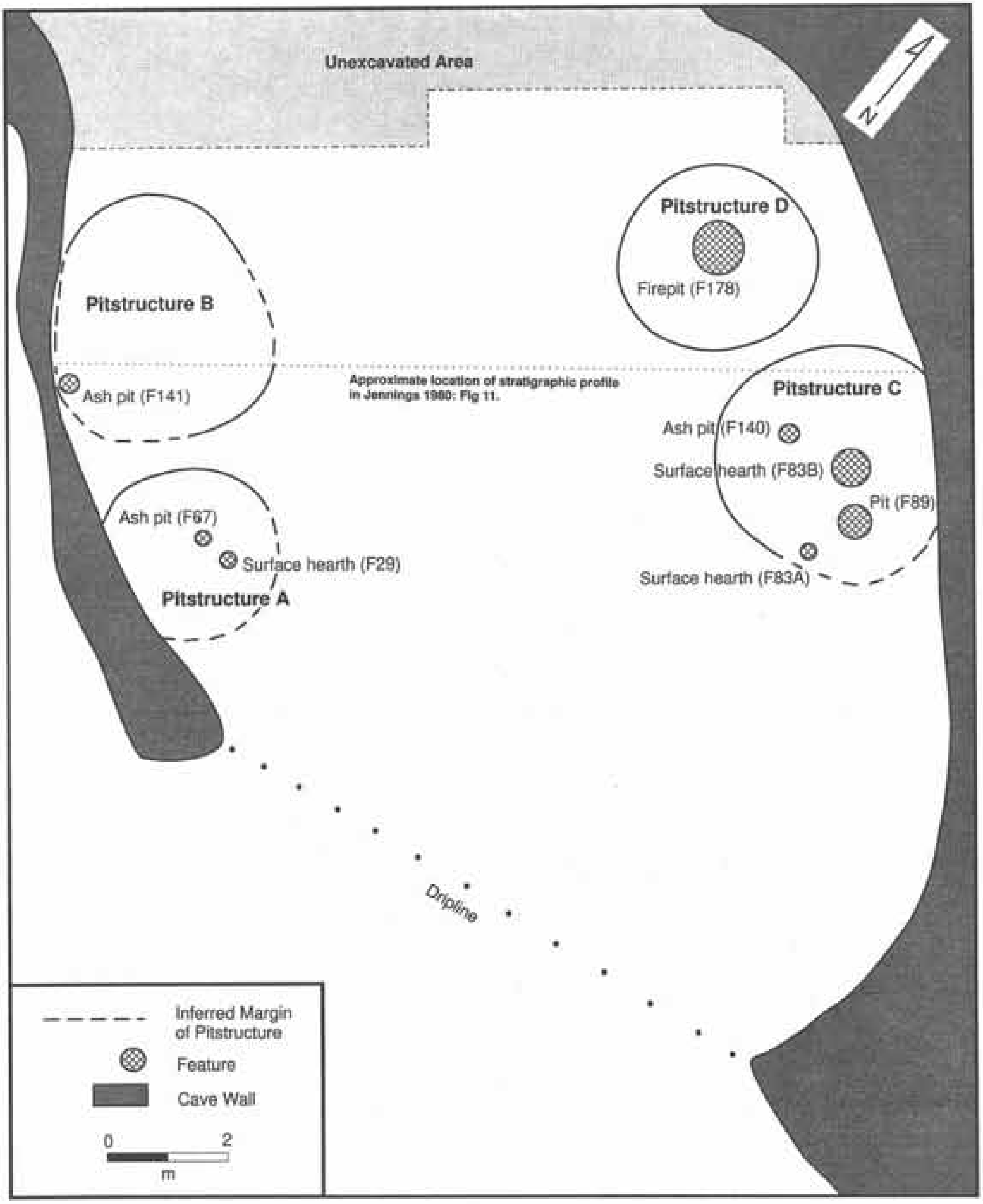

Figure 1. Plan map of Cowboy Cave showing the locations of the Early Archaic pitstructures and associated features.

The first use of these structures may have consisted of building small fires within natural depressions on each side of the cave without any excavation. Eventually, the actual excavation of these four pitstructures may have been a cleaning episode resulting in the deepening of a shallow, saucer-shaped depression. With each occupation, deposits accumulated in and around the floor features so the inhabitants would clean out the depression and associated features by pushing ash and waste deposits up and over the ring of back dirt partially surrounding the depression. Over time, the pit's floor would deepen as waste fill was deposited around the circumference of the pit. The repeated cleaning of the pit and central feature or features resulted in the discretely banded Early Archaic strata easily identifiable in site photos (Figures 13-14 in Jennings 1980:21-22). These strata represent secondary deposits from the multiple reoccupations and cleanings of the pitstructures over time.

The multiple cleaning episodes resulted in several of these pitstructures being excavated into the dung layer (Stratum Ib). The presence of several central firepits (e.g., F29, F89) situated on the surface of the Pleistocene dung layer lead the field excavators to speculate that these features represented the earliest occupation of the site. These features and the associated thin layer of cultural debris, in fact, marked the final occupation of each of the four pitstructures.

Pitstructure A (F28, F29, F31, F32, F67) was semicircular in plan view and abutted the west wall near the cave mouth. It had an estimated diameter of 2.5-3.0 m. The initial 1973 test trench at the site, situated in a looter's pit, cut through this pitstructure. A radiocarbon date from the initial test trench (UGa-637) probably dates an early cleaning episode from this pitstructure.

In the field notes, F32 marks the last occupation floor of Pitstructure A. It was a shallowly dug depression excavated into the precultural dung. This occupation of the pitstructure is marked by the presence of both surface hearth F29 and ash pit F67. Both these internal features were slightly off-set from the pitstructure center. Postoccupation fill is represented by Stratum IVa within the pitstructure.

Pitstructure B (F128, F141, F151) was set further back in the cave, behind Pitstructure A, on the west side of the cave. Pitstructure B is visible in the profile (Figure 11) in Jennings (1980:16). Pitstructure B was egg shaped in plan view, the pointed end toward the rear of the cave. This structure also abutted the western cave wall and measured 3.5 by 4.0 m. The last occupation floor of Pitstructure B (F151) contained an ash pit (F141) in the southwest quarter near the cave wall. It is notable that this was one of the two ash pits in the pitstructures that contained cactus pads.

Pitstructure C (F83, F83A, F83B, F89, F140) abutted the eastern cave wall. The cross section of this pitstructure is visible on the right side of Figures 11 and 13 in Jennings (1980:16, 21). Pitstructure C had an estimated maximum diameter of 4 m. An early occupation of this pitstructure was radiocarbon dated (SI-2419) and this date is discussed in detail below. The last occupation floor of this pitstructure is a mixture of sand, ash, and grass chaff that ranges from about 4 to 12 cm thick within the aboriginally excavated depression (F83). This occupation contained a piece of painted sandstone, a clay figurine with incised decorations (FS 868), and four floor features: two surface hearths (F83A, B), a pit (F89), and an ash pit (F140). F89 in Pitstructure C was one of the few pits with intact contents in the site. A capping rock of groundstone covered the pit. The pit was filled with burned and singed prickly pear cactus pads.

Pitstructure D (F38, F175, F176, F178) was located along the east side of the cave, towards the rear of the cave, north of Pitstructure C. It was a maximum of 3.5 m in diameter and a maximum of 1.0 m deep from the highest side of the pit perimeter to the bottom of the floor which was cut into the dung layer. Its final occupation floor (F175) contained a centrally located firepit (F178).

There is no evidence of a superstructure over any of the four pitstructures. No postholes, foot log channels, or other evidence of roof supports were found during the excavations. Nor were any leaner poles, logs, or pieces of wood of any substantial diameter found within the Unit III deposits that could have been remnants of superstructures. Of course, given that these pitstructures were inside the cave, they did not need to be roofed. It is interesting that several wooden pegs were recovered from the Early Archaic deposits in the cave (Janetski 1980:84-85). These pegs could well have held down hides or some sort of windbreak around the pitstructures.

Milling Stone Concentrations

Milling stone concentrations were among the most poorly described features in Cowboy Cave; nevertheless, three purposeful arrangements or concentrations of milling stones with grinding surfaces facing upward could be identified from the field notes from Strata IIIg, IVc, and Va. F188 in Stratum IVc was comprised of 10 milling stone fragments in a 1 m diameter circular area. F115 from Stratum Va was composed of one complete milling stone and three fragments, all found with grinding surfaces upward, suggesting an actual use area along the east wall of the cave. This concentration was at the same level of origin and less than 3 m away from two slab-lined pits (F113 and F114). F109 in Stratum IIIg was composed of two whole milling stones and one fragment that appeared to be arranged purposefully with grinding surfaces upward. Other milling stone concentrations may have been present, but the notes are insufficient to identify them.

Seed Processing Areas

Two seed processing areas were present in Stratum Vb. In plan view, both were circular areas of densely concentrated seeds and plant chaff. F40 was 3-4 m in diameter and 3-5 cm thick. It was thickest towards the front of the cave. The other seed processing area, F120, lay within 2 m of F40 in the same stratum. This seed processing area was about 4 m in diameter. It was 13 cm thick in the center and it thinned out towards the circumference. On the northeast edge of F120, about 1 m away from the seed concentration, three milling stone fragments (FS 2031) were found along with two ash pits, F120A and F120B. The association of these artifacts and features is suggestive of a specialized seed processing activity area.

Surface Structure or Room

Cowboy Cave contained a surface masonry room within the uppermost eolian sand, the Surface Sand (Figure 2), typical of Basketmaker structures found in rockshelters of the San Juan River region (Adams and Adams 1959:12-13; Long 1966). This looted surface structure represents the last major prehistoric use of the site. Figure 7 of the Cowboy Cave report (Jennings 1980:11) depicts the unexcavated structure covered with unconsolidated sand. Prior to excavation, the structure was covered by a 7 m diameter sand dune with a central depression 3 m in diameter. The central depression was a result of a looter's pit within the center of the structure; a dead burro lay near the edge of this depression and scattered rubble lay at the base of the dune. Because the field excavators failed to recognize this structure as a discrete feature, information about this structure is scattered throughout the field notes (F21, F24, F25, F134, F148, F149).

When the information is organized and a single plan map prepared (see Figure 2), it is clear the surface structure was originally a single, circular room outlined by a ring of 60 or more unshaped, irregular sandstone blocks and slabs, and at least 14 milling stone fragments. Looters had completely excavated the interior of the structure, leaving behind modern trash including cigarette butts. The looters had also disturbed the dry-laid masonry construction but, based on other such structures in the region, it seems this room was originally built of two to three courses of sandstone with associated upright vertical slabs. In addition to its construction, the room also had other features typical of a Basketmaker III or Anasazi surface structure, including some form of wooden superstructure and a masonry storage bin.

Several logs or branches scattered around the surface of the sand dune probably represent remnants of a

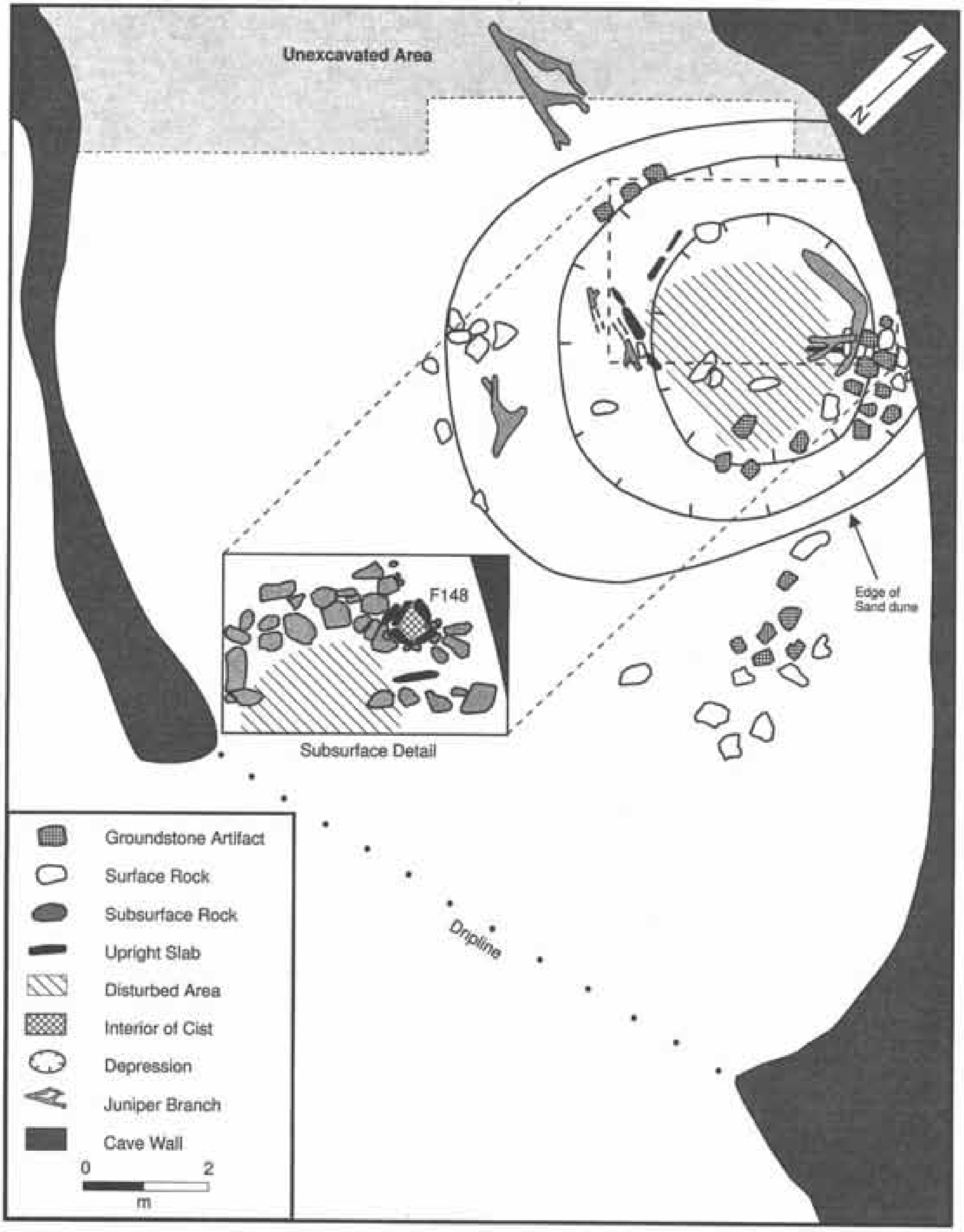

Figure 2. Composite plan map showing the looted remains of the surface room at Cowboy Cave. The insert shows details of the intact portion of the surface room that was recorded during excavation.

superstructure (see Figure 2). One of these branches is visible in Figure 9 (Jennings 1980:13). These timbers were not as large as the straight beams that form conical tipi superstructures typical of Basketmaker III sites throughout the Southwest (Bullard 1962). Such logs were usually placed with their butts against the periphery of the structure and their tips pointing to the center (cf. Morris and Burgh 1954). The timbers were also not as straight as those typically used as horizontal foot logs (Eddy 1966:345; Morris and Burgh 1954). Since looters had displaced the original arrangement of the logs and branches, we are unable to describe the wooden superstructure.

The end of the logs were burned, probably reflecting the absence of axes to cut the logs (Morss 1954). Tree-ring dating these logs would date the last occupation of the site, although, as Morss (1954:17) notes, timbers obtained by burning, rather than felling with an axe, tend to lack bark rings since they are not cut as green wood. Unfortunately, the logs were not curated since they were believed to have been brought into the cave by cowboys or looters.

A square storage bin or box-shaped cist (F148) was built into the rock ring outlining the structure. This is a typical Basketmaker/Anasazi-style storage bin (cf. Bullard 1962; Morris and Burgh 1954:Figure 26c). It was made by digging a large pit and placing a sandstone slab flat on the bottom of the pit. Upright sandstone slabs were placed around the bottom slab to line the pit sides. The upright sandstone slabs were placed at right angles to each other to form a box. The upright slabs were double on all but one side, so there were a total of seven uprights forming the box. Corners of the upright slabs were sealed with mortared juniper bark. The feature was filled with unconsolidated sand, pack rat dung, a corn husk, pieces of bone and charcoal, and, intruded into a matted layer of grass fiber, corn husks and ash that extended underneath the ring of rocks on both the east and west sides. This matted layer, which produced a radiocarbon date (SI-2426), predates the construction of this room.

RADIOCARBON DATES

Since the publication of the Cowboy Cave report in 1980, there have been a number of advances in radiocarbon dating and interpretation including the development of high precision tree-ring calibration of radiocarbon dates. In this section, we provide additional provenience data that were not presented by Jennings, provide two new dates on sandals that Phil Geib obtained since the 1980 report, and calibrate all of these dates to the Gregorian calendar using Calib (Stuiver and Reimer 1993)[1].

Although Jennings (1980:24-25) presented the radiocarbon dates in chronological sequence, the occupational history of the site is clarified by discussing the radiocarbon dates in stratigraphic sequence. Table 2 presents the cultural dates from Cowboy Cave in actual stratigraphic sequence along with the calibrated date ranges. Each of the dates is discussed individually below.

Figure 3 graphically depicts the distribution of radiocarbon dates and stratigraphy at Cowboy Cave in relation to a current cultural chronology for the Archaic (Schroedl 1992). The earliest seven dates fall into the Early Archaic period. Three dates are associated with a Late Archaic occupation in the cave. The last five dates apparently represent a Terminal Archaic occupation at the site.

SI-2418 (8275 ± 80 B.P.)

This date was obtained from a charcoal sample (FS 508) that was collected from the surface of culturally sterile Stratum IIa (grid 16R24) about 2.5 m northeast of the main debitage concentration in Stratum IIb. Since it was on the surface of this layer and associated with the debitage concentration, this date represents the earliest cultural occupation in Cowboy Cave with a 1-sigma calibrated date range of 7430-7100 B.C.

Table 2. Calibrated Radiocarbon Dates from Cowboy Cave in Stratigraphic Sequence

Laboratory Number	FS Number	Stratum	Radiocarbon Age	1 Sigma Calibrated Date Range	Material Assayed	Jennings (1980) Stratum Assignment
SI2425	1940	Surface Sand	1495 ± 60 B.P.	A.D. 540-650	Charcoal	Va
SI2426	1683	Vc	1580 ± 60 B.P.	A.D. 420-550	Bark of *Juniperus* sp. and stalks of *Artemisia* cf. *dracunculus*	Vc
SI2423	1516	Prob. V	1840 ± 65 B.P.	A.D. 90-310	*Sporobolus* cf. *giganteus*	Prob. V
SI3102R	1517	Prob. V	1670 ± 70 B.P.	A.D. 260-440	Corn	Prob. V
UGa1548	1517-1	Prob. V	1775 ± 70 B.P.	A.D. 150-380	Corn	Prob. V
SI3172	1517-1	Prob. V	1855 ± 70 B.P.	A.D. 80-250	Corn	Prov. V
SI2422	1517	Prob. V	1985 ± 70 B.P.	40 B.C.-A.D. 110	Corn	Prob. V
UGa1053	181	Vb	1890 ± 65 B.P.	A.D. 70-230	Charcoal	Vb?(NP)
SI2495	None	Prob. IVd/VA	3330 ± 80 B.P.	1730-1530 B.C.	*Sporobolus cryptandrus*	NP
SI2998	2293	IVd	3560 ± 75 B.P.	1980-1770 B.C.	Wood	IVd
SI2715	1373	IVc	3635 ± 55 B.P.	2110-1910 B.C.	Charcoal	IVc
AA13005	1692-1	Prob. IVb/IVa	6390 ± 65 B.P.	5420-5260 B.C.	Sandal fragment of *Yucca* sp	NA
AA13006	1790	IVb	6385 ± 85 B.P.	5430-5260 B.C.	Sandal fragment of *Yucca* sp	NA
SI2421	2158	IVa	6390 ± 70 B.P.	5430-5260 B.C.	Charcoal	IV? (or III)
SI2420	485	IIIi	6675 ± 75 B.P.	5600-5480 B.C.	Sandal fragment of *Yucca harrimaniae*	IIIi
UGa637	13	IIIh	6830 ± 80 B.P.	5720-5600 B.C.	Charred wood	III?
SI2419	1154	IIId	7215 ± 75 B.P.	6120-5970 B.C.	Charcoal	IIId
SI2418	508	IIb	8275 ± 80 B.P.	7430-7100 B.C.	Charcoal	IIb

Note: Prob. = probably, NP = no provenience, NA = not applicable.

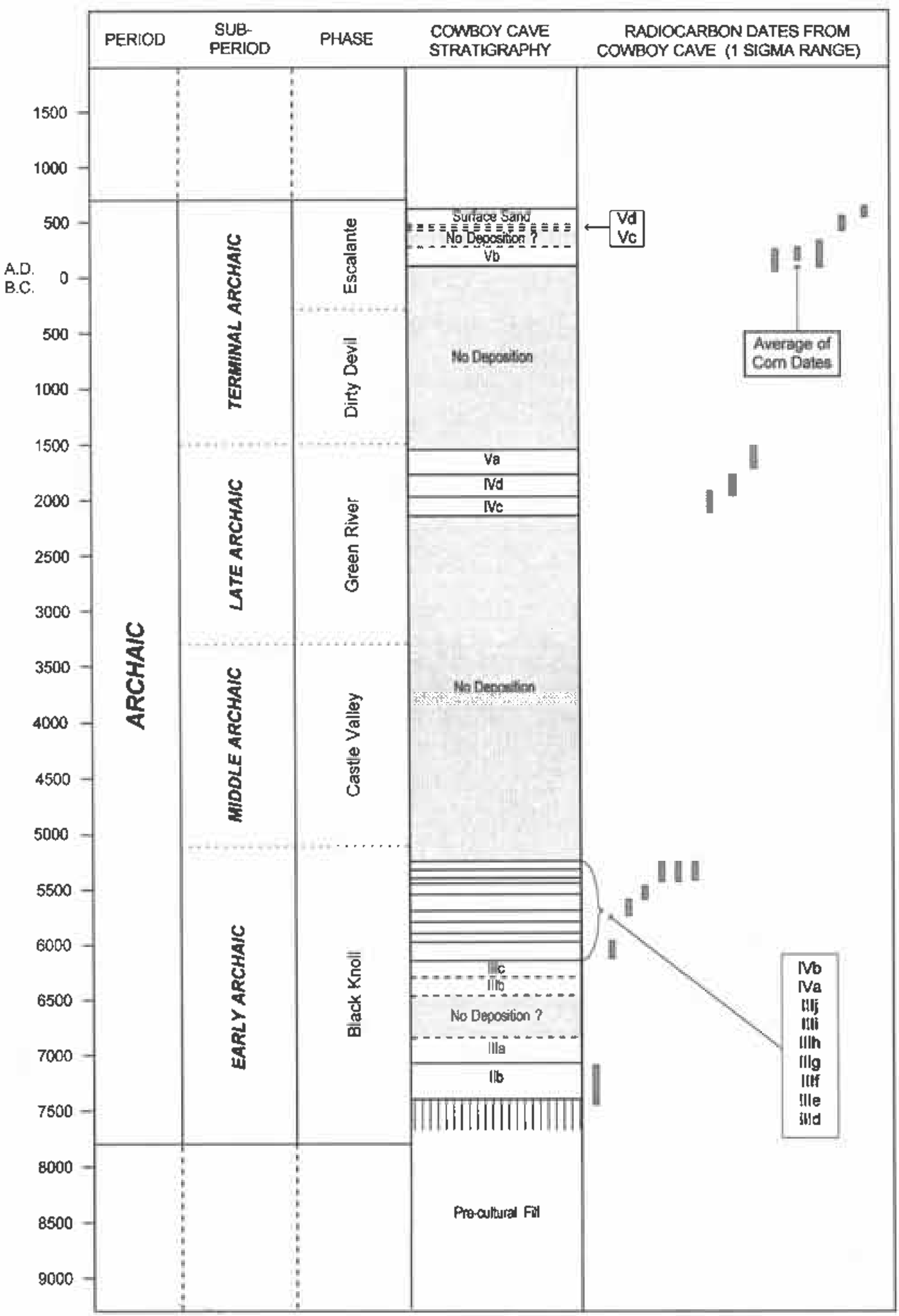

Figure 3. The distribution of radiocarbon dates and stratigraphy at Cowboy Cave in relation to chronological periods of the Archaic (cf. Schroedl 1992).

SI-2419 (7215 ± 75 B.P.)

This charcoal sample (FS 1154) was collected from grid 15R27 from Stratum IIId and has a 1-sigma calibrated date range of 6120-5970 B.C. This sample was collected from one of the midden strata to the west of Pitstructure C and appears to be associated with an early cleaning episode from this pitstructure.

UGa-637 (6830 ± 80 B.P.)

This charred wood sample (FS 13) was collected from the initial test trench in 1973 by Michael S. Berry. This sample was collected because it represented the lowest cultural material identified in the test trench directly above the sand layer Stratum IIIa. It was collected from F12 from within or near grid 15R20. The field notes indicate that F12 is correlated with Stratum IIIh. This stratum produced several plain weave sandals and appears to have resulted from one or more cleaning episodes during the occupation of Pitstructure A. This sample has a 1-sigma calibrated date range of 5720-5600 B.C.

SI-2420 (6675 ± 75 B.P.)

This date was derived from a sandal fragment of *Yucca harrimaniae* (Harriman yucca) (FS 485) collected from Stratum IIIi in grid 16R24. Although this sandal was not typed before it was sent for dating, it seems likely that this was a plain weave sandal (cf. Geib 1993:7-7). This sandal was recovered in midden debris in the middle of the cave away from any of the pitstructures associated with Unit III occupation. It has a 1-sigma calibrated date range of 5600-5480 B.C.

SI-2421 (6390 ± 70 B.P.)

This charcoal sample (FS 2158) was collected from a shallow basin within Stratum IVa (19R31) along the east wall. The 1-sigma calibrated date range for this sample is 5430-5260 B.C. Although Jennings questions this date, it was derived from an in situ basin within Stratum IVa and accords well with the dated sandals from the same occupational episode (see below, AA-13005, AA-13006).

AA-13006 (6385 ± 85 B.P.)

This plain weave sandal (FS 1790) was collected towards the rear of the excavated area in grid 18R28 from Stratum IVb. Phil R. Geib (personal communication 1994) obtained a small sample of this sandal in 1994 to submit for an AMS date. Geib has been attempting to define the time span of plain weave sandals from Early Archaic components in the Southwest. This sandal has a 1-sigma calibrated date range of 5430-5260 B.C.

AA-13005 (6390 ± 65 B.P.)

This plain weave sandal fragment (FS 1692-1) was collected in grid 19R22 and provenienced to Stratum IVc. A sample of this sandal was submitted for accelerator dating at the University of Arizona by Phil Geib in 1994. This sandal was located about 3 m to the northeast of Pitstructure B. It has a 1-sigma calibrated date range of 5420-5260 B.C. The provenience of this sandal may be in error. This sandal is away from the debitage concentration for Stratum IVc as depicted in Figure 21 (Weder 1980:47); Stratum IVc material and features were concentrated on the east side of the cave. Also, towards the rear of the excavations, all of the cultural strata thinned out compounding provenience assignments. It is probable that this sandal is from Stratum IVa or IVb.

SI-2715 (3635 ± 55 B.P.)

This charcoal sample (FS 1373) was collected from Stratum IVc in grid 17R25 near a heavy debitage concentration (Weder 1980:47). This sample has a 1-sigma calibrated date range of 2110-1910 B.C.

SI-2495 (3330 ± 80 B.P.)

This sample (no FS number) was a pad of *Sporobolus cryptandrus* (Sand dropseed) associated with the skin bag recovered during the testing in 1973 from a wood rat midden within the deposits. The initial 1975 excavations were expanded off the 1973 test trench and several strata/lenses were noted during the initial 1975 excavations that contained an abundance of wood rat feces and urine. Correlating these with the final stratigraphic designations at the site strongly suggests that the bag was associated with either Stratum IVd or Va. This sample has a 1-sigma calibrated date range of 1730-1510 B.C.

UGa-1053 (1890 ± 65 B.P.)

Jennings (1980) did not provide an FS number for this sample. In 1992, we contacted the Center for Isotope Studies at the University of Georgia where Stan DeFilippis provided the provenience. The charcoal sample (FS 181) was collected from F4 in grid 16R20 on June 11, 1975, and submitted for analysis on June 19, 1975. Stratigraphically, this sample is correlated with Stratum Vb. This sample was collected shortly after the start of the field excavations in 1975 and was submitted to provide a limiting upper date on what was at the time believed to be the last occupation at the site. This sample has a 1-sigma calibrated date range of A.D. 70-230.

The Corn Dates (SI-2422, SI-3172, SI-3012R, UGa-1548)

The radiocarbon dates on an early corn cache from Cowboy Cave have been discussed and interpreted in many publications (Berry 1982; Berry and Berry 1986; Geib and Bungart 1989; Wilde and Newman 1989). Geib and Bungart (1989) have most succinctly discussed and clarified the radiocarbon dates relating to this corn cache. As noted in Jennings (1980), four separate dates were obtained from the shelled corn within the skin pouch (FS 1517). However, Geib and Bungart point out that isotopic correction was not properly reported by Jennings for all the dates. We have used Geib and Bungart's "Standard Corrections" for the corn dates in Table 2. The average of the four separate corn dates provides a 1-sigma calibrated date range of A.D. 140-250.

The cache was discovered in F157 in grid 18R23 and was believed to have originated in Stratum IVc. An exhaustive review of the notes (both in 1975 and over the past two years) has failed to answer the question of the stratum of origin of the pit containing the cache. Based on radiocarbon dates, Strata IVc through Va date no later than about 1500 B.C. which is more than a 1000 years earlier than the dated corn samples. The calibrated date indicates the corn cache was situated in a pit that originated in Stratum Vb.

SI-2423 (1840 ± 65 B.P.)

This sample (FS 1516) was a grass pad of *Sporobolus giganteus* (Giant dropseed) associated with the corn cache (FS 1517) within pit F157. The provenience of this pad is also uncertain. This sample has a 1-sigma calibrated date range of A.D. 90-310 and is probably associated with Stratum Vb.

SI-2426 (1580 ± 60 B.P.)

This sample (FS 1683) of *Juniperus* sp. (Juniper) bark and stalks of *Artemisia* cf. *drunculus* (Terragon) was collected from the matted vegetal material beneath the ring of rocks and slabs forming the surface structure or room. The sample was collected from Stratum Vc (F145) in grid 18R27. The 1-sigma calibrated date range for this sample is A.D. 420-550.

SI-2425 (1495 ± 60 B.P.)

This sample (FS 1960) was collected from a firepit (F183) in grid 17R30. The student excavators assigned this feature to Stratum Va; however, reanalysis of the field notes and field specimen logs for grid 17R30 and the surrounding eight grid units demonstrate the artifacts from the Surface Sand and Strata Vb and Vc in this grid were bagged together as Stratum Va by the student excavators.

Given that the Surface Sand and Strata Vb and Vc were excavated as a single level in this grid square[2], it is highly likely that F183 originated in a stratum later than Stratum Va. Because the field notes clearly indicate this feature originated within a sand layer, we believe it was actually constructed within the Surface Sand. The sample has a 1-sigma calibrated date range of A.D. 540-640.

Discussion

Chronologically, the radiocarbon dates form discrete temporal clusters representing three periods of prehistoric use (Figure 3). The first ranges in age from about 7400 B.C. to about 5200 B.C. and falls within the Early Archaic; the second, from about 2200 B.C. to about 1500 B.C., occurs at the end of the Late Archaic; and the last ranges from about A.D. 100 to 650 and falls at the end of the Terminal Archaic (cf. Schroedl 1992). The stratigraphic distribution of the dates shows that the occupational hiatuses in the cave are not associated with the sand layers (Strata IIIa, IVa, and IVb and the Surface Sand) or *any* natural depositional events. All cultural strata include in situ artifacts and most include in situ features (see above). Based on the radiocarbon dates and the distribution of artifacts (see below), the sand layers (Strata IIIa, IVa, and IVb and the Surface Sand) are culturally and temporally affiliated with the preceding occupations, they are not sterile layers with a few trampled artifacts from later occupations. Thus, the Early Archaic component at the site is represented in Strata IIb through IVb, the Late Archaic in Strata IVc to Va, and the Terminal Archaic in Strata Vb through the Surface Sand.

Application of this stratigraphic interpretation to the artifact distributions in the cave addresses some of the issues previously raised about the site stratigraphy (Berry and Berry 1986; Matson 1991). This revised stratigraphic interpretation allows us to identify previously unrecognized traits and artifacts that are distinctive and diagnostic to each of these Archaic occupations (Table 3). Our discussion of diagnostic artifact classes below is tempered by the fact that we used the published artifact discussion in Jennings (1980) and did not, with the exception of the unfired clay figurines, actually review the artifact collections themselves.

During our analysis of diagnostic artifacts and traits, we considered several factors that might affect the stratigraphic distribution of artifacts at the site. First, there may be both field and laboratory provenience errors; artifacts may be assigned to strata from which they were not actually recovered. We have already noted several instances of wrong provenience assignment in the published report. Second, artifacts may have been moved up or down in the deposits by cultural and/or natural agents. There is no doubt that Berry and Berry (1986) were correct about the upward displacement of artifacts in the upper levels of the site. Many of the features that were constructed during the Terminal Archaic (Strata Vb through the Surface Sand) were excavated into the underlying Late Archaic deposits (Strata IVc through Va). These prehistoric pit excavations brought up some of the Late

Table 3. Artifact Types Restricted by Time Period at Cowboy Cave

Period	Projectile Points	Fiber Artifacts	Wood Artifacts	Unfired Clay Artifacts	Bone Artifacts
Terminal Archaic	Rose Spring	cross weave sandal, S-twist cordage	arrow shafts, gaming pieces	pinched nose figurines	gaming pieces, hyoid bone pendants?
Late Archaic	Gypsum	unknown sandals?, S-twist cordage, "problematic objects," "buttons"	split-twig figurines		
Early Archaic	Northern Side-notched	plain weave sandals, open twined sandals, Z-twist cordage	wooden pegs?	Horseshoe shouldered figurines, conical objects	rabbit phalanges with grass stems?

Archaic diagnostic artifacts, i.e., Gypsum points and split-twig figurines, and redeposited them in the Terminal Archaic strata.

Third, given the stratigraphic sequence presented by Jennings (1980), artifact analysts may have overlooked stylistic variation in an artifact class because the class was represented throughout the deposits. For example, clay figurines were found throughout the deposits and were interpreted as a single homogenous class (Hull and White 1980; see also Jennings 1989:163). Coulam and Schroedl (in prep.), however, applying the stratigraphic sequence presented here, show that the unfired anthropomorphic figurines recovered from the Early Archaic deposits are morphologically distinct from the pinched nose variety recovered from the Terminal Archaic component (cf. Morss 1954).

Finally, some of the artifact types defined by the analysts may not have any validity. Dodge (1980) presents a discussion of slab (< 5 cm thick) versus block (> 5 cm thick) metates. Analysis of thickness of 462 metates and metate fragments recorded in the field notes shows that metate thickness is unimodally distributed (Figure 4). While there may be different types of metates present at Cowboy Cave, they are not distinguishable by thickness.

DIAGNOSTIC ARTIFACTS AND TRAITS

Given the above caveats, there are a variety of artifact classes and traits that appear to be chronologically diagnostic at Cowboy Cave. Holmer (1980) notes that some of the projectile point types have chronological significance. The Northern Side-notched points are restricted to the Early Archaic strata and are associated with the pitstructure occupations. While Gypsum points first occur in Early Archaic Stratum IVa, Holmer apparently concedes that they are no earlier than about 3300 B.C. The occurrence of four Gypsum points in this strata may be examples of erroneous provenience assignment or downward movement of artifacts by trampling. In 1978, Holmer (1978) unquestioningly accepted the stratigraphic distribution of Gypsum points at Cowboy Cave and extrapolated a terminal date of manufacture of this type to about A.D. 500.

Berry and Berry (1986) believe that both Gypsum points and split-twig figurines do not date any later than about 1000 B.C. Lacking published feature data, they could only speculate that the presence of these artifact types in Terminal Archaic strata was a result of upward movement of the artifacts in the deposits. Given the feature data presented above, the revised stratigraphic interpretations, and the lack of Gypsum points from any other well-dated stratigraphic contexts after about 1500 B.C., Berry and Berry's speculation is finally supported. The presence of Gypsum points in the Terminal Archaic strata are a result of secondary deposition in these strata from prehistoric pit excavations into the underlying Late Archaic strata.

Arrow points definitively enter the archeological record in Stratum Vb. Eleven of the 12 provenienced Rose Spring points were recovered from the Terminal Archaic strata (Strata Vb through the Surface Sand). Additional support for the beginning of the Terminal Archaic occupation is provided by Janetski's (1980) analysis of the wooden artifacts from Cowboy Cave. Arrow shafts first occur in Stratum Vb, four of the six provenienced specimens are from this stratum.

Finally, Elko points, not surprisingly, were recovered from all three Archaic components. Holmer (1978, 1986) discusses different Elko point "florescences" during the Archaic period. He does not, however, address the issue of whether or not there may be subtle typological differences in Elko points over time. Berry (1987) and Schroedl (1992) suggest that analysis of Elko points and "Basketmaker" dart points from Terminal Archaic components may show typological variation from Elko points of earlier periods.

No other chipped stone tools appear to have any chronological significance (see Weder 1980). However, a review of fiber artifact analyses (Hewitt 1980) does identify chronological variation in this class of artifacts. The

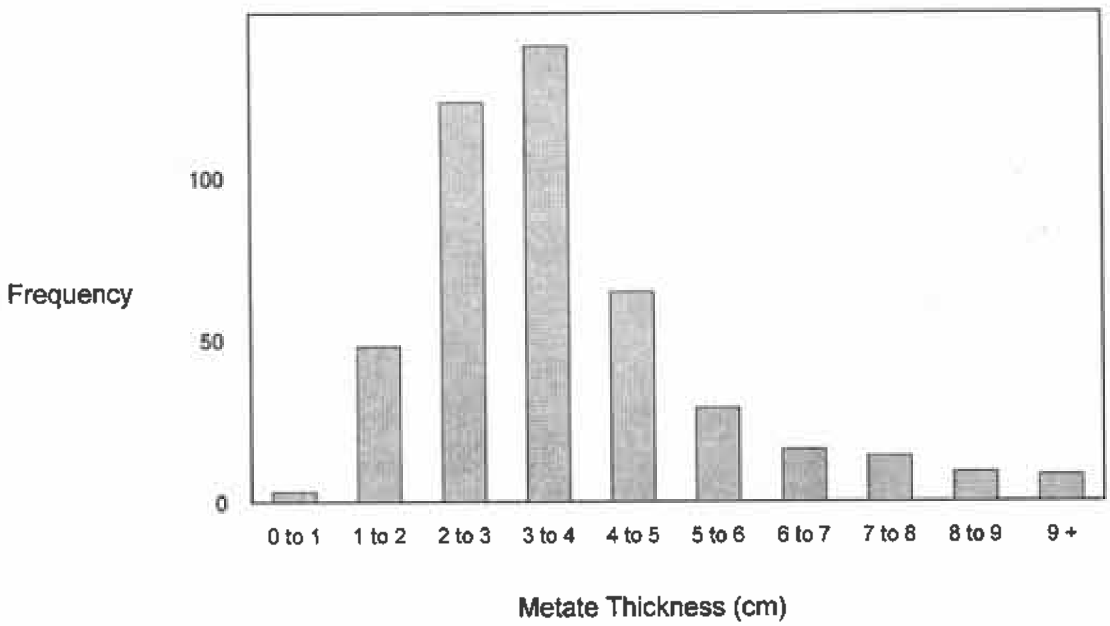

Figure 4. Histogram of thickness of sample of metate and metate fragments from Cowboy Cave.

open twined and plain weave sandals are diagnostic of Early Archaic occupations in the cave. Geib (1993) and Ambler (1993) both suspected these sandal types were temporally significant but could not reconcile their suspicions with the published stratigraphic sequence. In fact, Geib's uncertainty lead him to sample and date two of the plain weave sandals from Unit IV strata (see AA13006, AA13005 above). Given the stratigraphic discussions presented in this paper, it does indeed seem that these types are restricted to Early Archaic strata at the site. The plain weave and open twined sandals in Strata IVc through Va may be misprovenienced and/or represent temporal variations of these types. The single cross weave sandal from the Surface Sand (Terminal Archaic) corresponds directly with antecedents of later Anasazi sandal types (Kankainen 1995).

The distribution of the cordage types at the site is not only chronologically significant but also supports our stratigraphic sequence. In all Early Archaic strata (IIb through IVa) except IIIa, two-ply Z-twist cordage is numerically dominant. Beginning with the first Late Archaic stratum, IVc, and continuing until the final abandonment of the cave, two-ply S-twist cordage is predominant (Hewitt 1980:62). Finally, two other fiber artifacts may be chronological restricted to the Late Archaic, "problematic objects" and "buttons."

Janetski's (1980) analysis of the wooden artifacts from the site indicates wooden gaming pieces are restricted to Stratum Vb and later (Terminal Archaic), as are the arrow shafts and "sticks with pitch," again supporting our stratigraphic interpretation. However, the most distinctive wooden artifacts from the site are split-twig figurines.

Schroedl (1977) estimated that split-twig figurines originated about 2800 B.C. and continued until about A.D. 500 based on the specimens from Unit V at Cowboy Cave. Since then, the lack of any direct dates on split-twig figurines after about 1500 B.C., coupled with Berry and Berry's (1986) discussion of upward movement of artifacts in the deposits at Cowboy Cave, demonstrates that split-twig figurines are restricted to and diagnostic of the Late

Archaic. The occurrence of split-twig figurines in Terminal Archaic strata at Cowboy Cave is a result of secondary deposition by prehistoric pit and feature excavation. This is supported by analysis of the whole and fragmentary split-twig figurines from Cowboy Cave pictured in Figures 37-39 (Janetski 1980:88, 90-91). Seven of 10 whole, provenienced figurines were recovered from Strata IVc through Va (Late Archaic), while 5 of the 8 provenienced fragments were recovered from Strata Va and Vb. This suggests that whole figurines were broken when they were displaced upwards by prehistoric pit excavation in Stratum Vb.

Most of the bone implements (Lucius 1980) are not chronologically diagnostic. However, four rabbit phalanges with stems of grasses in them were found in Early Archaic Strata IIIf through IIIi associated with cleaning episodes of the pitstructures. Bone gaming pieces (Lucius 1980:98) have the same stratigraphic distribution as wooden gaming pieces. Three of the four provenienced gaming pieces of bone were recovered from Stratum Vb. Gaming pieces (wood and bone) are diagnostic of the Terminal Archaic occupation of Cowboy Cave.

Painted and incised stones (Hull and White 1980) may have some chronological significance. Fourteen of the 19 provenienced incised stone artifacts were recovered from the Early Archaic strata (Hull and White 1980:104). Incised stone is known from other sites in the West including Gatecliff Shelter (D. Thomas 1983), Swallow Shelter (Dalley 1977), Hogup Cave (Aikens 1970), as well as sites along the Lower Pecos River in Texas (Shafer 1986). Although apparently present in Early Archaic strata at these other sites, incised stone is more frequently recovered in later Archaic deposits. The Cowboy Cave specimens represent a relatively large assemblage from the Early Archaic. Hull and White (1980), however, did not examine them for stylistic variation between the cultural units. Such variation may exist since T. Thomas (1983) was able to distinguish temporal variation in incised stone styles at Gatecliff Shelter.

Almost half of the provenienced painted stones (8 of the 17) were also recovered from Early Archaic strata. Painted stones are rare to nonexistent in stratified cave sites farther to the west of Cowboy Cave including Danger Cave (Jennings 1957), Hogup Cave (Aikens 1970), Swallow Shelter (Dalley 1977), and Gatecliff Shelter (D. Thomas 1983). However, sites along the Lower Pecos River in Texas far to the southeast of Cowboy Cave have an abundance of painted pebbles. At these sites, painted pebbles appear to be more common than incised stone. In this area of Texas, various styles of painted pebbles have been recognized with the earliest occurring about 4000 B.C. (Shafer 1986:130). Given the widespread distribution of painted pebbles and incised stone in the western United States, we believe that future analyses will demonstrate temporally significant stylistic variation in these artifact classes.

Finally, our reanalysis of the unfired clay figurines (Coulam and Schroedl, 1996), demonstrates that a style we call Horseshoe Shouldered is restricted to the Early Archaic deposits at Cowboy Cave. The pinched nose variety of figurines in the Terminal Archaic strata have stylistic counterparts at Basketmaker sites (Morss 1954) and the Fremont River sites (Morss 1931). We suspect that some of the deposits at the Fremont River sites were mixed by prehistoric pit and feature excavations, and that some Terminal Archaic clay figurines were incorporated into later Formative deposits.

OCCUPATIONAL SEQUENCE AT COWBOY CAVE

One question that arises is what prompted the sporadic occupation of Cowboy Cave during the Archaic with final abandonment by about A.D. 650. Although Jennings (1989:163) states "there is no ready explanation for this occupancy record," we believe that the various occupations at the cave can be directly related to changing environmental conditions during the Holocene. Each of the occupations in the cave appears to be associated with periods of higher effective moisture. Isgreen (1986:113) notes that there was higher effective moisture in the southern and eastern Great Basin between 8490 and 7740 years ago. The Early Archaic occupation in Stratum IIb falls into this period. Isgreen (1986:113) also notes another period of higher effective moisture between 6910 and 6050 years ago, which covers Early Archaic Strata IIId through IVb. McVickar's (1991:111) vegetation analysis in the vicinity of Cowboy Cave leads her to also support a wet climatic model of the Altithermal during this time.

Isgreen (1986:119) also identifies another period of increased effective moisture between 3570 and 2760 years ago. Again the span of Late Archaic occupation at the Cowboy Cave falls into this time range. Finally, extensive paleoenvironmental research concentrating on the last 2000 years demonstrates that there was increasing alluvial aggradation beginning about A.D. 50 and continuing until about A.D. 250 when a cycle of alluvial degrading began (Plog et al. 1988). This period of higher effective moisture is also represented in the tree-ring data which show thicker rings (on a 50 year average) during this period (Dean 1988:156). Dean (1988:156) also identifies another period of higher effective moisture about A.D. 500. The radiocarbon evidence from Cowboy Cave is limited but does suggest that there may have been two episodes of occupation during the Terminal Archaic corresponding to these two peaks in effective moisture.

Obviously, the periods of higher effective moisture provided for a greater abundance and variety of plants around the Cowboy Cave area, which attracted prehistoric people to the site. Prehistoric people then continued to use the site until climatic conditions changed.

We believe that it was changes in effective moisture that lead to site abandonments. Lindsay's (1980:215) pollen study at Cowboy Cave sheds some light on the cause of site abandonments. He believes that a Neoglacial event is represented in the sand layers, particularly Strata IVa and IVb. To him, the increased arboreal pollen versus nonarboreal pollen in these strata represent expanding forest conditions. Because of Lindsay's use of relative frequencies (see Spaulding and Van Devender [1980:167] for a discussion of the statistical problems of relative pollen frequencies), he was emphasizing the wrong side of the ratio. Arboreal pollen did not increase, it was nonarboreal pollen that *decreased*.

At the end of each prehistoric occupation cycle at the site, economic plant resources, i.e., grasses, were waning as evidenced by declining nonarboreal pollen counts. We believe that it was the lessening of effective moisture over a relatively short period of time (e.g., possibly a High Frequency Process [cf. Plog et al. 1986:231]) that caused the loss of ground cover on stabilized dunes in the vicinity of Cowboy Cave. These barren dunes provided the source of the windblown sands that comprise the sand layers in the cave and the final strata of each major episode of occupation. Some time around A.D. 500-600 a drop in effective moisture (McVickar 1991:120) in the area caused the prehistoric occupants of the cave to abandon the site for the last time.

Based on this discussion of the features, stratigraphy, radiocarbon dates, diagnostic artifacts, and other information about the site, we now provide a short summary of the three major components at the site.

Early Archaic (Strata IIb-IVb [7400-5100 B.C.])

The Early Archaic component at Cowboy Cave ranges in age from about 7400 to 5100 B.C. and is represented by three discrete episodes of use. The earliest Archaic use of the cave, Stratum IIb, dates between 7430 and 7100 B.C. Only a single pit was associated with this occupation which produced a small array of perishable and nonperishable remains. The most distinctive aspect of this occupation is the presence of a lithic reduction activity area in the center of the cave (Weder 1980:46, Figure 20). This single lithic reduction area, covering about 4 m^2, produced 75 percent of the "blanks" and 89 percent of the debitage in the stratum. Surprisingly, no projectile points were recovered from this stratum. The lack of firepits, coupled with the dominance of *Sporobolus*, *Helianthus*, and *Dicoria* in the coprolites from this layer (Hogan 1980:204), and absence of large game species (Lucius 1980:101) indicate that Stratum IIb represents a short-term summer seed gathering and lithic reduction station.

This Early Archaic use of the cave is stratigraphically separated from the next sequence of Early Archaic occupations by an undated sand layer, Stratum IIIa. The lack of diagnostic artifacts and radiocarbon dates make it difficult to estimate the rate of deposition for this layer. However, some time after 7100 B.C. and before 6000 B.C., Early Archaic use of the cave shifted dramatically.

By 6000 B.C. until about 5500 B.C., Cowboy Cave functioned as a winter encampment. During this time, the Early Archaic occupants lived in a series of four pitstructures along the cave walls. How many, if any, of these structures were occupied simultaneously is unknown. Strata IIIb through IIIh represent various cleaning episodes from these structures. Strata IIIj and IIIk represent the last occupations within two of these pitstructures.

Besides the pitstructures themselves representing strong evidence of winter occupation (cf. Gilman 1987), other data support this hypothesis. Bad weather outside the cave is suggested by the quantity of sandals recovered (Kelly 1964:62). Sixty-three percent (28) of the sandals from the cave were recovered from these strata. One hundred and twenty hide and fur artifacts were recovered from these strata. This quantity is only exceeded by the Terminal Archaic occupation in Stratum Vb. Other evidence suggesting bad weather is the use of the cave as a latrine area. Stratum IIIi produced almost half of all coprolites recovered from the site (Hogan 1980:202). Perhaps the quantity of nonutilitarian items in these strata, such as painted and incised stone, and clay figurines, may be indicative of confinement in the cave because of snow or bad weather.

A winter occupation for Strata IIId to IVa is also suggested by the faunal data (Lucius 1980:101). For ethnohistoric Basin-Plateau hunter-gatherers (Steward 1938), the major source of animal protein throughout the fall and winter was jackrabbit. Jackrabbits served as a source of meat and fur for clothing and blankets. Ethnographic analogy suggests that the amount of fur, coupled with the consistent presence of jackrabbit bones in these strata, represents a fall through winter occupation.

Finally, the presence of prickly pear cactus pads in two features in these structures as well as coprolites with epidermal tissue from prickly pear cactus from Stratum IIIi also indicate a winter or early spring occupation. For the Southern Paiute, cacti were the winter staple; "available when all else failed" (Kelly 1964:22, 36, 45, 152, 179). Likewise, the Hopi ate cacti in the early spring (March) when stored foods were exhausted and spring plants were not yet available (Whiting 1966:86). Ambler (1984a) suggests that prickly pear cactus is a starvation food that was used at Dust Devil Cave in Arizona during the Early Archaic. At Cowboy Cave, 61 percent of the coprolites from Stratum IIIi contained epidermal tissue of prickly pear cactus (Hogan 1980:204), the highest of any strata studied. Given the ethnobotanical literature, we interpret the dominance of prickly pear cactus in these strata as indicating winter or early spring occupation. Interestingly, Ambler (1984b) also suggests a winter occupation for the Early Archaic inhabitants at Dust Devil Cave based on an abundance of human coprolites containing prickly pear cactus spines and tissue (see also Van Ness 1993).

We believe that about 5500 B.C. lower effective moisture in the area ultimately caused the deposition of the windblown sand that is the major constituent of Strata IVa and IVb. This climatic change altered the prehistoric pattern of use of the site. From about 5500 to 5100 B.C., prehistoric use of the cave shifted back to a spring-summer, fall pattern. Pitstructures were no longer used for habitation and several pits were constructed presumably for storage.

From about 5100 to 2200 B.C., there was an occupational hiatus in Cowboy Cave. This hiatus between the Early Archaic and Late Archaic occupation is not marked by *either* a cultural or natural depositional unit, it was differentiated solely by the stratigraphic unconformity between Strata IVb and IVc. Failure to acknowledge that occupational hiatuses do not always result in stratigraphic accumulations can lead to confusion. It is very possible that the stratigraphic uncertainty at Hogup Cave (cf. Madsen and Berry 1975) may have resulted from an inability to stratigraphically distinguish a temporal hiatus in a dry cave site when subsistence practices before and after the hiatus produce similar deposits.

Late Archaic (Strata IVc-Va [2200-1500 B.C.])

Reoccupation of the cave began again about 2200 B.C. and continued until about 1500 B.C. Separate occupational episodes could not be distinguished in these strata. While the faunal data are quite limited, available evidence (Lucius 1980:101) suggests a possible shift from small game during the Early Archaic to larger game during the Late Archaic. While numbers of all faunal remains are low, mule deer and bighorn sheep do not occur consistently until the Late Archaic Strata IVc to Va. The ethnographic literature suggests that big game were hunted in October or November (Steward 1938).

Supporting this change in subsistence patterns is the presence of Gypsum points in these deposits. Holmer (1980:104) comments on the possible association of Gypsum points with the hunting of bighorn sheep. Split-twig figurines, diagnostic of this Late Archaic occupation, at Cowboy Cave also support this inference. Schroedl (1977) and others (Emslie et al. 1987; Euler 1984; Jones and Euler 1979) have suggested that these figurines may be associated with hunting, magic, or rituals. Besides hunting, the limited data suggest a primary focus on the gathering and processing of summer-ripening seeds. It appears that diet in the Late Archaic was dependent on *Helianthus, Sporobolus,* and cheno-ams based on coprolites from Stratum IVc (Hogan 1980).

There is some indication that Late Archaic populations were responsible for initiating the Barrier Canyon rock art style. Tipps (1995) discusses in detail some chronometric data relating to the Barrier Canyon pictographs and suggests that the style could have originated as early as 1800 B.C. Horseshoe Canyon, with its numerous Barrier Canyon rock art panels, is only about a day's walk (20 km) downstream from Cowboy Cave. In addition, some red pictographs were noted in the cave (Jennings 1980:9), unfortunately their form and style could not be determined because they were too eroded.

The last Late Archaic use of the cave is represented in Stratum Va. Deteriorating climatic conditions again caused decreases in plant cover as evidenced in the pollen record (Lindsay 1980:217). By about 1500 B.C., Late Archaic peoples abandoned Cowboy Cave.

Terminal Archaic (Stratum Vb-the Surface Sand [A.D. 100-650])

In response to ameliorating climatic conditions, prehistoric people returned to the cave about A.D. 100. As noted above, two separate episodes of occupations may have occurred at the site during the Terminal Archaic. The first and most intense probably occurred between A.D. 100 and 250 during a period of high effective moisture (Plog et al. 1988).

While the span of this occupational episode is uncertain, it is clear that the brief occupation in Stratum Vb was relatively intense. For the first time, arrow points and shafts occur in the archeological record in the cave along with gaming pieces and pinched nose figurines. Corn also appears in this occupation. Besides the radiocarbon dates on the corn cache (see above), the field notes occasionally refer to the recovery of a scattered corn cob or kernel.

This stratum had the highest concentration of features, including 13 pits, 9 ash pits, 3 slab-lined pits, 2 seed processing areas, a surface hearth, and 9 firepits. Several of the slab-lined pits that are provenienced to Stratum Va (Late Archaic) may actually be associated with Stratum Vb. Given the sandy nature of Stratum Va, it is possible that some of the slab-lined pits in this stratum were constructed during the Terminal Archaic (Stratum Vb). The concentration of features in Stratum Vb is even more remarkable give the short time span this stratum apparently represents.

Wilke and McDonald (1989) argue that slab-lined pits from this time period in the Southwest were cache pits used to store foodstuffs, primarily corn. However, none of the pits from this stratum contained their original contents, and other data from Stratum Vb do not support this interpretation. Although limited corn pollen was noted in this stratum by Lindsay (1980), other Graminae pollen is more common. Also, the notes clearly indicated that the plant parts that compose the Terminal Archaic deposits are not composed of corn stalks, husks, cobs, or kernels. Rather, other grass stems, fiber, chaff, and seeds are the overwhelmingly dominant matrix. In fact, at least two seed processing areas were identified in this stratum (see above), believed by the excavators to have been amaranth processing areas. Samples of these seeds were collected but have never been analyzed.

Hogan's (1980) analysis of the coprolites from Stratum Vb fails to identity corn in any of the coprolites but does show extensive reliance on cheno-ams, *Sporobolus*, and *Helianthus*, in descending order. These data suggest that Stratum Vb represents a late summer/early fall seed processing locale. The abundance of pits suggests that seeds, not corn, were processed and stored at the site during this period. These data support the interpretation that there was a general trend of increasing intensification of plant husbandry during the Terminal Archaic (cf. Schroedl 1992; Winter and Hogan 1986) and that corn was initially just another grass that was incorporated into an existing horticultural subsistence pattern.

We believe that there was a short break in occupation between Strata Vb and Vc, perhaps 100 to 200 years. Sometime after about A.D. 400, local populations returned to Cowboy Cave. This occupation is represented by Stratum Vc through the Surface Sand. We cannot speculate about the subsistence patterns during this occupation because of the lack of data. It is intriguing that groundstone counts are somewhat higher and that all six of the "grooved stones" (?) were recovered from this occupation (Dodge 1980:14). It was also during this episode of occupation that the surface room was constructed. We believe that this short use of the cave corresponds to slightly higher increases in effective moisture as noted by Plog et al. (1988:235). By A.D. 600, poorer climatic conditions prevailed and the site was probably abandoned by A.D. 650. Outside of an unprovenienced Desert Side-notched point (A.D. 1300-1850), there is no evidence of any later prehistoric use of the cave.

GENERAL OBSERVATIONS

Besides clarifying the Archaic occupational sequence at Cowboy Cave, our reinterpretation of the site touches on a number of issues relating to the excavation of caves and rockshelters on the northern Colorado Plateau. First and foremost, the importance of stratigraphic excavation and reporting by stratigraphic level is absolutely confirmed. While it is a truism that excavations of deposits by arbitrary levels must mix artifacts from different time periods and occupations, it is not so obvious that published data from arbitrary excavations cannot readily be questioned or reinterpreted.

Jennings' (1980) interpretation of the cultural sequence at Cowboy Cave was based on stratigraphic discussions supported by artifact distributions *presented by stratigraphic level* in the published report. This approach contrasts with excavations conducted by arbitrary levels in caves and rockshelters (Gooding and Shields 1985; Gross 1988; Horn 1990; Lindsay et al. 1968; Martin et al. 1983; Nelson and Kane 1986; see Berry and Berry 1986 for additional discussion of problems with Archaic sites excavated in arbitrary levels). At such sites, the original excavators make laboratory decisions about cultural affiliation and artifact composition of various components and complexes; decisions that are not available for review in the published report. Because artifacts are already consigned to synthetic cultural groupings in such reports, there is no possibility of other researchers reassessing or reexamining the chronological associations such as we were able to do with the Cowboy Cave data unless a complete reanalysis of the data is undertaken.

Because of careful stratigraphic excavation by Jennings and his students, we were able to take the published information and reinterpret the stratigraphy and associated artifact assemblages from Cowboy Cave. Madsen and Berry (1975) were only able to reassess the artifact distributions at Hogup Cave because the artifact assemblages were provenienced by stratigraphic levels rather than by a priori defined cultural groupings. At sites excavated by arbitrary levels, the final cultural groupings, component assemblages, and complexes are not only dependent on the analytical skills and expertise of the researcher but are also most certainly influenced by the biases and expectations of the researcher. At sites that are stratigraphically excavated, the cultural groups, assemblages, and complexes can be defined and redefined as often as necessary. For these sites, it is the field excavation skills of the researcher rather than his or her theoretical biases that will affect the interpretations.

Another benefit of excavating sites in stratigraphic levels is the ability to associate depositional events with paleoenvironmental variation. A fundamental assumption of cave site stratigraphy, particularly dry caves and rockshelters, is that different strata represented cultural and/or natural changes in the local environment. As noted above, the stratigraphic deposits at Cowboy Cave correlate with changing environmental conditions favorable to human occupation. Obviously, correlating human occupation with environmental fluctuation is easier if a site is excavated stratigraphically.

Given our reinterpretation of Cowboy Cave, it should be apparent that more than half of the cultural deposits in the cave represent Early Archaic occupation. In addition to Cowboy Cave, substantial Early Archaic deposits occur at a number of other rockshelters and cave sites on the Colorado Plateau including Sudden Shelter (Jennings et al. 1980), Joes Valley Alcove (Barlow and Metcalfe 1993), Old Man Cave (Geib and Davidson 1994), Sand Dune Cave and Dust Devil Cave (Ambler 1984a, 1984b; Lindsay et al. 1968). Matson (1991:149), for example, notes "in many ways the Early Archaic is the best known of the Archaic periods in the Southwest." While we do not agree that it is the best known of the Archaic periods, we would certainly agree that it is the best represented period in cave site deposits on the Colorado Plateau; but these data have yet to be fully examined and assimilated.

Our own experience at Cowboy Cave indicates that archaeologists working in cave sites on the Colorado Plateau have failed to carefully evaluate the depositional matrix at these sites, particularly in relation to dry cave site deposits. At Sudden Shelter, colluviation provided the depositional context for prehistoric occupation at the site (Currey 1980). Stratigraphy at the site was primarily dependent on environmental factors that affected colluvial deposition and only indirectly dependent on human occupation (dispersion of charcoal, features, and artifacts in the strata).

In contrast, at dry cave sites, such as Cowboy Cave, Sand Dune Cave, Dust Devil Cave, and Hogup Cave and Danger Cave in the Great Basin, stratigraphic deposition is dependent primarily on human agents who transport various plant remains into the sites. In cases of intermittent or sporadic use, such as Cowboy Cave, natural deposition may or may not occur during periods of site abandonment. There is no reason to assume that eolian deposition, mass wasting from roof spalling, erosion of sand grains from the cave walls, etc., will occur and conveniently separate different periods of prehistoric occupation. As discussed above, we believe that in many cases long periods of nonuse or abandonment may only be represented by a stratigraphic unconformity. Failure to recognize such stratigraphic boundaries may cause researchers to unknowingly mix assemblages from different time periods. This problem would obviously be exacerbated if such deposits were excavated in arbitrary levels.

At Cowboy Cave, the excavation of a large number of pits and slab-lined pits in Stratum Vb resulted in underlying Late Archaic artifacts being brought up and secondarily deposited in the Terminal Archaic levels. This was only recognizable because Gypsum points and split-twig figurines are particularly time sensitive diagnostic artifacts independent of their stratigraphic distribution at Cowboy Cave (cf. Berry and Berry 1986). Our cursory review of other cave and rockshelter sites suggests that there is a potential for substantial stratigraphic mixing of earlier artifacts types with later artifacts because of this phenomena. Aboriginal pit construction, causing stratigraphic mixing, appears to have reached a peak near the end of the Terminal Archaic period.

We submit that widespread prehistoric pit excavation during this time span resulted in numerous mixed assemblages. We also believe that many cave site excavators in the earlier part of this century failed to consider the possibility of stratigraphic mixing and did not search for subtle stratigraphic changes nor did they contemplate the possibility that long periods of site abandonment might be represented by unrecognizable stratigraphic unconformities. The possibility of mixed assemblages from the Terminal Archaic has significant implications for interpreting "Basketmaker" assemblages in the greater Southwest, but discussion of these implications is well beyond the scope of this paper.

The excavation of Cowboy Cave in 1975 provided extensive information about Archaic occupation in southeastern Utah. We hope that our reanalysis of the occupational sequence at the site and our general observations about cave site archeology will aid in future interpretations of the culture history of the Colorado Plateau.

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Finally, we also would like to acknowledge Jesse D. Jennings for developing a field note taking system (Jennings 1994:277-278) that allows researchers the opportunity to review, reexamine, reanalyze, and reinterpret data 20 years after the fact.

NOTES

[1]The dates discussed here do not include the precultural dates from the Pleistocene dung layer nor do they include the two radiocarbon dates from Walters Cave. The first from Walters Cave was a sandal fragment (FS 370), collected from grid 11R10 and associated with an unfired clay figurine, that was submitted for dating in 1975. This sample (SI-2416) has a 1-sigma calibrated date range of 8030-7710 B.C.

Although Jennings identifies this specimen as "No Provenience," this specimen was actually assigned the provenience of Stratum IIID. The stratigraphy in Walters Cave paralleled that of Cowboy Cave, so Unit designations were consistent between the two caves. The capital letter [D] indicates a stratum within Unit III in Walters cave. This stratum, of course, could not be correlated with any individual stratum within Unit III in Cowboy Cave.)

Geib (1993) and Ambler (1993) note that this specimen was not identified to type before it was submitted for dating. Ambler (1993:7-7) believes that it may be a "fine warped faced" sandal. Geib (1993:5-6), however, notes that all the sandals from early units in Cowboy Cave that he has examined at the Utah Museum of Natural History are plain weave sandals (Ambler's coarse warp face sandals). It seems likely that this was a plain weave sandal given that two other plain weave sandals (FS 576 and FS 577) were also recovered from Unit IIID in Walters Cave. We do not believe that Geib's (1993:Figure 5-4) stratigraphic reconstruction is accurate for Walters Cave. We believe that all the artifacts that he depicts (FS's 305, 370, 339, 301, 394, 576, 577, and 567) are associated with Unit IIID in Walters Cave.

In an effort to clarify the stratigraphic situation, Geib submitted a plain weave sandal (FS 576-1) from Unit IIID in Walters Cave for AMS radiocarbon dating at the University of Arizona (AA-13007). The date on this sample was 6348 ± 84 B.P. with a calibrated range of 5410-5230 B.C. Thus, the relationship of SI-2416 to AA-13007 is unclear. Further review of the notes are necessary.

[2]Stratum Vd did not occur in this area of the site. Stratum Vd was localized in an area towards the mouth and right side of the cave.

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APPENDIX

Selected features from Cowboy Cave.[a]

F. Number	Stratum	North Grid centroid	Right Grid centroid	N-S Dia. cm	E-W Dia. cm	Max Dia. cm	Depth cm
			Pits				
152	Surface	18.50	27.50		81	81	34
95	Surface Sand	17.62	27.00		36	36	13
144	Surface Sand	17.35	27.73		25	25	18
156	Surface Sand	18.60	26.75		100	100	30
164	Vc	18.00	22.50		30	30	60
185	Vc	20.00	27.00		30	30	22
192	Vc	20.90	28.00		50	50	35
116	Vb	16.00	31.70		78	78	49
139	Vb	17.00	31.00				
153	Vb	18.50	26.00		50	50	29
163	Vb	17.50	27.50		28	28	44
186	Vb	20.90	25.00		40	40	45
187	Vb	20.00	30.00				
190	Vb	18.00	30.00		27	27	45
194	Vb	19.50	27.40		33	33	15
195	Vb	19.00	30.60		45	45	25
201	Vb	20.00	29.00		120	120	70
206	Vb	21.00	30.50		33	33	18
208	Vb	22.00	25.60		76	76	84
209	Vb	21.00	28.40		71	71	63

F. Number		Stratum	North Grid centroid	Right Grid centroid	N-S Dia. cm	E-W Dia. cm	Max Dia. cm	Depth cm
126		Va	16.00	18.50		55	55	60
133	A	Va	17.00	30.85		40	40	30
133	B	Va	17.00	30.25		50	50	33
168		Va	18.00	28.00		88	88	28
202		Va	20.00	28.50				
210		Va	22.00	27.50		86	86	50
212		Va	22.00	28.80		65	65	43
147	A	IVd	17.00	19.80				
31	A	IVc	15.00	20.85		30	30	
68	A	IVc	15.90	25.50		63	63	53
68	B	IVc	15.90	25.50		91	91	69
70		IVc	13.60	26.37		33	33	10
106	A	IVc	17.00	29.50				
142		IVc	18.00	24.00		38	38	42
205		IVc	21.00	28.60		74	74	27
207		IVc	21.50	29.50		81	81	76
211		IVc	21.25	26.00		42	42	30
105		IVb	15.00	29.00		84	84	36
138		IVb	17.00	31.00				
146		IVb	17.00	20.50		60	60	
150		IVb	17.00	20.50		45	45	16
80		IVa	16.80	25.30		45	45	40
122		IVa	16.20	30.65		41	41	14
162		IVa	18.00	20.50		35	35	40
189		IVa	20.60	27.00		40	70	10
89		IIIj	14.50	31.00				
16		IIIh	15.70	20.80	15	15	15	30
174		IIb	19.45	20.55		45	45	15
62		?	12.36	26.10	69	69	69	25
90		?	15.63	30.29	51	74	74	12
99		?	15.50	26.00		91	91	52
121		?	15.86	20.00	62	90	90	
157		?	18.00	23.00				
161		?	18.75	22.70		70	70	30

F. Number	Stratum	North Grid centroid	Right Grid centroid	N-S Dia. cm	E-W Dia. cm	Max Dia. cm	Depth cm
169	?	18.00	28.00		77	77	38
			Ash Pits				
52	Vd	11.00	32.00		37	37	13
34 A	Vb	17.00	20.60				17
119 A	Vb	18.00	26.00				12
120 A	Vb	19.50	29.50				8
120 B	Vb	21.50	28.50				18
155	Vb	18.00	26.10		25	25	13
180	Vb	21.00	20.50		33	33	25
197	Vb	18.50	30.50		29	29	6
199	Vb	19.70	28.00		32	32	14
200	Vb	19.40	28.00		20	20	10
167	IVd	19.00	21.00		45	45	13
31 B	IVc	14.85	20.60		16	16	10
31 C	IVc	15.38	20.48		35	35	24
69	IVc	15.00	25.40		22	22	15
135	IVc	17.00	30.00		24	24	15
136	IVc	17.00	30.50		27	27	16
137	IVc	17.00	31.00		27	27	16
166	IVc	18.00	30.00		44	44	23
173 B	IVa	19.00	19.00		15	15	8
181	IVa	20.38	19.18	17	20	20	6
67	IIIk	14.65	20.15		19	19	5
141	IIIk	17.00	18.00				
140	IIIj	16.00	29.95		23	23	10
			Slab-lined Pits				
148	Surface Sand	19.61	30.20		50	50	50
45	Vd	10.00	32.44				
191	Vc	19.40	27.55	40	60	60	
198	Vb	19.50	31.00		94	94	74
193	Vb	20.10	27.50		70	70	26
94	Vb	17.00	26.00		100	100	30
125	Va	15.50	28.50		66	66	56

F. Number	Stratum	North Grid centroid	Right Grid centroid	N-S Dia. cm	E-W Dia. cm	Max Dia. cm	Depth cm
114	Va	16.30	31.72		121	121	45
113	Va	15.58	30.64	56	76	76	
97	Va	16.00	31.80		77	77	66
100	IVa	16.30	26.00		50	50	60
203	?	19.50	31.50				
131	?	16.50	29.50	59	59	59	52
			Surface Hearths				
204	Vb	21.00	28.50		100	100	20
172	Va	19.00	19.50	150	150	150	31
154	IVd	18.60	26.70				
173 A	IVa	19.00	19.00		100	100	15
179	IVa	20.00	25.00				
29	IIIk	14.00	20.50		46	46	2
83 A	IIIj	14.00	30.25		23	23	5
83 B	IIIj	15.60	31.00	50	63	63	9
184	IIIg	21.00	19.40		65	65	8
			Firepits				
143	Surface Sand	17.88	25.58	50	50	50	
117	Vb	15.75	29.00		32	32	23
183	Va	17.00	30.00		43	43	10
132	Va	17.00	28.50		82	82	46
196	IVc	19.50	30.00		28	28	12
178	IIIj	19.20	28.80		85	85	25
182	IIIg	20.66	20.09		30	30	9
			Slab-lined Hearths				
93	Surface Sand	16.71	26.44	43	57	57	7
73	Vd	12.00	30.50				
64	Vd	10.58	30.35	104	104	104	

[a]See text for discussion of pitstructures, metate concentrations, seed processing areas, and the surface structure.

FROM HERE TO ANTIQUITY: HOLOCENE HUMAN OCCUPATION ON CAMELS BACK RIDGE, TOOELE COUNTY, UTAH

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The results of limited archaeological investigations at an open lithic scatter and neighboring cave on Camels Back Ridge are presented. The location of nearby remnant features of Pleistocene Lake Bonneville suggests that Camels Back Ridge was accessible during the latter part of the post-Provo regression approximately 13,000 B.P. Basalt artifacts recovered from the lithic scatter may signal a Paleoindian occupation, and artifact types and radiocarbon analyses indicate that the cave was occupied periodically from ca. 7,500 B.P. through the Fremont Period. Given their setting, antiquity, and the presence of occupation surfaces in the cave, the sites offer a unique opportunity to investigate the types and distribution of artifacts and ecofacts spanning 7,500 years of intermittent occupation in an uncharitable desert environment.

INTRODUCTION

Over the past two years a research team led by the Antiquities Section, Utah Division of State History has been examining archaeological and paleontological resources on Department of Defense installations as part of the Legacy Resource Management Program. The purpose of the project is to extract floral and faunal remains from dry, stratified caves in Utah's western deserts to reconstruct environmental change over the past ca. 15,000 years, and to investigate the processes behind those changes. Reconnaissance of Camels Back Ridge on the U.S. Army Dugway Proving Ground identified a cave overlooking a lithic scatter that contained basalt artifacts similar to those associated with the Western (Great Basin) Stemmed Tradition which dates from approximately 11,000-8,000 B.P. (e.g., Willig and Aikens 1988), indicating that the neighboring cave may contain late Pleistocene deposits. As a result, the cave was tested to investigate its suitability for full-scale paleoenvironmental excavations. Although limited testing found floral and faunal remains to be insufficient for pursuing detailed paleoenvironmental studies, excavations discovered an extraordinary archaeological site containing stratified deposits with hearths and occupation surfaces extending back approximately 7,500 years. This report presents the results of test excavations at the lithic scatter (42To798) and Camels Back Cave (42To394) (Figure 1), and we conclude by offering some directions for future research.

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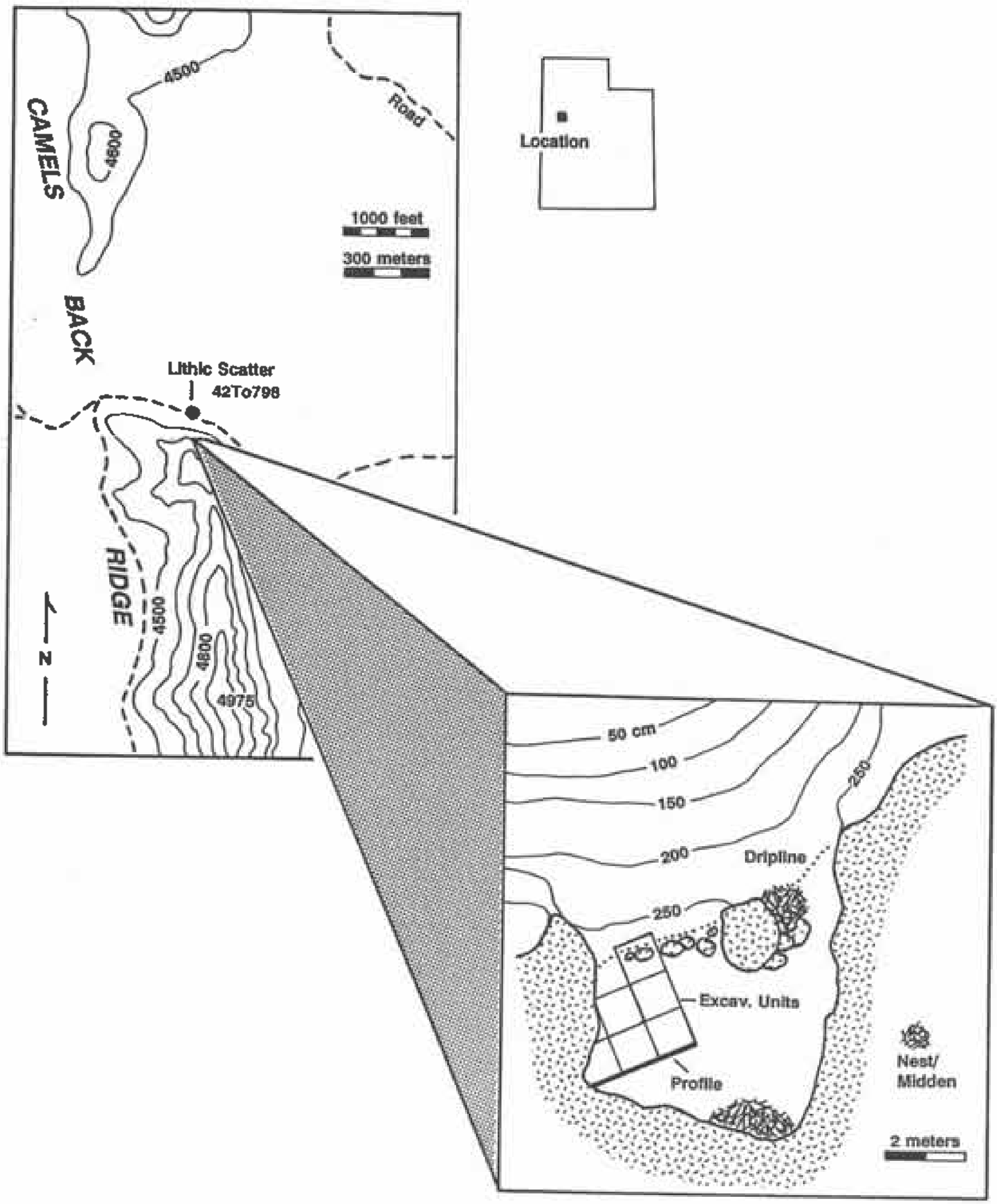

Figure 1. Plan of southern Camels Back Ridge showing site locations and detail of Camels Back Cave.

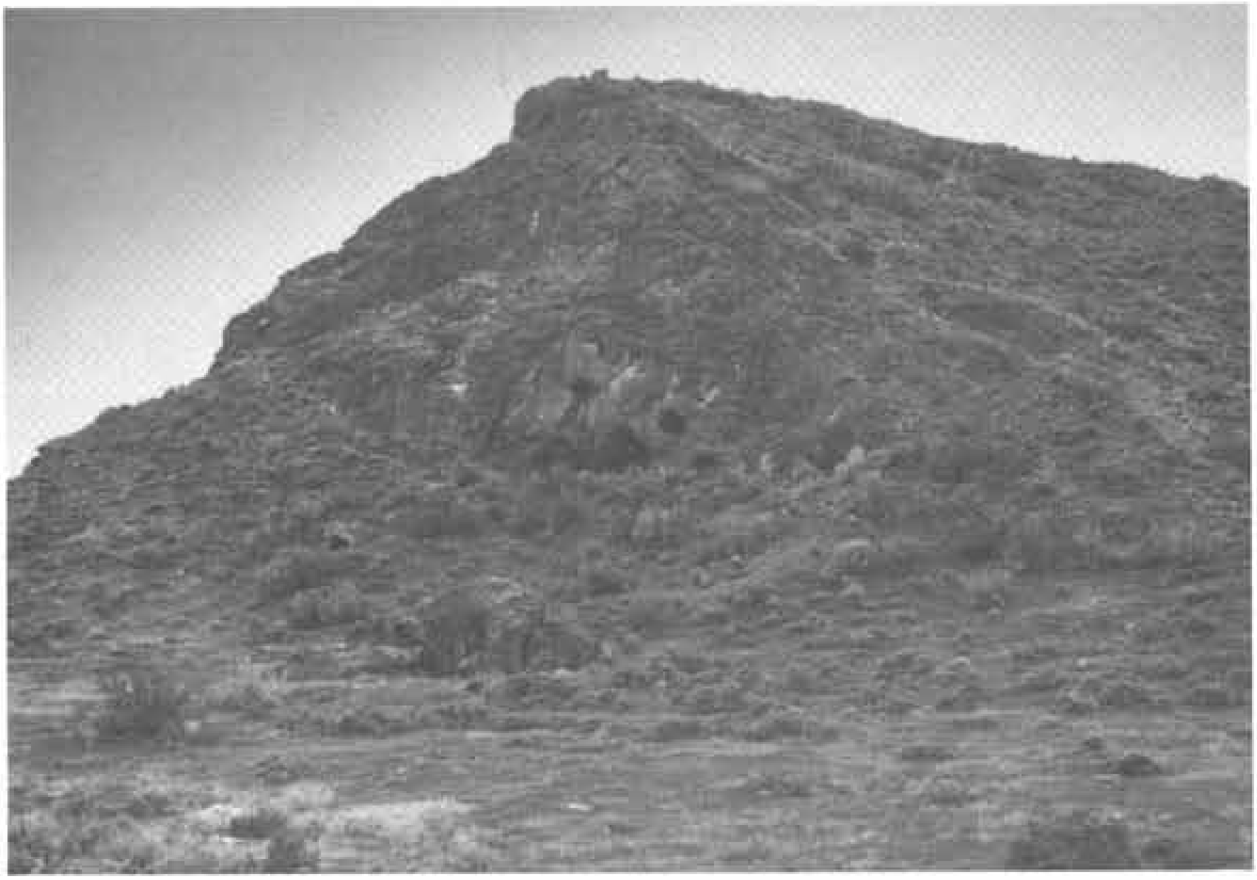

Figure 2. Camels Back Cave (center) looking south from the northeast edge of 42To798.

SETTING

Camels Back Ridge is in the southeastern portion of the Dugway Proving Ground in south-central Tooele County. The ridge is an isolated desert island consisting of two north-south trending limestone fault-block mountain ridges separated and surrounded by low alkali flats and dune sheets. The larger, northern ridge crests at, 1,677 m while the southern ridge peaks at 1,517 m. Both of the sites are associated with the northern toe of the southern ridge; Camels Back Cave is at 1,380 m and the lithic scatter rests immediately below the cave at 1,366 m (Figures 1 and 2). Modern vegetation consists of a desert scrub community containing greasewood (*Sarcobatus vermiculatus*), four-winged saltbush (*Atriplex canescens*), big sagebrush (*Artemisis tridentata*), and Indian ricegrass (*Oryzopsis hymenoides*).

Numerous relic features of Pleistocene Lake Bonneville occur in the project vicinity. The proximity of these distinct features provides a local record of the late Pleistocene regression of Lake Bonneville and serves to delineate the time at which Camels Back Ridge was accessible for human occupation. A pronounced terrace marking the

14,300 B.P. Provo shoreline is evident on Camels Back Ridge at an elevation of ca. 1,463 m, some 75 m above the entrance to Camels Back Cave. Approximately 4 km to the northwest is the terminus of the Old River Bed, marking the overflow of Sevier Lake (= Lake Gunnison) northward to a southern arm of Lake Bonneville in what is now the Great Salt Lake Desert (e.g., Currey and James 1982; Oviatt et al. 1992 and references therein). Oviatt et al. (1992:238) note that Lake Gunnison overflowed through this now-abandoned river channel for "several thousand years," but recent investigations suggest that the overflow manifested a more rapid event which occurred ca. 12,750-12,500 B.P. (C. Oviatt, personal communication, 1994). Fifteen kilometers to the north near Wig Mountain is an extensive linear dune feature marking the shoreline formed by the 10,900-10,300 B.P. Gilbert transgression (Zier 1984). This shoreline currently occupies an elevation of 1,311 m, but its modern elevation reflects Holocene hydro-isostatic rebound; at its time of formation, the shoreline was at approximately 1,304 m (Currey 1990:Figure 13). Zier (1984:61-62) reports a basalt stemmed point from the 1,311 m Gilbert shoreline immediately west of Wig Mountain at site 42To385.

The location of sites on Camels Back Ridge in relation to the topographic/temporal distribution of these remnant features suggests that the ridge was accessible during the latter part of the post-Provo regression (ca. 13,000 B.P.), and remained exposed during the Gilbert transgression and throughout the Holocene. As a result, the basalt tools in the lithic scatter may be associated with the Great Basin Stemmed Tradition, and it is possible that Camels Back Cave contains deposits dating to the Pleistocene/Holocene transition.

THE LITHIC SCATTER (42TO798)

Site 42To798 encompasses approximately 3,150 m^2 on a vegetated alkali flat. Initial investigations involved the construction of a detailed map to plot the distribution of flakes and tools (Figure 3), and the collection and characterization of all formed artifacts from the site's surface. Surface reconnaissance identified 244 pieces of debitage, 11 flaked stone tools, and a limestone mano. No discrete artifact concentrations were encountered. Debitage is dominated by obsidian and basalt, followed by sparse occurrences of chert and fine-grained quartzite. Informal inspection of flake types found angular shatter and early-to-middle stage biface thinning debris to be most common. Given that some obsidian artifacts exhibit heavily patinated flake scars while others display unoxidized fracture surfaces, the site appears to be a product of several occupations. In some cases this variability in oxidation may be the result of differential exposure, but the presence of specimens with unoxidized scars truncating patinated flake surfaces indicates that some materials were reworked by later inhabitants.

Investigations also involved the excavation of a 10 x 10 m surface scrape (Figure 3) to extract a sample of artifacts and examine the substrate for features. Thirty flakes and two biface fragments were collected (1/8 in. mesh) and no features were encountered (Shaver 1994). Excavations found the cultural deposits to be shallow with materials restricted to the uppermost 1-2 cm. Debitage largely consists of obsidian and basalt flake fragments, shatter, and biface thinning debris, and is similar to the types and frequencies of surface materials.

Formed artifacts from the lithic scatter represent at least five functional classes. A single piece of ground stone suggests at least some limited food processing activities occurred at the site. The artifact is a one-handed bifacial mano manufactured on a limestone cobble. One surface exhibits light use-wear and the other exhibits moderate fatigue. Expedient cutting and scraping tasks are reflected by four modified/utilized flakes. One specimen is a large chert secondary flake with bifacial retouch and use-wear along one edge, and another is a worked obsidian flake with unoxidized flake scars truncating the patinated ventral surface of an interior flake fragment. Two modified basalt flakes also were recovered, including a large flake midsection that possesses a highly polished edge indicative of extensive use. Bifaces are represented by an obsidian base/midsection, two small obsidian tips, and a chalcedony

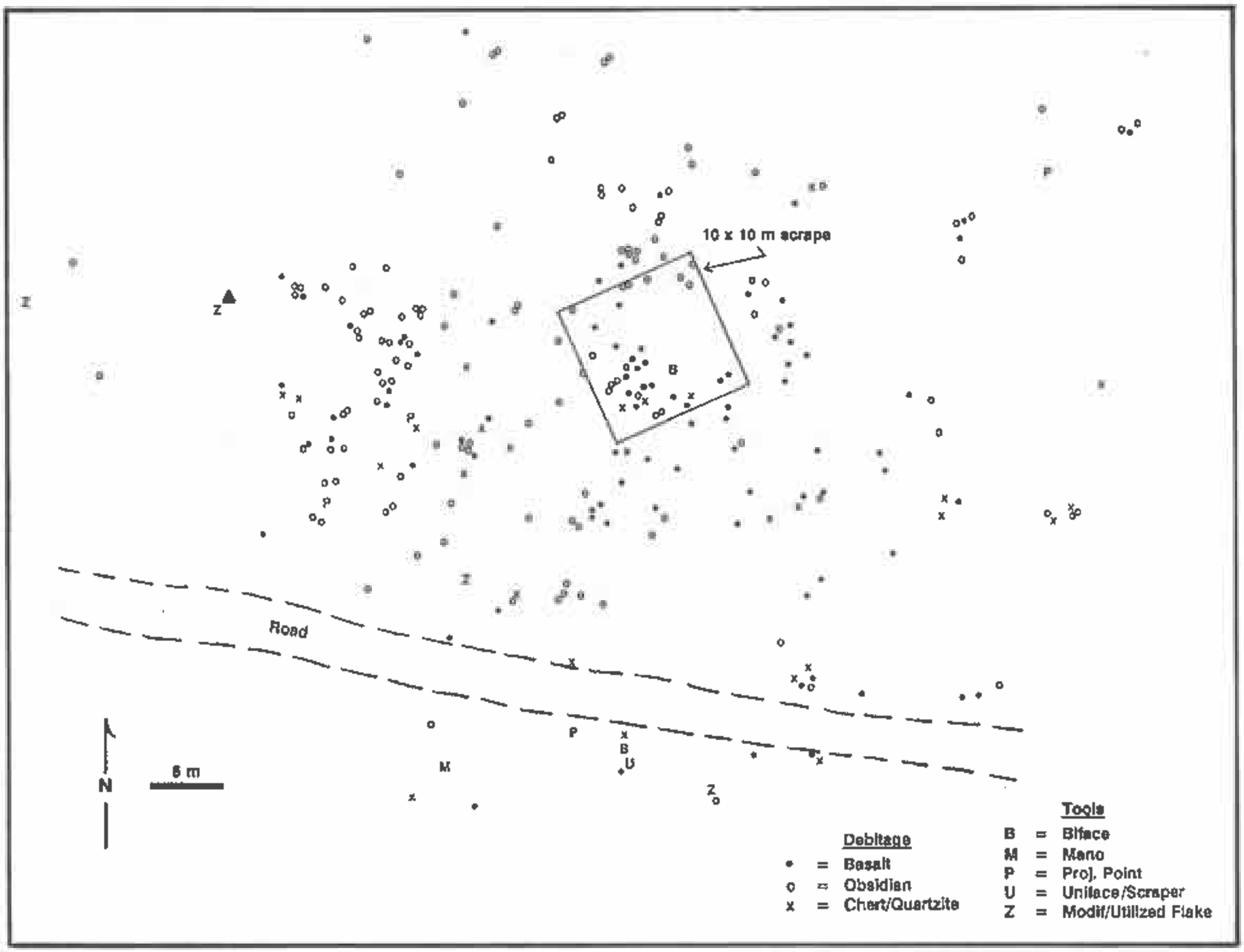

Figure 3. Plan of piece-plotted surface artifacts at 42To798.

fragment. The latter specimen is a large, curved flake exhibiting overall pressure flaking, including retouch along a transverse hinge fracture on one end. A basalt end scraper was formed by unifacial retouch on the dorsal surface of a large expanding flake blank (Figure 4a). Step-flaking and polish are most evident along its wider (distal) end, a characteristic common to large end scrapers from Western Stemmed and Clovis period sites (e.g., Bryan 1979, 1988; Davis 1989).

The projectile point assemblage consists of four fragmentary specimens. These include a small chert tip and a basalt midsection possessing a transverse bending break that appears to have resulted during basal thinning. A small obsidian basal projection ("tang") with remnant proximal and distal notches also was collected. Although its specific type remains undetermined, the location and orientation of associated notches are similar to those in Northern Side-notched and Pinto points. These chronological markers overlap in the eastern Great Basin during the Early Archaic and may signal deposition as early as 8,200 B.P., but possibly as late as 5,000 B.P. (Holmer 1986). The remaining specimen is a fine-grained basalt proximal fragment possessing a flared stem and convex base (Figure 4b). Although it represents an atypical form, this large point base may represent a Pinto Series, or perhaps a Western Stemmed variant.

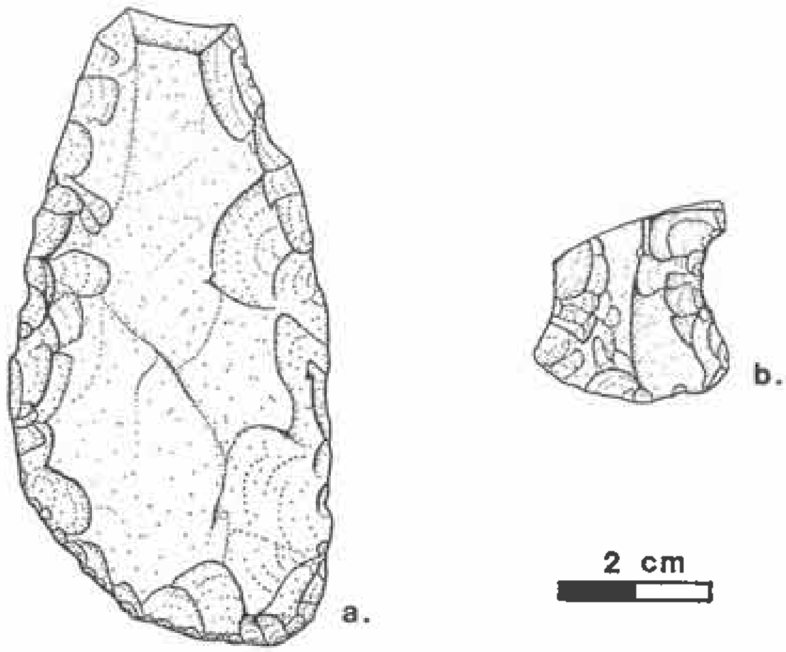

Figure 4. Selected basalt artifacts collected from 42To798; a. scraper, b. expanding (flared) stem projectile point fragment.

CAMELS BACK CAVE

Camels Back Cave was initially recorded in 1984 as part of a cultural resources inventory project (Zier 1984). Its north-facing entrance overlooks site 42To798 (Figure 2) and affords a vast panorama of southern Skull Valley. Evidence of historic use include a burned domestic sheep (*Ovis aries*) innominate and a turn of the century tomato can. Both of these items were found on the surface in association with a partially collapsed rock wall; a strand of metal wire was found wrapped around one of the associated cobbles indicating that the wall also manifests historic occupation. Two small looter's pits also were observed inside the cave, and large wood rat nests occupy the eastern edge of the collapsed wall and the southern wall of the cave (Figure 1).

Initial investigations involved mapping the cave and surrounding areas, establishing a grid oriented parallel to the cave entrance, and excavating a small block of six contiguous 1 x 1 m units (Shaver 1994). Excavations commenced by removing the uppermost ca. 40 cm of wood rat accumulations and disturbed deposits in arbitrary 10 cm levels, passing the excavated matrix through 1/8 in. mesh. Materials recovered include a small, ovate chert biface, a serrated Elko Series projectile point fragment (Figure 5c), and five pieces of debitage. After the wood rat accumulations and disturbed deposits were removed, sediments were excavated in stratigraphic units. Due to time constraints and inhospitable weather, block excavations were abandoned at ca. one meter below ground surface and efforts centered on excavating a 1 x 1 m unit in the southeast corner of the block to bedrock. A total of 14

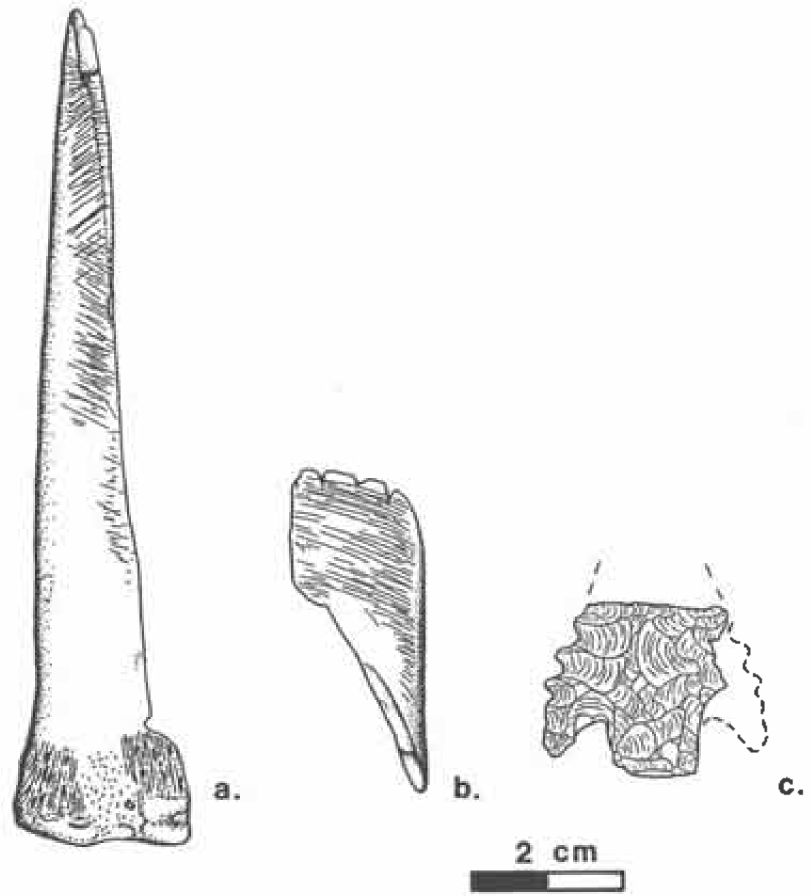

Figure 5. Selected artifacts from Camels Back Cave; a. bone awl (Stratum XII), b. incised/serrated bone tool (Stratum XIV), c. serrated Elko Series projectile point fragment (unprov.).

strata was identified in the cave, including eight that contain cultural debris and four with associated hearth features (Figure 6). The five strata that bear no evidence of human occupation are a significant aspect of the site (see below), but the ensuing discussion focuses only on those contexts that yielded artifactual remains.

Stratum XIV, a ca. 25 cm thick brown silt layer with abundant roof spall, represents the uppermost unit containing cultural materials (Table 1)[1]. Excavations retrieved eight flakes and an obsidian biface margin from a large, early-stage blank. A single bone artifact is represented by a notched and heavily striated and polished artiodactyl limb bone fragment (Figure 5b). Similar artifacts in Great Basin sites have been interpreted as scraping or fleshing tools (e.g., Dalley 1970, 1976; Thomas 1983). Thirty-seven fragmentary mammal bones also were recovered. Identified taxa include jackrabbit (*Lepus* sp.) and a possible pronghorn (cf. *Antilocapra americana*) phalanx; a proximal femur fragment from a large ungulate likely represents bison (*Bison bison*) or wapiti (*Cervus elaphus*). A flake scarred small artiodactyl radius shaft, and an artiodactyl distal humerus shaft with cut marks on its anterio-lateral surface reflect limited butchering activities.

A tan silt containing charcoal flecks, lithics, pottery, and perishable artifacts was identified as Stratum XII (Figure 6; Table 1). Ceramics are represented by four shards identified as Great Salt Lake Gray. Each exhibits smooth,

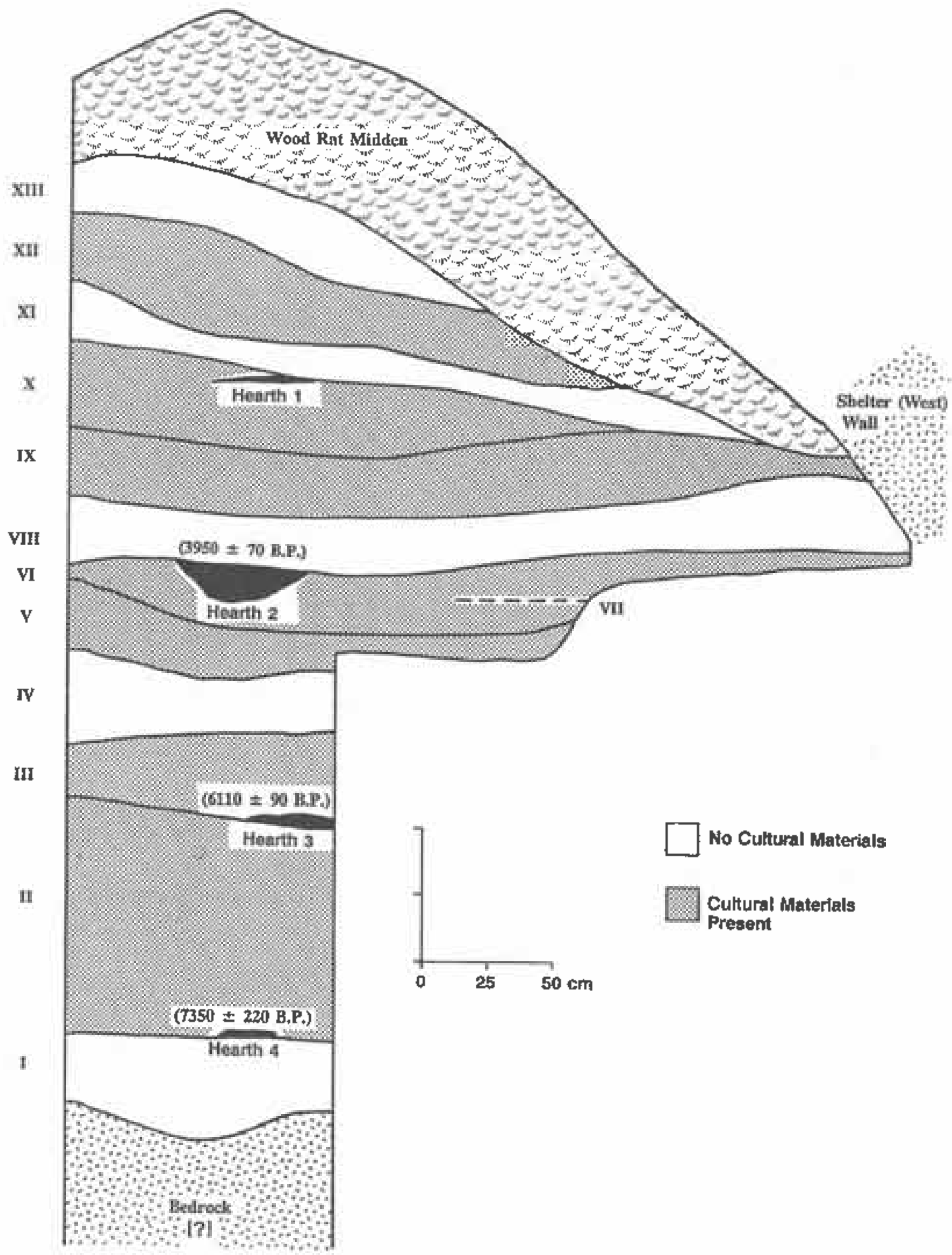

Figure 6. South wall stratigraphic profile, Camels Back Cave.

Table 1. Artifact Classes by Stratum from Camels Back Cave

Stratum	Obsidian Debitage	Chert Debitage	Biface	Preform	Proj. Point	Flake Tool	Worked Bone	Gr. Stone	Hammer Stone	Ceramic	Arrow Shaft
XIV	6	2	1	-	-	-	1	-	-	-	-
XIII	---	---	---	---	---	---	---	---	---	---	---
XII	4	8	-	-	-	-	2	-	-	4	2
XI	---	---	---	---	---	---	---	---	---	---	---
X	19	2	-	-	1	2	-	-	-	-	-
IX	16	1	-	-	-	1	-	2	-	-	-
VIII	---	---	---	---	---	---	---	---	---	---	---
VII	---	---	---	---	---	---	---	---	---	---	---
VI	8	3	-	1	-	-	-	-	2	-	-
V	7	2	-	-	-	-	1	-	-	-	-
IV	---	---	---	---	---	---	---	---	---	---	---
III	7	1	-	-	-	3	-	-	-	-	-
II	3	1	-	-	-	1	-	-	-	-	-
I	---	---	---	---	---	---	---	---	---	---	---
Unprov.	20	5	2	-	1	-	-	-	-	-	-
Totals	90	25	3	1	2	7	4	2	2	4	2

Unprovenienced materials include surface wood rat accumulations, disturbed deposits, and wall slumps.

gently undulating surfaces, and small temper granules consisting of mica and quartzite. The presence of Great Salt Lake Gray indicates that a Fremont period occupation occurred sometime between 1,400-700 B.P. (e.g., Madsen 1986).

Additional artifact classes include a scored bone, a bone awl, and two arrow shafts. The scored bone is a jackrabbit tibia cylinder with a fractured proximal end and a cut and snapped shaft below the tibia-fibula junction. This specimen is remarkably similar to the bone bead manufacturing by-products recovered from James Creek Shelter (Schmitt 1990:118-120) suggesting that beads were manufactured at Camels Back Cave during the Fremont period. A *Lepus* tibia diaphysis cylinder was recovered in association, representing human subsistence refuse and possibly a bead preform (see Drews and Schmitt 1986; Hockett 1993, 1994; Schmitt 1990). The bone awl (Figure 5a) is fashioned on a split artiodactyl metacarpal and is extensively polished and striated from both manufacture and use. One arrow shaft consists of a greasewood foreshaft inserted into an arrow cane (*Phragmites* sp.) mainshaft and tied with a thin vegetal fiber and sealed with sap (total length = 48 cm). The distal end of the foreshaft has been cut along one edge to create a tapering point. The second specimen is a 32 cm greasewood foreshaft fragment with a tapered and slightly burned (fire-hardened?) point. Faunal remains from Stratum XII are represented by fragmentary small and large mammals (n=65), including two flake scarred artiodactyl limb bone shafts indicative of marrow extraction.

Stratum X was identified as a mottled tan-gray fine silt containing abundant subangular roof spall. Excavations recovered 21 pieces of debitage, a chert projectile pint tip, and two flake tools. The margin of a thin charcoal stain also was uncovered near the top of the stratum and appears to represent the edge of a small hearth (Hearth 1; Figure 6). Debitage is dominated by obsidian (Table 1), including both early stage biface reduction debris and small pressure flakes indicative of late stage biface thinning and/or tool maintenance. Flake tools are represented by an obsidian primary flake from a small cobble with retouch along one dorsal margin, and a thin, patinated obsidian flake fragment truncated by unoxidized use-wear along one edge. The latter specimen offers clear evidence for the use of weathered obsidian scavenged from another context, possibly site 42To798 (Shaver 1994). A large and diverse assemblage of animal bones (n=133) includes the remains of jackrabbit, Townsend's ground squirrel (*Spermophilus townsendii*), Botta's pocket gopher (*Thomomys bottae*), and unidentified bird, large mammal, and reptile. None of the specimens bear evidence of human processing and the majority of the jackrabbit and small animal bones exhibit polish and pitting characteristic of partially digested bone produced by mammalian and avian predators (e.g., Andrews 1990; Rensberger and Krentz 1988; Schmitt and Juell 1994).

Stratum IX represents a ca. 25 cm thick layer charcoal-stained gray silt containing lithic artifacts. Included are 17 flakes, one extensively retouched obsidian flake (preform?), and two pieces of ground stone. One ground specimen is a unifacial metate represented by two refitted pieces of welded tuff, together measuring 10.9 x 7.7 x 3.5 cm. The use-surface is slightly concave and one margin exhibits evidence of shaping by grinding. A one-handed mano is represented by an ovate limestone cobble measuring 11.0 x 7.2 x 3.0 cm. Moderate surface fatigue on one side is evident in abrasion and polish covering approximately one-half of the surface. Faint pitting (pecking) is present around the edges of the use-surface. Excavations also recovered 230 faunal specimens representing at least 11 taxa. Identified specimens include jackrabbit, cottontail (*Sylvilagus* sp.), kangaroo rat (*Dipodomys* sp.), Townsend's ground squirrel, long-tailed weasel (*Mustela frenata*), and possible coyote (*Canis* cf. *latrans*); based on provenience, a single molar fragment from a large artiodactyl also may signal the presence of bison. Subsistence activities are reflected by a small artiodactyl hyoid possessing transverse cut marks and a proximal artiodactyl humerus with striations on its lateral shaft just below the head. Most of the leporid and small animal remains exhibit digestive corrosion and appear to have been deposited by non-human predators.

Excavations in Stratum VI unearthed 14 artifacts (Table 1) in association with a large hearth feature (Hearth 2; Figure 6). The hearth is a basin shaped depression measuring ca. 45 cm in diameter and contains large chunks of charcoal and a few fire-cracked rocks. Radiocarbon assay (^{13}C adjusted) of extracted charcoal produced a date of

3,950 ± 70 B.P. The modest assemblage of associated tools is represented by a small (2.6 x 1.6 cm) obsidian preform and two quartzite hammerstone spalls. A total of 101 animal bones also was recovered. Except for a single mule deer (*Odocoileus hemionus*) phalanx, the faunal assemblage consists entirely of hares, rabbits, rodents, and reptiles, none of which exhibit evidence of human subsistence activities.

Stratum V was identified as a ca. 20 cm thick layer of light gray aeolian silt containing nine flakes, one worked bone, and scattered flecks of charcoal. The bone artifact is a small (2.6 x 0.5 cm) large mammal bone splinter with a pointed, polished tip. Its thin, diminutive point and the presence of small shoulders 6 mm proximal to the tip suggest that it was used to perforate soft, thin materials. Sixty-seven faunal specimens include the remains of desert wood rat (*Neotoma lepida*), kangaroo rat, Townsend's ground squirrel, cottontail, hare, and mule deer. A single artiodactyl long bone shaft displays cut marks.

Approximately 2.5 m below ground surface, excavations in Stratum III recovered eight flakes, two obsidian flake tools, and a large, flat quartzite flake with bifacial retouch. The flake was refitted with a quartzite cobble that also was recovered from the stratum; the tool may represent the modification of a fortuitous spall caused by using the cobble as a hammer. Obsidian tools consist of a large flake fragment with extensive use-wear on the dorsal surface of both lateral margins, and a large, dome-shaped interior flake with contiguous step-flaking along its broad (4.2 cm) distal end. The location and morphology of use on the latter specimens suggests that it was used for scraping tasks. Although at least five taxa are represented, none of the 37 animal bones appear to have been accumulated by human subsistence activities.

A hearth at the bottom of the stratum (Hearth 3; Figure 6) consists of two lenses of ash and charcoal separated by a thin lens of burned aeolian silt, suggesting the feature represents two use-episodes. A sample of charcoal from the upper layer was submitted for radiocarbon analysis (^{13}C adjusted) and returned a date of 6,110 ± 90 B.P.

The most deeply buried cultural deposits were discovered in Stratum II. Excavations in the lower portion of the stratum encountered charcoal stained soil containing four pieces of debitage and a utilized obsidian flake in association with a small hearth dated to 7,350 ± 220 B.P. (Hearth 4; Figure 6). These stained, midden-like deposits may represent a separate stratigraphic layer (possibly a living surface), but poor visibility in the small, deep exposure precluded the definition of subtle soil changes in the profile. A large assemblage of animal bones was recovered in association (n=274), including 17 burned jackrabbit-sized bones and two *Lepus* tibia cylinders that probably reflect subsistence refuse. Hockett (1993) also reports *Lepus* tibia diaphysis cylinders from early Holocene deposits at Hogup Cave.

Due to the potential hazards of excavating in a confined unit adjacent to a 3 m vertical exposure, systematic 1 x 1 m excavations were terminated at the bottom of Stratum II. However, investigations continued by employing a soil auger to explore underlying deposits for cultural materials, and to identify the depth of bedrock. Auger excavations encountered approximately 30 cm of soils (Stratum I; Figure 6) containing no cultural materials and each probe terminated on a layer of impenetrable rock. This rock may delineate the floor of the cave, but it is more likely that the rock represents a layer of roof fall. Given the site's geomorphic setting, the cave was apparently exposed near the end of the Provo regression and it may contain natural and/or cultural deposits dating to ca. 12,000 B.P.

SITE SUMMARY

Data from archaeological investigations indicate that Camels Back Ridge was occupied periodically throughout the Holocene. The morphology of basalt tools at 42To798 indicate that a Western Stemmed component may be present, and the presence of reworked, unoxidized margins on oxidized obsidian flakes reflect a later occupation(s).

Time-sensitive artifacts and radiocarbon analysis indicate that Camels Back Cave was occupied intermittently from at least ca. 7,350 B.P. up to the Fremont period. The proximity of the two sites suggests that the peoples who inhabited 42To798 likely took advantage of the shelter offered by Camels Back Cave (see Figure 2). Similarly, the presence of patinated flakes with reworked, unoxidized margins in the cave deposits suggests that, on occasion, the occupants may have scavenged toolstone from 42To798. The tools from 42To798 indicate that fabrication and processing tasks were undertaken, but the frequencies of lithic tools and residues suggest that the occupations were brief. Although excavations in Camels Back Cave were limited, the types and frequencies of recovered artifacts also reflect brief episodes of tool manufacture and maintenance, and a few butchered leporid and artiodactyl bones offer direct evidence for subsistence activities.

The location of Camels Back Ridge with respect to available water and food resources tends to support our inferences concerning transitory occupations. The majority of the cave sites in western Utah are located immediately adjacent to the Great Salt Lake or Early Holocene and Neoglacial lake extensions in what is now the Great Salt Lake Desert (see Aikens and Madsen 1986; Madsen 1982a). Not surprisingly, the recovered artifacts and subsistence residues largely reflect dependence on lake-edge/marsh resources (e.g., Aikens 1970; Jennings 1957; Madsen 1982b; Madsen and Kirkman 1988). Although human occupations were relatively routine throughout the Holocene, they flourished during the early Holocene and subsequently declined in response to variable middle and late Holocene climatic regimes (Currey and James 1982; Grayson 1993) that diminished, desiccated, or inundated local resources (Madsen 1982a).

Camels Back Ridge occupied a lakeside setting at one time, but during the past ca. 7,500 years of periodic occupation the cave was far removed from extensions of the Great Salt Lake, and the nearest source of permanent water appears to have been at Simpson Springs approximately 14 km to the southeast. Small, isolated lakes and brackish marshes probably were nearby throughout most of the early Holocene in oxbows of the Old River Bed, offering the ridge's first inhabitants a diverse array of plant and animal resources. As aridity increased in the middle Holocene (ca. 7,000 B.P.), Camels Back Ridge and vicinity undoubtedly transformed into an inhospitable alkali desert offering little water and scanty food resources. Even as effective moisture increased and the lake expanded to its late Holocene highstand (4220 ft.; ca. 3,000 - 2,000 B.P. [Currey 1990]), Camels Back Ridge likely remained stark, offering a limited resource base that could not sustain prolonged occupations. The middle and late Holocene plant community probably was dominated by shrubs and grasses (e.g., pickleweed, saltgrass, Indian ricegrass) which offered low caloric yields (Jones and Madsen 1991; Simms 1985, 1987), and the fauna likely consisted of isolated patches of small mammals and infrequent sightings of large game. As a result, occupations at Camels Back Ridge probably were brief.

SOME CONSIDERATIONS FOR FUTURE RESEARCH

Camels Back Cave offers a unique arena for investigating a number of research domains, including paleoenvironments, hunter-gatherer subsistence and mobility, vertebrate taphonomy, and site structure, none of which stands alone. In order to extract the data necessary to address these issues with conviction, detailed, fine-grained recovery techniques must be employed, including the excavation of occupation surfaces in broad horizontal exposures (e.g., Simms and Heath 1990).

Although the floral and faunal remains recovered from test excavations were somewhat limited, large-scale excavation of the dry, stratified deposits would recover a large set of paleoenvironmental data spanning at least 7,500 years. This assemblage also would contain plant and animal food residues that would offer a unique glimpse of hunter-gatherer subsistence strategies, and how these strategies changed through time. Along similar lines, comparing small mammal taxonomic presences, abundances (Grayson 1991), and attritional patterns (e.g., Schmitt and Juell 1994; Shaffer 1992) in the cultural bearing deposits with those from non-cultural strata may shed light on distinguishing naturally from culturally deposited bone. Furthermore, large-scale excavations would result in the collection of abundant lithic tools and detritus. Detailed technological analyses in concert with obsidian sourcing and hydration would offer data on temporal variation in site function, residential mobility, and lithic procurement strategies and utility (e.g., Binford 1979; Elston 1990; Kelly 1988). Employing similar studies on lithic materials from 42To798 may serve to bridge the two sites by identifying periods of contemporaneous occupation.

Most of the Western Stemmed sites in the central and eastern Great Basin manifest on (or near) surface scatters in open lowland settings associated with fluvial/pluvial remnant features (e.g., Beck and Jones 1990; Price and Johnson 1988; Simms and Isgreen 1984; Simms and Lindsay 1989). These sites certainly offer valuable information on "Paleoindian" settlement and technology, but they tend to extend only a glimpse of past lifeways due to the lack of organic preservation in open contexts. Limited perishable artifacts and ecofacts recovered from Western Stemmed Tradition occupations in eastern Great Basin caves have provided a more detailed portrait of ancient adaptations (Aikens 1970; Bryan 1979; Jennings 1957), but the paucity of such sites in concert with variable excavation strategies and problematic context(s) have forsaken reliable inferences on adaptive variability. If Camels Back Cave contains a Western Stemmed Tradition occupation in stratigraphic context, materials from fine-grained excavations would doubtless offer unique and essential data for drawing inferences on Paleoindian technological and behavioral adaptations in the region (see, for example, discussions in Bryan 1988; Kelly and Todd 1988; Simms 1988).

Perhaps most significant are the presence of undisturbed deposits containing intermittent, short-term human occupation surfaces with hearths. Because some of these surfaces are capped by aeolian dust and roof spall, Camels Back Cave may offer a rare opportunity to examine the structure of human occupation in a cave setting spanning most of the Holocene. Most cave sites with long depositional records are associated with springs or lake-edge habitats that attracted people on a regular basis (e.g., Aikens 1970; Jennings 1957). As a result of virtually continuous (and often intensive) occupation, sequential living surfaces are repeatedly disturbed by subsequent activity. People dig storage pits, scavenge tools, and generally mix up older materials, making the archaeological identification of food preparation loci, sleeping areas, and refuse dumps a laborious, often impossible task (O'Connell 1993). In the few cases where living surfaces have been identified, the exposure of materials on these surfaces has allowed the reconstruction of past lifestyles in exceptional detail (see especially Thomas 1983). By employing fine-grained excavation techniques in broad exposures, Camels Back Cave may produce this kind of archaeological detail that is so rare in sites of similar context.

NOTES

[1]Stratum XIV was encountered only in the northern portion of excavations and did not occur in the south wall stratigraphic profile presented in Figure 6.

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FREMONT SETTLEMENT AND SUBSISTENCE PRACTICES IN SKULL VALLEY, NORTHERN UTAH

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Excavations were conducted at 42To504, a small site in Skull Valley, northern Utah, which dates to the Early/Mid Fremont time period. Situated on a long dune-like feature, the site contains evidence of an ephemeral brush structure, shallow pits, and a suite of nested clay-lined pits. Fremont pottery, corn, ground and flaked lithics, fire-altered rock, and daub fragments were recovered. The site is interpreted to be a locus for late-summer/early fall seed gathering by small mobile groups of people who had access to corn, either through trade of part-time horticulture. The environment, probably locally moister than today, resulted in perennial water in the playa adjacent to the site. 42To504 represents another example of Fremont subsistence and settlement diversity.

INTRODUCTION

Early definitions of the Fremont culture relied almost exclusively on data from village sites (Marwitt 1970; Madsen 1980). Postulated subsistence strategies, when addressed at all, were variations of the notion that Fremont people were horticulturally dependant, casually exploiting wild resources to some degree. In the past two decades, Great Basin anthropologists have turned attention towards gaining an understanding of Fremont subsistence and settlement variability (e.g. Madsen and Lindsay 1977; Madsen 1980, 1982; Janetski 1893, 1986; Janetski et al. 1991; Jones and Madsen 1991; Simms 1986, 1990; Sharp 1989). The broad brush outlines of the theory of highly variable Fremont subsistence strategies are becoming more detailed and explicit as a range of site types and locations are researched. This paper reports excavation results at a small Fremont site in the Great Salt Lake Desert where people intermittently gathered and stored wild seeds. It adds a small vignette to the overall portrait of Fremont adaptive variability.

ENVIRONMENTAL SETTING

A large land exchange proposal prompted inventory of 8,360 acres in central Skull Valley, Tooele County (Figure 1) by the Salt Lake District of the Bureau of Land Management. Thirty-seven prehistoric sites were discovered, and one (42To504) contained subsurface cultural deposits.

Site 42To504 is near the center of Skull Valley (1287 m to 1500 m asl), which is located between the Stansbury and Cedar Mountains at elevations ranging from 1287 m asl to 1500 m asl (Figure 2). The valley floor is composed of alkaline Quaternary lake bed sediments, which form hardpan playas. Cobbles of black basalt are scattered sparsely over the landscape, and probably originate from Tertiary volcanic deposits in either or both of the mountain ranges.

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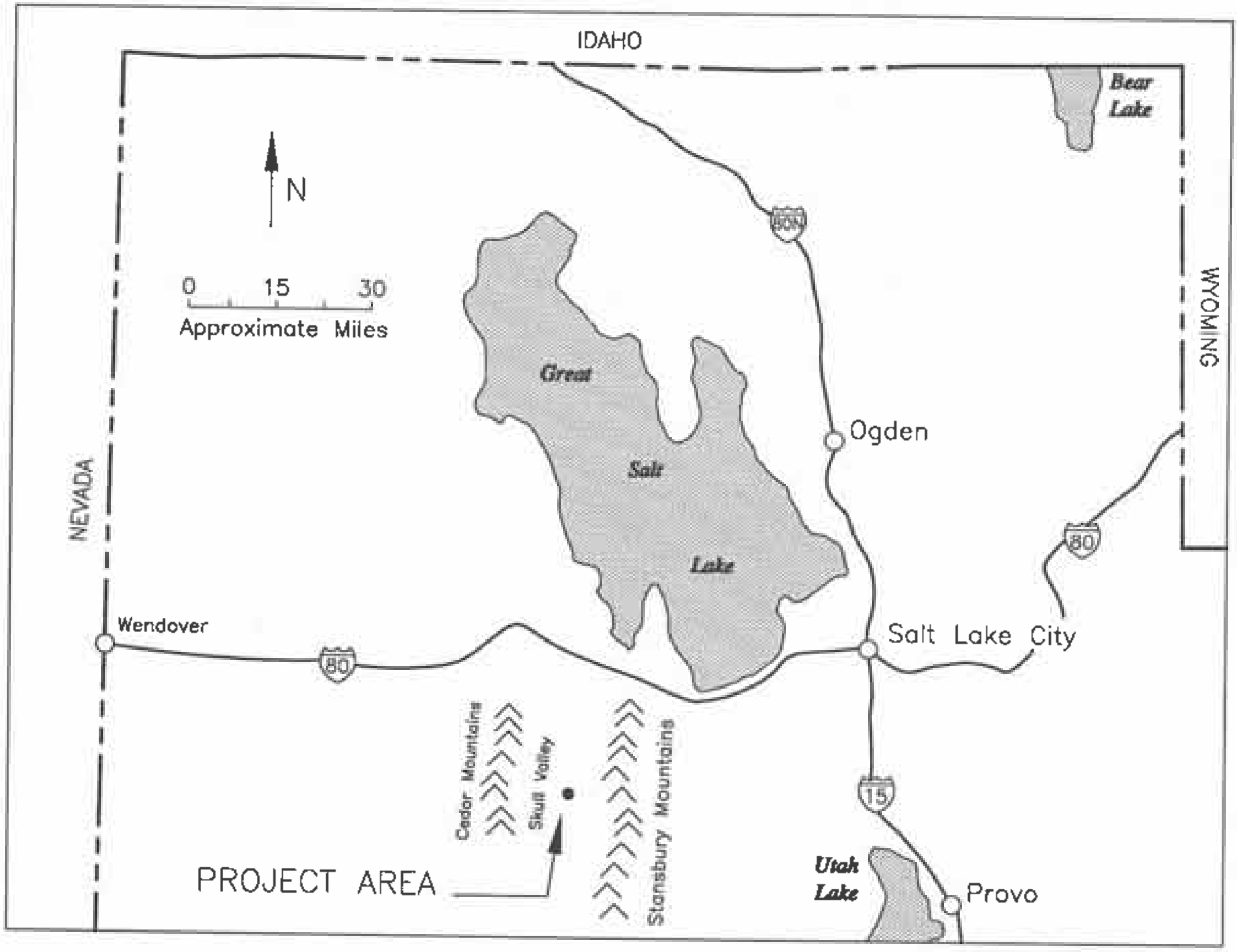

Figure 1. Project Area Location Map.

Vegetation is typical of the shadscale zone. It is dominated by greasewood *(Sarcobatus vermiculatus)*; shadscale *(Atriplex confertifolia)*, rabbitbrush *(Chrysothamnus nauseosus)*, pickleweed *(Salicornia* sp.), horsebrush *(Tetradymia* sp.), halogeton *(Halogeton glomaratus)*, prickly pear cactus *(Opuntia* sp.), clasping peppergrass *(Lepidium perfoliatum)*, and cheatgrass *(Bromus tectorum)* are also present.

A series of perennial springs emanate from the foothill-valley contact on both sides of the valley, the larger of which support broad areas of riparian vegetation. The waters are typically brackish. Ephemeral north-flowing drainages cross the valley floor. Shallow ponds briefly form in the playas during periods of heavy rainfall, especially in the northern end of the valley. Precipitation is less than ten inches per year, 70 per cent of which occurs from winter storms.

A north-south trending linear escarpment is located in the central portion of Skull Valley; it extends for over two miles in a continuous segment, with shorter sections continuing on either end. Shorter segments of a second parallel bar lie to the east. Both are approximately 2 to 3 meters high, and 10 to 15 meters wide at the base. Backhoe trenching and stratigraphic analysis indicate that the bars are features deposited by off-shore currents of Lake Bonneville. The upper 40 cm of sediment are in part aeolian derived, indicating deposition after Lake Bonneville receded. Therefore, the bars probably were similar during the prehistoric occupation to their current configuration,

Figure 2. View of site; excavations were on the bar feature near the center of the photo.

although the uppermost aeolian sediment appears to be shifting somewhat, with aeolian deposition on the west faces of the bars being generally thin to non-existent.

Site 42To504 is located on the west side of the western bar and in the adjacent playa, at an elevation of 1320 m asl. Five additional prehistoric sites (42To545-549) were discovered in association with bar features, each consisting of flaked lithic and fire-altered rock scatters of quartzite and basalt, and located very near the juncture of the bar's western edge and playa. Test excavations at the five sites showed the fire-altered rock scatters to be lag deposits of eroded features.[1]

SITE 42TO504

Site 42To504 is the most extensive (100 m n-s by 40 m e-w) of the bar sites and the only one which contained subsurface cultural deposits (Figure 3). Surface artifacts include a quartzite cobble mano, four greyware sherds, over 100 pieces of flaked stone (predominately basalt secondary flakes), and two areas of fire-altered rock on the western slope of the bar feature (Loci 1 and 2). An isolated obsidian Desert Side-notched point was found 50 meters west of the western site boundary. All of the surface artifacts were found on the playa, with the exception of the mano and one sherd, which were associated with the fire-altered rock areas, and a small burned daub fragment found on the crest of the bar.

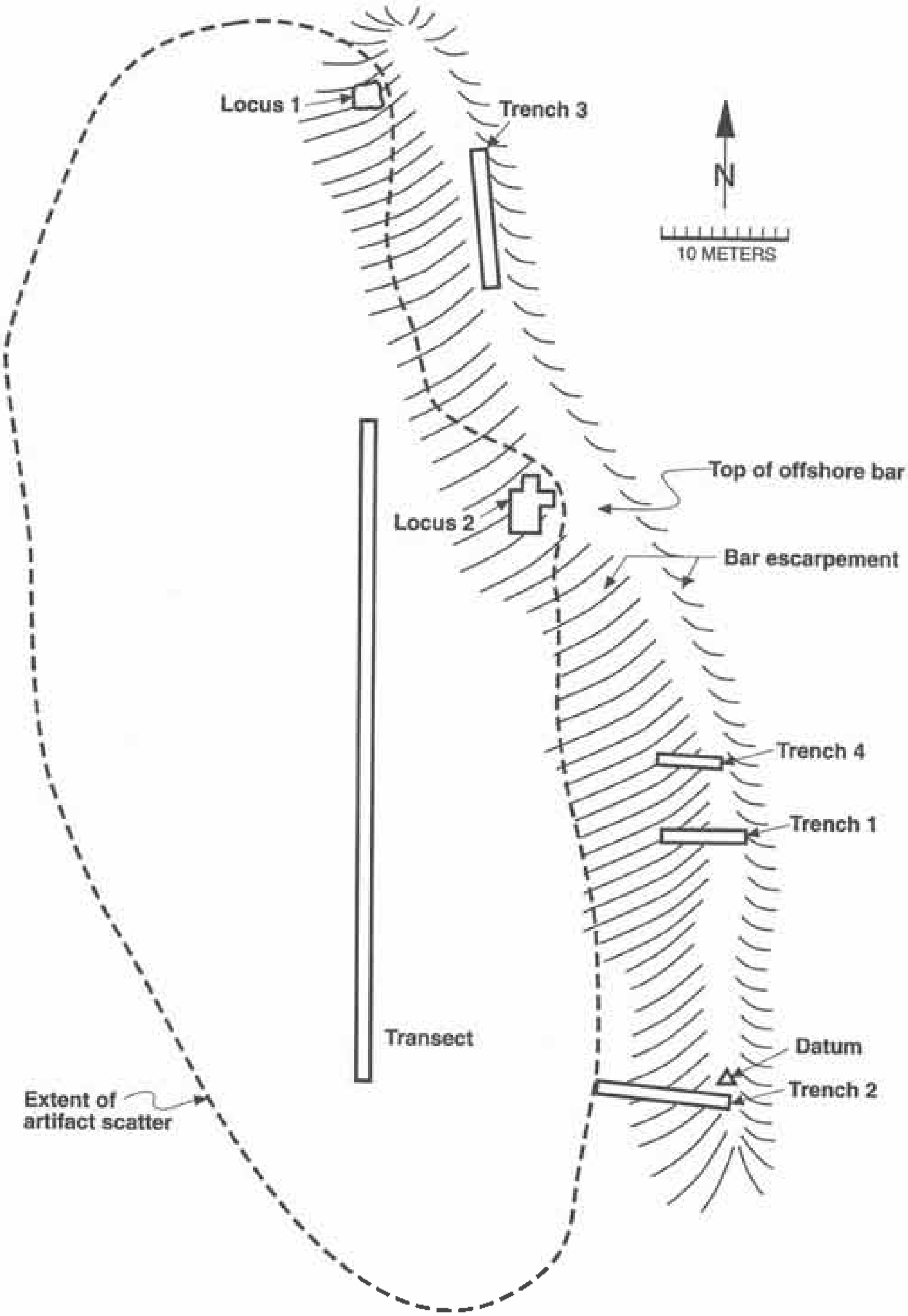

Figure 3. Plan View of 42To504.

Loci 1 and 2

Both fire-altered rock scatters were test excavated. Locus 1, the northernmost scatter covered an area 2.4 m^2 and contained a quartzite cobble mano. Two other fragments of fire-altered rock show wear consistent with use as a grinding implement. Locus 1 was test excavated to a depth of 40 cm. There was no soil discoloration, feature definition or additional artifacts, although small flecks of charcoal were within the loose upper sediment. Screening through 1/4" mesh recovered 26 small pieces (1 to 4 cm) of fire-altered rock, which probably represents a lag deposit from an eroded feature. The rock fragments are small and not likely to be from cleaning another feature and dumping its contents.

The main focus of archaeological excavations, Locus 2, is just downslope of the western crest of the bar, approximately 35 meters southeast of Locus 1 (Figure 4). At initial recording, a slightly darkened area approximately 2 meters in diameter contained a diffuse scatter of fire-altered rock and one greyware sherd, and a more discrete concentration of charcoal and ash (Feature 7). Portions of eight 1 x 1 meter squares were subsequently excavated over two field seasons.

The 1989 excavation removed overburden with shovels in thin layers (< 5 cm) until the staining became more discrete or features were discovered. This was necessary due to extensive rodent disturbance. The strategy was only partially successful, so two profiles through the stained area were prepared (Figure 5). All but the uppermost loose fill of the two eastern units was passed through a 1/4" screen. Excavations revealed the remains of a brush structure and four pit features.

Locus 2 Structure

A very dark charcoal-stained and mottled lens, 1 to 2 cm thick, underlies much of the excavation area (Figures 2 and 4). The distance between the present extreme edges of the charcoal layer is 1.97 meters. Another charcoal-dense lens more or less discontinuously parallels the bottom one and is from 16 to 10 cm above it. On the southern edge of Profile A'-A, the two layers meet. Intervening fill is a greyish brown sandy silt (10 YR 5.2) heavily mottled and stained with charcoal, as is the fill above the upper charcoal layer. Fragments of carbonized *Phragmites* sp., a carbonized corn cob fragment, one orange chert flake, three greyware sherds, and four fragments of fire-altered basalt and quartzite were recovered from this fill. Several fragments of daub, some impressed with small sticks and grass, were found in a rodent burrow.

The charcoal, *Phragmites,* and daub, together with the excavation profile, imply that this area had a light brush structure which burned. *Phragmites* was possibly a construction element. Occupation was at or near the initial occupation of the site.

Pits 1 through 4

Four pit features were identified in Locus 2 as associated with the structure. Pit 1, an ash/charcoal-stained soil concentration, is 1.25 meters in diameter, and, where not eroded, is 7 cm deep. A flotation sample of the fill contained small amounts of burned and unburned rodent bone (LaMar Lindsay, personal communication 1992). Since the feature is at the modern ground surface, the antiquity of these remains is questionable.. Given its superposition, Pit 1 represents one of the final occupations of the site.

Pit 2 is 15 cm deep and otherwise similar to Pit 1. Fill is a sandy clay silt with diffuse charcoal and ash and numerous rodent burrows. While neither Pits 1 or 2 appear to be prepared hearths, the edges of Pit 2 are slightly hardened. The base of Pit 2 touched the charcoal-stained layer.

Pit 3 is really a series of small nested pits (45 cm maximum diameter, and 10 cm deep) that have been lined at

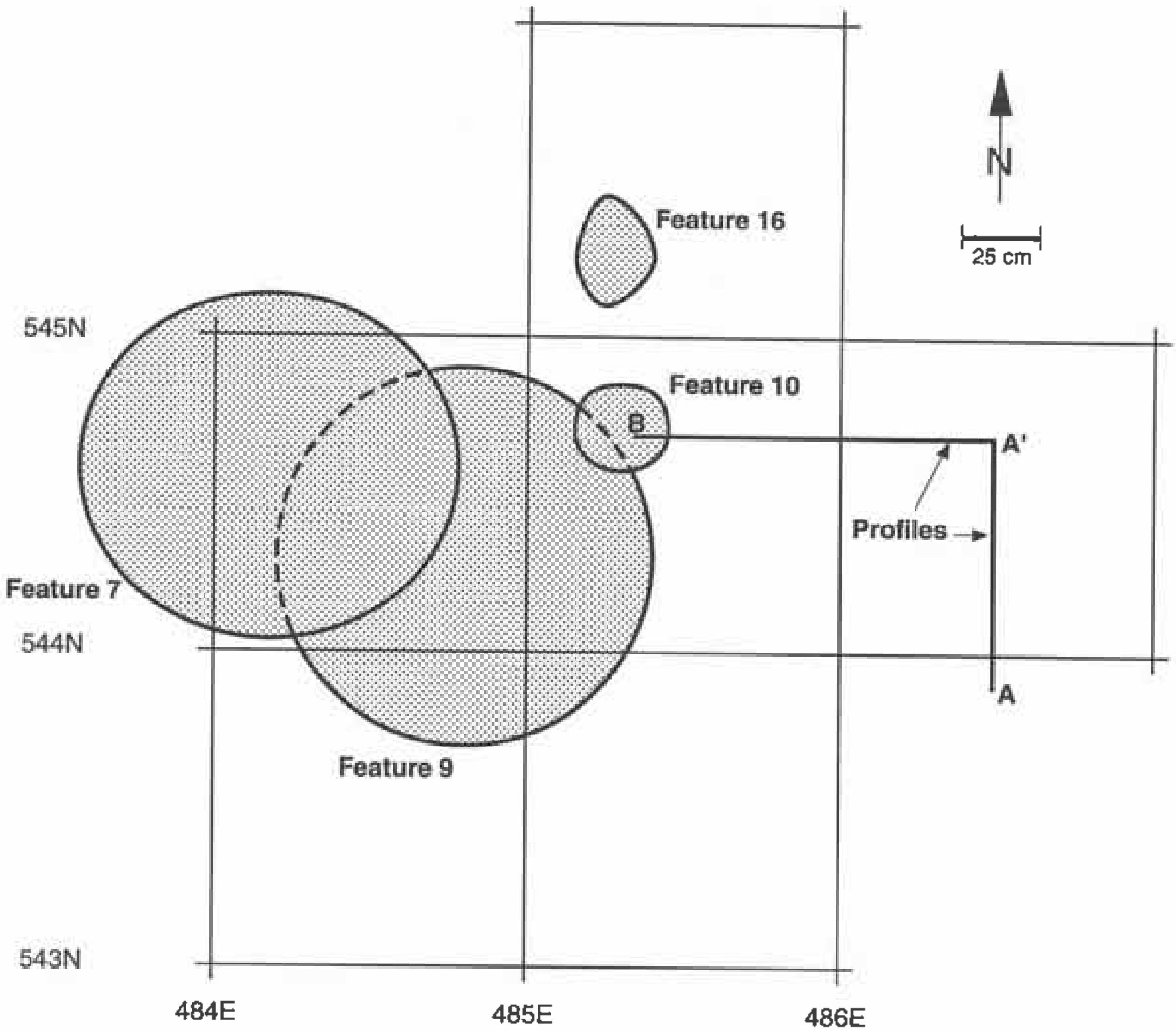

Figure 4. Plan View of Locus 2 Excavation Area.

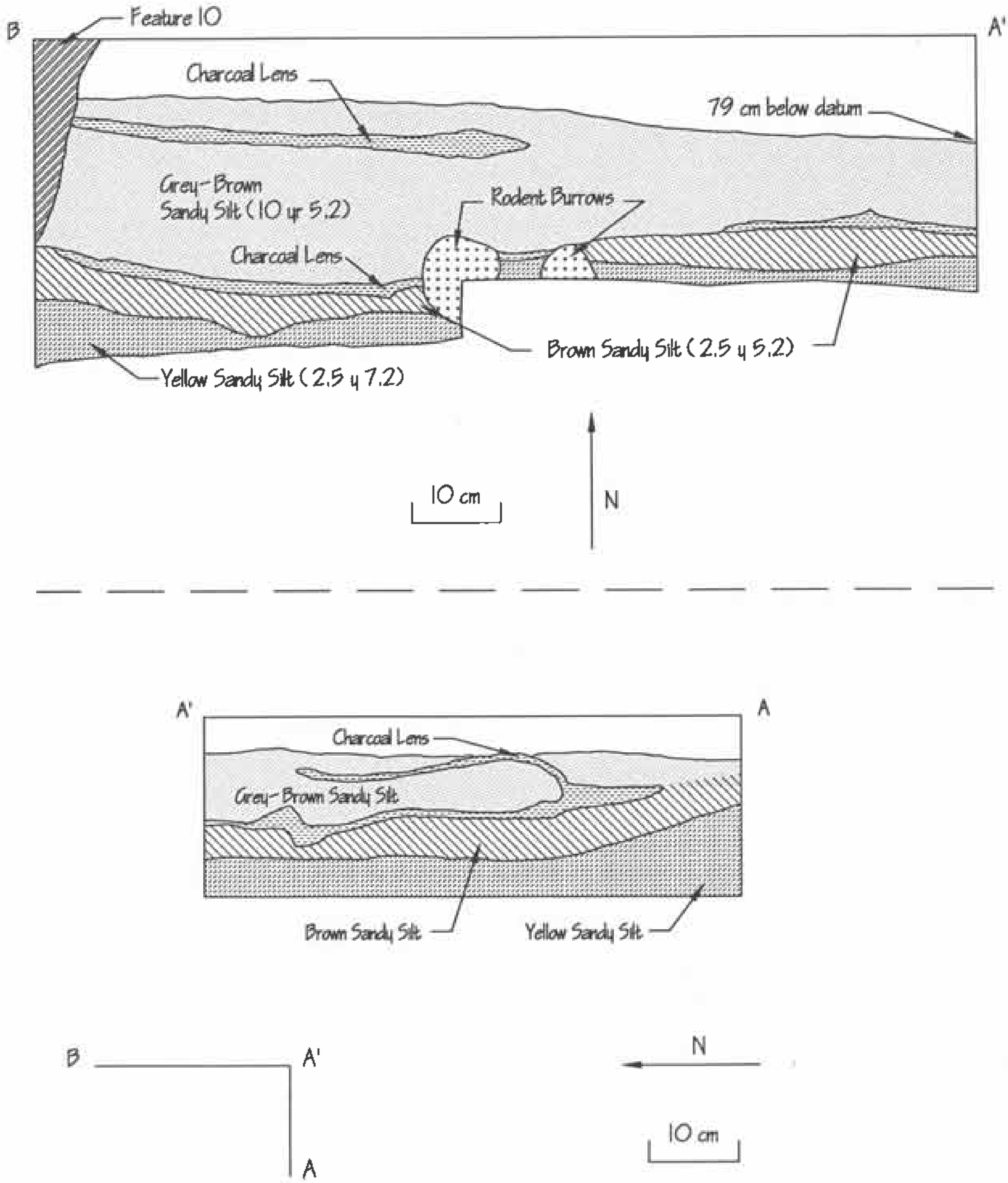

Figure 5. Locus 2 Profiles.

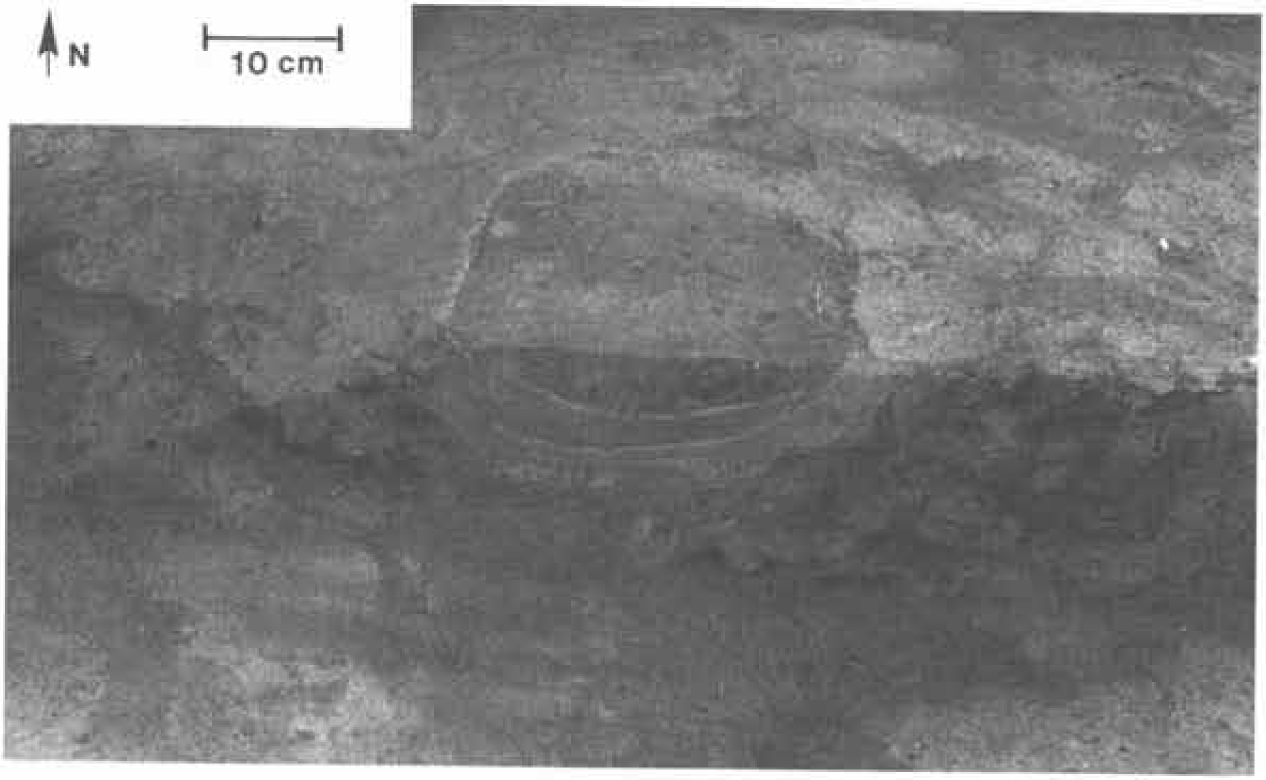

Figure 6. Feature 10, Nested Suite of Lined Pits.

least 6 times (Figure 6). The linings are a white silty-clay, evenly applied, and each is approximately 0.5 cm thick. Fill in each level is a yellowish sandy loam containing sparse fine charcoal, grading finer with depth. The top three lined pits have fill depths of 2 to 5 cm between linings, the deepest being the most recent. The lower three linings have scant fill between them, comprising a 2 cm thickness in total. Below the lowest lining, on the west edge of the feature, is a short lens 1 to 2 cm thick containing charcoal, ash, and minute burned cylindrical plant fragments, probably *Phragmites*. This lens appears to be a portion of the underlying charcoal layer from the burned structure which became discontinuous at the eastern edge of Pit 3. A series of flotation and pollen samples was collected from the nested pits. No artifacts were found in Pit 3. Both Pits 1 and 3 intrude Pit 2.

Pit 4 (40 cm x 25 cm) is a shallow pit (10 cm deep), with no signs of burning, discovered 9 cm below the modern ground surface. The fill is a series of cross-bedded silt laminae. No artifacts or charcoal were present, and the pit appears to have filled naturally with water-borne sediments from both surface runoff and standing water. The charcoal layer that underlies the other features does not extend to Pit 4.

ARTIFACT AND SAMPLE ANALYSES

Radiocarbon Dates

Two samples were submitted for radiocarbon dating. Radiocarbon Sample 1 (Beta-33794; ETH-5947) is a carbonized corn cob, that was dated by the accelerator mass spectrometer technique to 1290 ± 70 BP, and calibrated to AD 605-875 (Klein et al. 1982). The cob was found in the charcoal-mottled structure fill 21 cm below the modern ground surface.

Since the corn cob's provenience was uncertain due to bioturbation, another radiocarbon sample comprised of a pooled sample of carbonized wood was collected from the same excavation unit. This sample dates to 1320 $\pm$ 70, and is calibrated to A.D. 595-860. A pair-wise test of these dates ($t=.3$, $p<.05$ [Thomas 1976:249-251]) suggests that the two samples are contemporaneous. The samples from 42To504 date between A.D. 595 and A.D. 875 (95% confidence interval).

Ceramics

Three sherds from Locus 2 were selected for petrographic analysis, one from the surface and two from the structure fill. All were examined in detail by Patricia Dean using standard petrographic analyses (Kerr 1977). All three sherds are from a single vessel. Andesite temper (commonly called "gray basalt" in the archaeological literature) comprises 70-75 per cent of each sherd; andesite clay composes the remainder. Both temper and clay are from the same source and were ground before the vessel was shaped using coil construction (Patricia Dean, personal communication, October 1989).

> Andesite is found in pottery throughout northeast Utah and has been identified variously as Great Salt Lake Gray at the Bear River, Levee and Knolls sites; Promontory Ware at Lakeside Cave; Shoshonean Ware and Great Salt Lake Gray at Danger Cave; and Snake Valley Gray and Great Salt Lake Gray at Hogup Cave (Dean 1992). Andesite is not only the earliest raw material used to make pottery in this region, but occurs in pottery continuously throughout the archaeological record to the most recent date of 330 BP (Dean 1992: Figure 11).

Obsidian

A bifacially flaked obsidian tool fragment from the playa was submitted for X-ray florescence analysis. The trace element profile of this tool matches obsidian from the Topaz Mountain source area, 96 km (60 miles) to the south (Richard E. Hughes, personal communication, January 1990). Three other samples from 42To545, a site situated on the bar feature about one-quarter mile south of 42To504, also match the Topaz Mountain source.

Macrofossils

In addition to a carbonized marcophyte from the fill at the southeast end of the excavation, five flotation samples taken from the fill above the hypothesized structure were analyzed (Table 1). The macrophyte was identified as *Phragmites* sp., common reed (Newman 1990:8). Macrofossil samples 1 - 4 are from strata in Pit 3 (Figure 6). Sample 5 is from the fill at the southeast end of the structure immediately above Profile A-A'.

The six plant taxa from the flotation samples resemble the contemporary vegetation of the area. Of the 350 recovered macrophytes, over 99 per cent are uncharred. Four charred specimens are from Sample 2 (nested pits) and one burned *Lepidium* seed is from Sample 5 the fill near the A-A' profile. Uncharred plant fragments often are excluded from analysis because their antiquity is uncertain. A comparison of the contents of Sample 5 (the largest bulk sample) and those from the nested pits is instructive.

Sample 5 was collected from unconsolidated sandy-silt fill sparsely flecked with charcoal and a few artifacts, and showing some bioturbation. Because the sediment of this stratum is loose and disturbed, and not reliably part of a defined feature, it is questionable whether the macrophytes within it are ancient. The fact that only nine specimens were recovered from this sample also suggests the Sample 5 represents a generalized natural sampling of nearby plant taxa over an unknown period of time. Samples 2 and 3, from the nested pits, in contrast contain abundant macrophytes (see Table 1). The sample from the uppermost pit (Sample 1) however, contains only 17 specimens; it originated only five cm below the modern ground surface. This level has likely been exposed and covered several times by the shifting overburden, and the sample contents are best disregarded as the result of human activity.

Compared to Sample 5, the macrophytes from the nested pits are quite concentrated. Additional evidence for this argument includes four charred seeds and plant fragments in the fill of the second lined pit (Sample 2). The macrophytes from the lower levels of the nested pits are therefore considered to be the result of human activity and are included in further analysis and interpretation.

All of the identifiable plant taxa recovered from 42To504 have known ethnographic uses, and each has been found in prehistoric contexts as well. The *Chenopodiaceae-Amaranthus* group (which includes *Atriplex* and *Suaeda)* are used as greens and seeds for meal. They have been recovered in abundance at Clyde's Cavern, Hogup Cave, Evans Mound and Backhoe Village and Sudden Shelter. *Lepidium* sp. and mustard are used by modern groups (Bye 1979; Kearney and Peebles 1960) for food and flavoring, and also have been found at Sudden Shelter and Clyde's Cavern (Winter and Hogan 1986; Coulam and Barnett 1980; Newman 1990:10). Ethnographically, *Phragmites* was used for arrowshafts (Wheat 1967:24; Thomas et al. 1986:269), and "honeydew" (sap) was collected from dried canes and used for candy or medicine (Wheat 1967:23). Hogup Cave coprolites show that *Phragmites* seeds were eaten (Winter and Hogan 1986:132), and, as the evidence at 42To504 supports, the thick, woody stalks could be used as an element in a brush structure.

The macrofossil analysis shows an abundance of cheno-am specimens (undifferentiated: 218 seed specimens, 9 of which are burned; *Atriplex*: 20, 1 charred seed; *Sueda*: 61, 1 charred seed) and *Lepidium* (peppergrass) seeds (29, 1 burned). *Chenopodiaceae* seeds are available for harvest, depending upon species, between August and December, and *Lepidium* seeds are ripe June through August (Simms and Heath 1990:808). Other seed plants not represented in the macrofossil samples but present locally today, and probably part of the prehistoric landscape, include shadscale, bulrush, saltgrass, and pickleweed. Shadscale is available in mid to late winter, bulrush from August through November, saltgrass from June through September, and pickleweed from early August to early November (Simms and Heath 1990:808; Simms 1985:121) The archaeological samples indicate a late summer, perhaps early fall occupation of the site. The other seed plants, with the exception of shadscale, have a similar season of availability.

Pollen

Five samples were submitted for pollen analysis; (Table 2 [Newman 1990:2-3]). Pollen Sample 2, which was collected from the modern ground surface, represents the pollen profile of contemporary vegetation. Pollen sample 1 was collected from the fill of the second lined pit of Pit 3, which dates to near the end of site use. Three samples (3,4, and 5) were collected from a stratified column of the eastern edge of profile B-A' in the structure, but only one of them (Sample 5) has a pollen sum high enough to be interpreted. This sample reflects climatic conditions just prior to site occupation, and the abundant cheno am pollen found in it cannot be attributed to human activity.

Sample 1 was taken from a level of Pit 3 that was in use near the discernable end of occupation. The pollen spectrum here probably represents plant gathering, processing, and/or storing activity, and the natural background pollen rain. The pollen data corroborates the macrofossil data from the same location and, again, point to an abundance of local cheno-ams.

Pollen analysis can provide insights about temperature, moisture, and precipitation pattern. While the samples reported here do not constitute a large enough sample to reconstruct paleoclimates, they do provide an indication of local changes over time and a fit with broader regional paleoclimatic reconstructions.

Table 1. Counts of Macrobotanical Remains Recovered from 42To504

TAXA	SAMPLE 4	SAMPLE 3	SAMPLE 2	SAMPLE 5	SAMPLE 1
Atriplex Leaf/Leaves - Charred	0	0	1	0	0
Atriplex Leaf/Leaves Uncharred	0	2	6	0	9
Atriplex Seed - Uncharred	0	0	0	0	1
Atriplex truncata-type Fruit - Uncharred	0	0	0	0	1
Cheno - Am Seed - Charred	0	0	2	7	0
Cheno - Am Seed Uncharred	29	83	96	0	1
Cruciferae Seed - Uncharred	5	6	2	0	0
Gramineae Floret - Uncharred	0	0	0	0	3
Lepidium sp. Seed - Charred	0	0	0	1	0
Lepidium sp. Seed - Uncharred	2	9	16	0	1
Suaeda sp. Seed - Charred	0	0	1	0	0
Suaeda sp. Seed - Uncharred	11	34	14	0	1
Unknown A Seed - Uncharred	0	1	0	1	0
Unknown Leaf/Leaves Uncharred	0	0	3	0	0
Unknown Seed - Uncharred	1	0	0	0	0
Sum of Items Recovered	48	135	141	9	17

Sample 1, from the nested pits, displays a pattern consistent with a cool temperature regime, relatively high effective moisture, and a winter precipitation dominance during site occupation. Sample 5, older and prior to site occupation, shows a plant community consistent with a warmer temperature condition and similar amounts of effective moisture, with perhaps most of the precipitation occurring during the warmer months. The similarity between the modern sample (Sample 2) and that from the nested pits is related to the fact that the historic period is considered cool and dry, as is the period associated with site occupation (D. Newman, personal communication, March 1993).

At about the time 42To504 was occupied, there appears to have been a transition between warm/wet and cool/dry conditions in central Utah (Newman 1988). In the northern Southwest, there is relatively high effective moisture between 1450 BP and 1200 BP (Plog et al. 1988:234). A cooling climate can result in more effective moisture, even with less precipitation, because the cooler temperatures conserve moisture.

DISCUSSION

Environmentally, the site 42To504 locality probably looked decidedly different during site occupation. The playa, nearly barren today, must have supported a stand of *Phragmites* (common reed) and associated riparian vegetation. If indeed the light burned structure included *Phragmites* as a construction element, then the parsimonious explanation is that it was available locally. The canes grow to two to four meters tall and over 2 cm in diameter (Welsh et al. 1987:759). With shrubby plants locally abundant and suitable for use in a brush structure, there would be no reason to transport heavy, bulky *Phragmites* canes any distance.

Phragmites grows along waterways, and in both saline and freshwater marshes, at elevations between 760 m and 1980 m asl (Welsh et al. 1987:759). Today it is absent from the valley bottom; it grows several miles away near the springs and seeps along the valley foothills. The water table in Skull Valley today is shallow, only 50 cm below the ground. Even a minor change in the temperature or moisture regime could result in a raised watertable and perennial standing water. *Phragmites* and possibly other riparian vegetation could have been immediately available to site occupants.

Studies of Holocene climate show fluctuating levels of the Great Salt Lake during the time of site occupation (Currey and James 1982:40; Currey 1990:204-205). Higher stands of the lake, reflecting greater effective moisture, could have raised groundwater levels in nearby central Skull Valley sufficiently to support riparian vegetation in playa marshes, at least for brief episodes (Don Currey, personal communication, May 1995). The regional paleoclimatic data discussed previously also supports the view that there was greater effective moisture during the time of site occupation.

In this environmental setting, Fremont people left behind the remains of a brush structure, four shallow pits, a carbonized corn cob, Fremont greyware sherds, fire-altered rock, flaked lithics, grinding implements, and daub fragments. These data imply that people were present long enough to warrant the investment in constructing a shelter, but brief enough to preclude the necessity for internal features such as a hearth or storage pits, or the accumulation of a midden deposit. Numerous ethnographic sources attest to Great Basin peoples using circular to semi-circular brush windbreaks, sunshades, small lodges, or dwellings (Thomas et al. 1986:268; Malouf and Findlay 1986:511; Murphy and Murphy 1986:294-295; Kelly and Fowler 1986:374).

The function(s) of the shallow pits (Pits 1, 2, and 4) is unclear. They may represent work areas or features associated with plant processing, such as threshing or holding bins. Pit 3, the suite of nested clay-lined pits, was evidently prepared at least six times. The density of recovered macrofossils, especially charred and uncharred

Table 2. Pollen Counts and Percentages from 42To504

TAXA	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Abies	1 (0.2%)	1 (0.2%)	-	-	-
Juniperus	12 (2.9%)	38 (6.2%)	-	-	4 (1.1%)
Pinus	95 (22.8%)	140	2 (6.7%)	3 (33.3%)	69 (18.3%)
Picea	1 (0.2%)	-	-	-	-
Quercus	1 (0.2%)	1 (0.2%)	-	-	-
Ambrosia-type	-	2 (0.3%)	-	-	2 (0.5%)
Artemisia	51 (12.2%)	102 (16.7%)	-	1 (11.1%)	6 (1.6%)
Cactaceae	1 (0.2%)	-	-	-	2 (0.5%)
Cheno-Ams	64 (39.3%)	187 (30.7%)	17 (56.7%)	33 (3.3%)	248 (65.8%)
Compositae	14 (3.4%)	12 (2.0%)	-	1 (11.1%)	4 (1.1%)
Ephedra	3 (0.7%)	7 (1.2%)	1 (3.3%)	-	1 (0.3%)
Sarcobatus	49 (11.8%)	91 (14.9%)	8 (26.7%)	1 (11.1%)	28 (7.4%)
Shepherdia	-	-	-	-	1 (0.3%)
Cruciferae	1 (.02%)	-	-	-	-
Eriogonum sp.	-	-	-	-	1 (0.3%)
Plantago	-	1 (0.2%)	-	-	-
Sphaeralcea sp.	-	-	-	-	1 (0.3%)
Gramineae	14 (3.4%)	19 (3.1%)	1 (3.3%)		4 (1.1%)
Monolete Spores	-	-	1 (3.3%)	-	1 (0.3%)
Trilete Spores	-	-	-	-	3 (0.8%)
Indeterminate	10 (2.4%)	9 (1.5%)	-	-	2 (0.5%)
POLLEN SUM	417	610	30	9	377

cheno-am seeds, suggest that the feature functioned as a storage pit for small quantities of seed.

The site is interpreted as an activity area for processing plants, primarily cheno-ams. Occupants initially constructed a brush shelter. The site was repeatedly occupied, and used as a station from which to gather storable seeds in late summer and/or early fall. This postulated season of use is consistent with the presence of a light fair-weather structure. Seeds were cached in Pit 3, the suite of nested pits, perhaps for consumption immediately upon return. Corn and pottery were brought to the site at least once.

The presence of corn at 42To504 is notable. Corn has been recovered from regional Fremont village sites (e.g. Grantsville [Steward 1933], Garrison [Taylor 1954], and Nephi [Sharrock and Marwitt 1967]) and the Fremont levels at Hogup Cave (Winter and Hogan 1986:132). However, subsurface corn has been recovered from only one other open temporary site in the West Desert, Topaz Slough, which contained one corn cob.

Locally available black basalt comprises the majority of ground and flaked lithic artifacts. However, site occupants had access to Topaz Mountain obsidian, 60 miles distant. Formal tools are scarce; they consist of a mano, two fragments of fire-altered rock showing grinding wear, and an obsidian biface fragment. The flaked lithic assemblage contains a preponderance of secondary flakes, the result of on-site manufacture of tools or preparation of expedient cutting edges.

It is significant that no faunal resources were recovered from 42To504. While negative evidence certainly does not constitute proof, it does seem that occupants of this site were focused on plant resources. Equally significant is that the recovered macrofossil taxa, with the exceptions of corn and *Phragmites*, are members of the desert salt brush community, not riparian resources. If the playa sustained a full complement of marsh resources, evidence of such species as *Typha* and *Scirpus* would be expected. Instead, it seems that a localized occurrence of perennial water supported a limited number of plant species, including *Phragmites*.

A particularly notable characteristic of the people who occupied this site is the persistence with which they returned to one tiny spot in a vast area of seeming sameness. Pit 3, measuring less than a half meter in diameter, was repeatedly prepared with a clay lining. A logical conclusion is that the very same individuals returned at least six times. If marsh resources are not the primary magnet here, what could explain this repeated use?

As other have pointed out (Janetski 1986; Simms 1985; Madsen and Kirkman 1988; Jones and Madsen 1991) resource acquisition cost includes search time and harvesting ease. If Fremont culture can be characterized by its variability, Skull Valley's salient characteristic is its uniformity. In excess of 81,000 ha. are covered with desert shrub species. For gathering seeds of desert plants, a staging area more strategic than the center of Skull Valley is difficult to imagine. In the appropriate season and in years of adequate moisture, search time for desert seed plants would be minimal. Further, some of the plant species exploited by site occupants, especially *Atriplex*, have a relatively high return rate (Simms 1985:121). The initial acquisition cost of storable seeds would be relatively low (although subsequent transportation costs are another matter).

The repeated attraction of this area, then, could be its location in a vast area of desert seed-producing plants, near water and *Phragmites*, which is surely an easier material to work into a structure than the more thorny and brittle desert shrubs. Bringing a little corn along, and tapping a small store of seeds from the season(s) before, Fremont people had an initial food reserve as they set about the task of collecting and processing wild seeds.

Considering the other five bar-associated sites along with 42To504, a pattern emerges. The western sides of these low rises contain small sites composed primarily of local black basalt flaked lithics and discrete fire-altered rock scatters. It could be that each was a seed collecting station, taking advantage of the same environmental circumstances. It is indeterminable if the sites are contemporary, although the similarity of the artifact assemblage and features, and the fact that Topaz Mountain was included in the obsidian acquisition scheme of two different sites' occupants supports (albeit weakly) the view that the sites were nodes in the same synchronous subsistence system.

The availability of local perennial water in Skull Valley seems to have been a short-lived phenomenon; otherwise, evidence of a more intense occupation would be expected. It appears that local environmental conditions fortuitously enabled (water) to be present in the midst of an attractive resource that was not as exploitable without water available. The low rise of the bars afforded convenient places for seed processing, including shallow pits and access to the rock used, presumably, in some related roasting or parching activity. *Phragmites* may have been an additional attraction.

The convergence of desirable environmental conditions in a particular area is only of value to a people poised to take advantage of it. Early Fremont people in Skull Valley were technologically and logistically so positioned. They were either exclusively mobile collectors, trading for corn, or a task group dispatched from a settlement that had a partial reliance on horticulture (Madsen 1982; Simms 1986). They were able to exploit a desirable, relatively low cost resource in a region where resources are temporally and spatially highly variable.

The subsistence and settlement pattern exhibited at 42To504 has not been widely documented elsewhere, in part due to the rarity with which temporary sites with subsurface cultural deposits have been identified (let alone excavated). Topaz Slough (Simms 1986) is the only other similar site reported in the region. The physiography of the Skull Valley sites and Topaz Slough is similar, but 42To504 dates somewhat earlier and represents a briefer and less intense occupation. In both cases, climatic data suggest a regime that produced local wetland flora. Fremont people occupied sand dunes and bar features adjacent to wetlands areas, where they returned repeatedly but briefly. They especially exploited storable seeds, especially those of the Chenopodiaceae family, and had access to corn. Further investigation of similar desert locales, as Simms observed (1986:206), should help to further explicate this pattern and its variations.

SUMMARY

At the time of occupation, sometime between the seventh and ninth centuries A.D., Skull Valley probably had at least one episode of perennial standing water in the playa areas. Too saline to grow domestic crops like corn, the riparian areas nevertheless could have supported some marsh resources, including *Phragmites* sp, in a vast area of seed-producing desert plants.

A flexible subsistence strategy enabled Fremont people to opportunistically utilize these resources when environmental conditions made it cost effective to do so. Changing conditions alter resource availability, and other areas become more attractive. "In the Great Basin the marshes and playas were intermittent affairs, always at the mercy of dry cycles and shifting dunes and channels (Wheat 1967:3). The occupants of site 42To504 were apparently "getting it where the gettin's good" (Madsen 1982).

NOTES

[1]All artifacts and samples from both the survey and excavations are curated at the repository at Southern Utah University, Cedar City.

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APPENDIX

Correlation of Features with Feature and Sample Numbers

FEATURE	FEATURE NUMBER	POLLEN SAMPLE FS	MACROFOSSIL SAMPLE FS	^{14}C SAMPLE FS	CERAMIC FS
Pit 1	7	-	-	-	-
Pit 2	9	-	-	-	-
Pit 3 (nested pits)	10	10 (Sample 1)	9,11,12,13 (Samples 1,2,3,4)	-	-
Pit 4	16	-	-	-	-
Structure	18,19	28,29 (Samples 3,4)	19 (Sample 5)	25 (^{14}C #1) 26 (^{14}C #2)	21,24

FS = Field specimen number.

ARCHAEOLOGICAL SALVAGE INVESTIGATIONS AT A FREMONT SITE IN THE JORDAN RIVER DELTA

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Salvage excavations at site 42SL197 in west Salt Lake City retrieved stone tools, butchered bison bone, ceramics, and human skeletal remains. Although the deposits had been disturbed by recent construction activities, recovered artifacts and ecofacts, and human bone analyses provide some useful information on human subsistence and settlement. Radiocarbon analyses of human bone collagen indicate that the site witnessed at least two occupations during the Fremont Period, and stable carbon isotope studies suggest that domesticates comprised a portion of the diet. Site content and context suggest that 42SL197 represents a farming base or habitation site tied to a larger horticultural complex.

INTRODUCTION

In March of 1993, construction activities at the future location of the State Tax Commission Building in the Jordan River delta in west Salt Lake City unearthed a human burial originating from approximately one meter below the modern ground surface. When first recorded, the site (42SL197) had been bladed into a large pile of backdirt and reconnaissance of the disturbed area identified no in situ materials. However, additional human remains, prehistoric artifacts, and chunks of adobe were observed in construction backdirt, including materials encased in large intact blocks of matrix. Because the materials encased in these blocks appeared to retain their relational integrity, archaeologists from the Division of State History conducted salvage investigations to retrieve isolated human bones, excavate burials encased in the blocks and extract artifacts and ecofacts associated with the human remains. Salvage investigations recovered partial skeletons of three adults and three subadults, as well as flaked stone tools, ground stone, and ceramic shards. A modest assemblage of animal bones also was recovered, dominated by the broken and butchered remains of bison. Radiocarbon assay of samples of human bone collagen and associated time-sensitive artifacts indicate that people at 42SL197 were interred during the Fremont period.

SETTING

Site 42SL197 is in the Jordan River delta at an elevation of 1,287 m (4,223 ft.). The site is situated on the toe of a natural levee flanked by Late Holocene meander scars and oxbows of the Jordan River (Figure 1). During the

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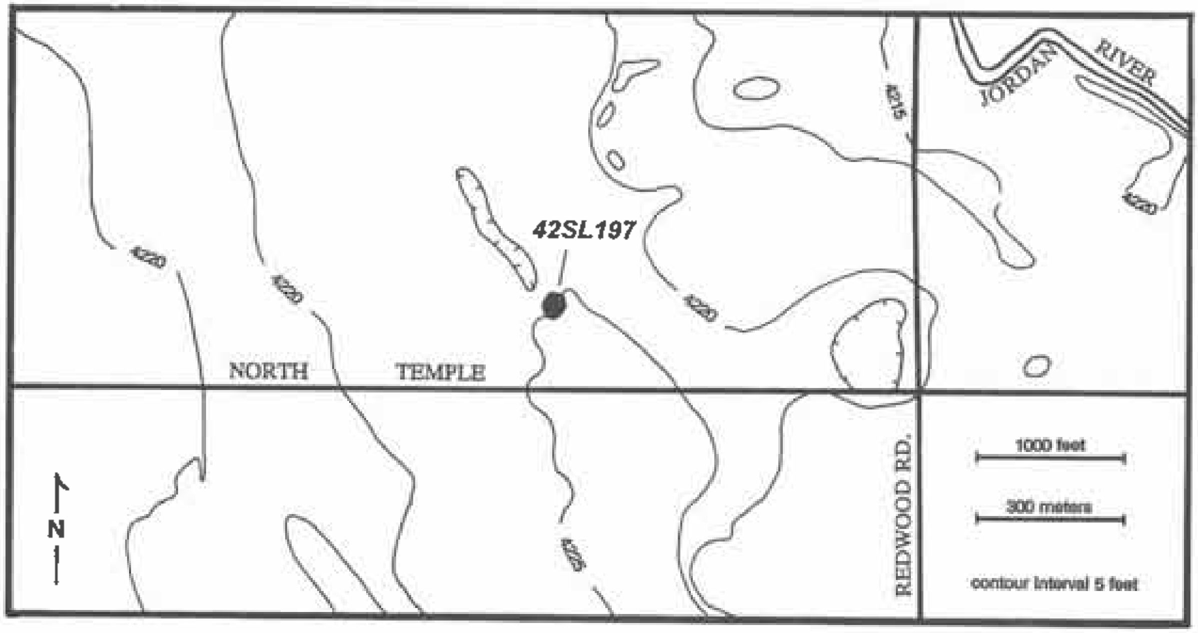

Figure 1. Site location map. Only Redwood Road and North Temple are illustrated for site location purposes; additional roads, commercial developments, etc. are not included. Contours have been modified slightly to eliminate modern road cuts and canals.

ca. 1,200 B.P. occupation of the site, the Great Salt Lake was located approximately 1.2 km to the north, likely fluctuating between 1,281 - 1,283 m (ca. 4,205 - 4,210 ft.) (Murchison 1989:115). Given its deltaic setting, the vicinity of 42SL197 probably consisted of a complex mosaic of sodic sands and floodplains, brackish wetlands, and fresh water marshes. These diverse habitats would support an array of shrubs and grasses including black greasewood (*Sarcobatus vermiculatus*), western wheatgrass (*Agropyron smithii*), saltbush (*Atriplex* sp.), inland saltgrass (*Distichlis stricta*), bulrush (*Scirpus* sp.), and cattail (*Typha latifolia*), as well as a number of annual and perennial forbs. This assorted mosaic of flora would host an equally diverse array of fauna, including bison (*Bison bison*), muskrat (*Ondatra zibethicus*), voles (*Microtus* sp.), leporids, small carnivores, and abundant waterfowl.

The setting of 42SL197 on a floodplain is similar to the Great Salt Lake Fremont sites known from excavations along the lower reaches of the Bear and Weber Rivers (Aikens 1966, 1967; Fry and Dalley 1979; Shields and Dalley 1978). However, those sites are located at or below 1,283 m and near the terminus of the floodplains. The zone near 1,283 m likely marks the lower limit of prehistoric farming due to encroaching saline waters and sodic soils (Currey and James 1982; Fry and Dalley 1979:5, 9; Murchison 1989; Simms and Stuart 1993:9, 11). At an elevation of 1,287 m, 42SL197 is located at a higher elevation than is typical for the known Fremont sites, well above the lower limit of farming. The setting of 42SL197 farther up the distributary is similar to the large (albeit few) Fremont farming bases in the region, best characterized by the numerous mounds at Willard (elevation = 1,288 m). Urbanization has destroyed most opportunities to examine sites along the margin of the Great Salt Lake above the 1,283 m level, thus 42SL197 represents a small, but important body of evidence for Fremont sites positioned in settings suitable for farming (see Simms and Stuart 1993:16-19).

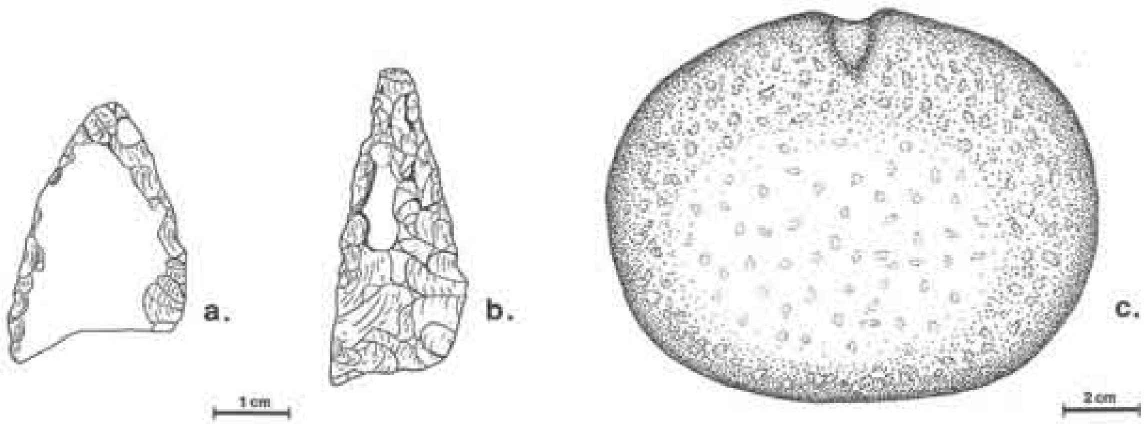

Figure 2. Selected artifacts from 42SL197. a. quartzite biface/preform, b. chert drill, c. limestone mano/maul.

ARTIFACTS AND ARCHAEOFAUNAS

A total of 34 artifacts was retrieved from backdirt "surface" collections and screening approximately 1.5 m^3 of articulated fill through 1/4" mesh. In addition to six pieces of debitage, flaked stone artifacts include a quartzite pressure-flaked biface/preform fragment (Figure 2a), a chert drill fragment (Figure 2b), a retouched chalcedony flake, and a fragmentary Rose Springs projectile point manufactured of fine-grained quartzite. A single bone artifact is represented by an awl fashioned on an artiodactyl long bone. It appears that a naturally sharp end of an artiodactyl bone splinter was used with minimal modification (see also Dalley 1976:52-53; Lupo 1993:210), suggesting that the artifact represents an expedient tool (e.g., Schmitt 1990). Ground stone artifacts are represented by a thin (1.6 cm) bifacial metate fragment and a complete mano manufactured on a pitted limestone cobble. The metate exhibits rather pronounced surface fatigue and is pecked (resharpened) on one surface. The mano is ground on one surface and has a small groove pecked into one edge (Figure 2c). One rounded end of the cobble also is battered, indicating that the notched edge may reflect a hafting support for use as a maul. Grooved manos and mauls similar to the 42SL197 specimen have been recovered from other Fremont sites in the region (e.g., Aikens 1966; Fry and Dalley 1979).

All of the 21 ceramic shards are identified as Great Salt Lake Gray (e.g., Madsen 1986). Surface colors are predominantly gray (Munsell 10 YR 5/1) to dark gray (7.5 YR 4/0) and none of the ceramics exhibits surface decorations. Shard surfaces are predominantly smooth (n=13, 62%) to smooth and undulating (n=6, 29%) and informal inspection of temper found most to contain relatively small homogeneous grains ranging between 0.3-0.6 mm. Although certainly a modest sample, these ceramic characteristics tend to reflect relatively marked investments in ceramic manufacture (see Simms et al. 1993). Two large everted rim shards (estimated vessel mouth diameter for both = 18 cm) probably represent fragments of a single wide-mouthed jar. Two additional rim shards also display slight curvature indicative of a wide-mouthed jar(s), but their estimated vessel apertures of 24 cm reflects the presence of at least one additional vessel.

The assemblage of animal bones consists of 122 specimens representing at least six taxa. Included are the remains of muskrat (*Ondatra zibethicus*; n=8), mule deer (*Odocoileus hemionus*; n=1), waterfowl (n=9), and fish (probably Utah chub [*Gila atraria*] or sucker [*Catostomus* sp.]; n=3). Two domestic sheep (*Ovis aries*) bones suggest that a small historic component was also present. A number of bison (*Bison bison*) bones also were recovered (Table 1) and represent the most abundant taxa at the site[1]. Minimum number of individual counts identified portions of at least three individuals. Although the burned proximal end of a muskrat metapodial may reflect human subsistence activities, unequivocal evidence for human intervention is present in the recovery of a mule deer scapula and eight bison bones possessing butcher marks (Table 2). Cut mark types and locations reflect an array of functions, including carcass dismemberment, meat filleting, and bone breakage for marrow extraction. The recovery of four waterfowl long bone cylinders may also reflect human subsistence activities; this damage probably manifests the deliberate removal of articular ends to facilitate grease extraction (i.e., soup bones; see Schmitt 1988). Although the 42SL197 archaeofaunas represent a modest "grab sample" of bones, taxonomic presences and damage patterns are similar to Fremont assemblages recovered from the Bear and Weber river deltas (e.g., Aikens 1967; Shields and Dalley 1978).

HUMAN REMAINS

Two hundred fifty-three human bones representing six individuals were recovered from four burials. The skeletal material was examined using procedures reported in Loveland (1991). Brief descriptions of the human remains are provided below and are followed by the results of radiocarbon, stable carbon isotope, and molecular analyses. The results of bone chemistry analyses from a sample as small as that from 42SL197 gain relevance only in the context of similar studies on larger samples. Therefore, we briefly place 42SL197 in larger context.

Burial 1 was discovered in a backhoe trench in the southwest portion of the site approximately 35 m from the pile of construction backdirt. Reconnaissance of the disturbed area identified no additional burials or associated artifacts, suggesting that the bones represented an isolated interment. The burial consisted of a skull and postcranial bones of a 25-35 year old female (Table 3). Stature, based on Trotter and Gleser's (1952) formula for Caucasian female femora, was 151.2 $\pm$ 3.7 cm (ca. 4'11"). Dental wear was moderate, but some enamel surfaces were fractured by post-mortem attrition; there was no evidence of enamel hypoplasia. The left and right glenoid fossae of the scapulae were necrotic and pitted. A large septal aperture occurred on the left distal humerus, and a hard, dense protuberance (14 x 8 mm) was observed on the right parietal (Loveland 1993a).

Burial 2 was recovered from a block of matrix in the backdirt pile. The burial was represented by complete and fragmentary postcranial bones (Table 3) of an adult male. A number of fragmentary mammal bones, including butchered bison remains, were found in association. The right glenoid fossa contained a pitted, necrotic area (4 x 5 mm) which had a bony ridge surrounding it. Evidence of a slight degenerative joint disease was evident on the head of the humerus and femur and on the phalanges (Loveland 1993a). Based on the formula for Mongoloid male fibulae (Trotter and Gleser 1958), stature was 161.4 $\pm$ 3.2 cm (ca. 5'4").

Burial 3 consisted of a fragmentary adult right femur (Table 3). Although this isolated femur signals a third adult burial at the site, it was discovered by a construction worker subsequent to on-site archaeological investigations, thereby precluding any inferences about its spatial and temporal affiliation. Burial 4 (a-c) was recovered from an articulated block of fill and consisted of a commingled interment containing the remains of three subadults. Forty-seven of the 129 postcranial bones (Table 3) were identified as belonging to a ca. 8 year old (4a), with the remaining specimens representing two additional juveniles (4b, c). Based on long bone lengths reported by Ubelaker (1978), these two individuals were between 5.5 - 7.5 years of age. Additional materials found in association include

Table 1. Inventory of Identified Bison Elements, 42SL197

Element	Number	Element	Number
Incisor	1	Patella	2
Proximal Ulna	1	Proximal Tibia	2
Proximal Radius	1	Tibia Shaft Fragment	1
Cervical Vertebra Frag.	1	Distal Tibia	5
Rib Fragments	16	Astragalus	2
Proximal Femur	1	Calcaneus Fragment	1
Femur Shaft Frag.	1	Carpal/Tarsal	2
Distal Femur	1	Phalange	2

Table 2. Butchering Marks on Bison (*Bison bison*) and Mule Deer (*Odocoileus hemionus*) Bones, 42SL197

Taxa	Element	Mark Type/Location	Function[a]
Bison	Astragalus (n=2)	Multiple transverse cut marks on the medial surfaces	Dismemberment
Bison	Proximal Femur	Multiple transverse cut marks on the anterio-medial shaft 2 cm below the femur head epiphysis	Dismemberment
Bison	Distal Femur Shaft	Multiple transverse and oblique cut marks on the medial and posterio-medial shaft, and opposing (cf. bipolar) flake scars on the anterior and posterior shaft[b]	Filleting and Marrow Extraction
Bison	Tibia Shaft	Flake scars on the anterior (mid) shaft	Marrow Extraction
Bison	Distal Tibia Shaft	Multiple transverse and oblique cut marks on the medial shaft, and flake scars on the anterio-medial shaft	Filleting and Marrow Extraction
Bison	Distal Tibia (n=2)	Multiple transverse cut marks on the anterio-medial and posterio-lateral surfaces	Dismemberment
Mule Deer	Distal Scapula	Multiple oblique cut marks on the posterior border	Filleting

[a]After Binford (1981).

[b]Originating from a transverse break, approximately six flakes also have been removed (struck proximal-distal) from the bones exterior, posterio-medial surface, indicating that the shaft may have been modified for use as an expedient tool.

Table 3. Inventory of Complete (C) and Fragmentary (F) Human Remains Recovered from Site 42SL197

	Burial 1		Burial 2		Burial 3		Burial 4 (a-c)	
Element	C	F	C	F	C	F	C	F
Cranium	1	-	-	-	-	-	-	-
Mandible	-	1	-	-	-	-	1	-
Molar	3	-	-	-	-	-	-	-
Clavicle	2	-	-	-	-	-	3	-
Scapula	2	-	-	2	-	-	-	4
Sternum	-	2	-	-	-	-	-	-
Rib	11	20	-	21	-	-	23	44
Cervical Vert.	-	-	3	-	-	-	-	-
Thoracic Vert.	7	3	-	-	-	-	10	1
Lumbar Vert.	2	4	2	-	-	-	5	-
Ilium	-	2	1	-	-	-	-	2
Ischium	-	1	-	-	-	-	-	-
Pubis	2	-	-	-	-	-	1	-
Humerus	1	1	2	-	-	-	5	-
Ulna	-	2	1	1	-	-	4	-
Radius	1	-	1	-	-	-	4	-
Metacarpal	-	-	2	-	-	-	-	1
Phalange	2	-	2	-	-	-	2	-
Femur	2	-	2	-	1	-	4	-
Patella	-	-	1	-	-	-	1	-
Tibia	2	-	2	-	-	-	5	1
Fibula	1	-	1	1	-	-	1	2
Tarsal	-	-	2	-	-	-	3	-
Unident.	-	1	-	-	-	-	-	2
Subtotals	39	37	22	25	1	-	72	57

a chert flake, two ceramic shards, and a number of bison and bird bones. Although burials can become scattered and/or mingled by a number of natural processes (e.g., Simms et al. 1991; Wood and Johnson 1978), the mixture and orientation of body segments in Burial 4 indicated that the individuals may have been re-interred by prehistoric site inhabitants. Multiple interments and reburials have been reported from other Fremont period sites in central and northern Utah (e.g., Madsen and Lindsay 1977; Simms et al. 1991).

Two conditions observed in the 42SL197 skeletons occur consistently in the vast collection of human remains recovered from sites in the Great Salt Lake region. These are moderate to extreme tooth wear resulting from chewing hard, coarse materials, and degenerative joint disease (see Loveland 1991, 1993a, 1993b). Degenerative joint disease is found in both males and females and is indicative of an active, vigorous lifestyle as well as characteristic of the aging process.

Bone Analyses

Small fragments of bone/bone collagen were extracted from three of the six individuals and studied for accelerator mass spectrometric radiocarbon (^{14}C) dating, stable carbon (^{13}C) isotopes, and mitochondrial DNA screening[2] (Simms 1994). The results of radiocarbon analyses (Table 4) indicate that burials were interred at 42SL197 during two periods, but places all three individuals within the Bear River Phase of the Great Salt Lake Fremont culture (Fry and Dalley 1979). Given the association of Great Salt Lake Gray ceramics and a Rose Springs projectile point, the radiocarbon dates are consistent with the modest assemblage of material culture.

Stable carbon isotope ($\delta^{13}C$) data were recovered from the same samples used in the radiocarbon dating, negating the analysis of additional bone. The 42SL197 values (Table 4) fall near the middle of the range of values obtained for 53 individuals from the Great Salt Lake area where values range from -9.87 to -19.84 parts per thousand ($^{o}/_{oo}$). Of particular interest for Fremont-period samples is the contribution of corn, a C^4 plant, to the diet. The values from 42SL197 indicate diets with contributions from both C^3 and C^4 sources, and the values are consistent with the possibility that some corn was in the diet of all three individuals. The greatest contribution of C^4 sources such as corn was found in Burial 4a (-13.24 $^{o}/_{oo}$; Table 4), but it should be noted that the $\delta^{13}C$ value is much less "enriched" than in other cases of the Fremont or Anasazi where corn is thought to be a dietary staple (e.g., Coltrain 1993; Spielmann et al. 1990). The C^4 enrichment is even lower for Burials 1 and 2, indicating larger contributions from C^3 sources, hence a mixed diet more strongly in favor of foraged rather than farmed foods. On the other hand, these latter values are not as strongly skewed toward C^3 sources as other foragers within the Great Salt Lake region, or elsewhere (e.g., Coltrain 1993; van der Merwe and Vogel 1978).

We believe that $\delta^{13}C$ data offer valuable portraits of past dietary constituents, but we emphasize that the 42SL197 data is preliminary and should be cautiously weighed for the following reasons: 1) Some C^4 enrichment may have come from wild sources occupying the diverse suite of habitats that existed in the vicinity of 42SL197; 2) the influence of wild C^4 sources has been insufficiently studied to make precise estimates of their dietary contribution relative to corn, and; 3) the bone samples have yet to be analyzed for stable isotopes of nitrogen, which may be informative as to the contribution of animal protein (e.g., Tuross et al. 1994), thus enabling greater precision in interpreting the results of $\delta^{13}C$ analysis.

An attempt to extract mitochondrial DNA was successful for Burial 1. The DNA was amplified and screened for patterns of molecular variation. The molecular pattern from the individual is consistent with those found in a larger sample of over 40 individuals from the Great Salt Lake area. According to O'Rourke et al. (1994), one molecular marker, a nine base paired deletion in region V (Haplogroup B), occurs in over 60% of the samples; the frequency of this marker in the Great Salt Lake sample is among the highest reported in North American populations studied to date. The results of molecular analysis are preliminary and we stress the tentative nature of interpretation given the small sample sizes, the fragmentary nature of the ancient DNA, and the incomplete knowledge about the genetics of living Native American populations (after O'Rourke et al. 1994).

Table 4. Summary of Human Bone Analyses, 42SL197

Sample	Sex	Approx. Age (yrs)	Radiocarbon ^{14}C (yrs B.P.)[1]	Calibrated Age Range (yrs B.P.)	Age Range[2] (yrs A.D.)	$\delta^{13}C$
Burial 1	F	25-35	1,130 ± 40	1,133-943	817-1007	-15.79 (‰)
Burial 2	M	Adult	1,380 ± 60	1,380-1,174	570-776	-16.20 (‰)
Burial 4a	M	8	1,160 ± 60	1,232-939	718-1011	-13.24 (‰)

Burial 1 Lab (CAMS) No. = 12281

Burial 2 = 10211

Burial 4a = 11114

[1]Corrected for ^{13}C fractionation.

[2]Calibrated range (Stuiver and Reimer 1993).

DISCUSSION AND SUMMARY

Salvage investigations at 42SL197 offer some valuable information on human occupation in the Jordan River delta. Recent, extensive disturbance certainly impedes inferences on the spatial arrangement of features and refuse, but the types of artifacts and ecofacts, and human bone analyses allow some broad inferences regarding Fremont settlement and subsistence.

Researchers have long acknowledged variability in Fremont settlement and subsistence adaptations (e.g., Madsen 1982, 1989; Marwitt 1970; Simms 1986, 1990). Fremont sites in northern Utah reflect an array of "types," including large farming villages, small residential bases that manifest both farmed and foraged resources, short-term campsites, and diurnal task sites (e.g., Fawcett and Simms 1993 and references therein). Based on site location and the types of materials recovered, 42SL197 likely represents a farming base or a substantial habitation site tied to a larger horticultural complex. Stable carbon isotope analyses suggest that domesticates comprised a share of the diet, and butchered bison and deer bones reflect the hunting and processing of mammalian resources. The modest assemblage of artifacts indicates that an array of fabrication and processing tasks were undertaken, and chunks of adobe offer evidence for structural remnants. Radiocarbon assay of samples of human bone collagen indicate that 42SL197 witnessed at least two use episodes between A.D. 570 - 1011.

Of particular importance is the fact that 42SL197 exists. Other Fremont sites in the Jordan River vicinity have been reported, including a lithic, ceramic, and ground stone scatter (42SL133; Metcalfe and Shearin 1989) and a human burial associated with large mammal remains and ceramic shards (42SL196; Patricia Dean, personal communication 1994). However, when compared to archaeological record of the eastern arm of the Great Salt Lake, that of the Jordan River vicinity is paltry at best. While it remains possible that the Jordan River area witnessed only intermittent human occupations during the Fremont period, we find it more plausible that the scant record is a product of modern human developments and extensive overburden generated by the numerous natural and artificial dikes and levees (see also Metcalfe and Shearin 1989). These (and other) processes have undoubtedly destroyed many sites in the region, but in many instances they have served to bury and preserve them.

Human bone chemistry data recovered from 42SL197 represent a small piece of a large puzzle. Great Salt Lake prehistoric skeletons and others recovered from throughout the state are currently undergoing stable carbon isotope and molecular analyses to examine variability in subsistence systems and characterize genetic traits in modern and prehistoric peoples. We eagerly await the results of these large-scale studies, as well as the formal application of the 42SL197 data in a broad context.

NOTES

[1]Fifty-one bison-sized bone fragments also were collected. Because a saw cut large mammal rib (probably cow [*Bos* sp.]) also was recovered, some of these large mammal bone fragments may represent the remains of domestic cattle. However, based on similarity in color (i.e., soil staining) and the presence of bones exhibiting cut marks and flake scars, we are confident that the majority of the fragmentary large mammal remains are bison.

[2]In accordance with the agreement leading to the analyses reported here, the human remains are temporarily curated at Utah State University until completion of the state-sponsored vault at Pioneer State Park in Salt Lake City. The 42SL197 remains are included in a larger collection of Great Salt Lake burials under agreements between Utah State University, the State of Utah, and the Northwestern Band of the Shoshoni Nation, Blackfoot, Idaho.

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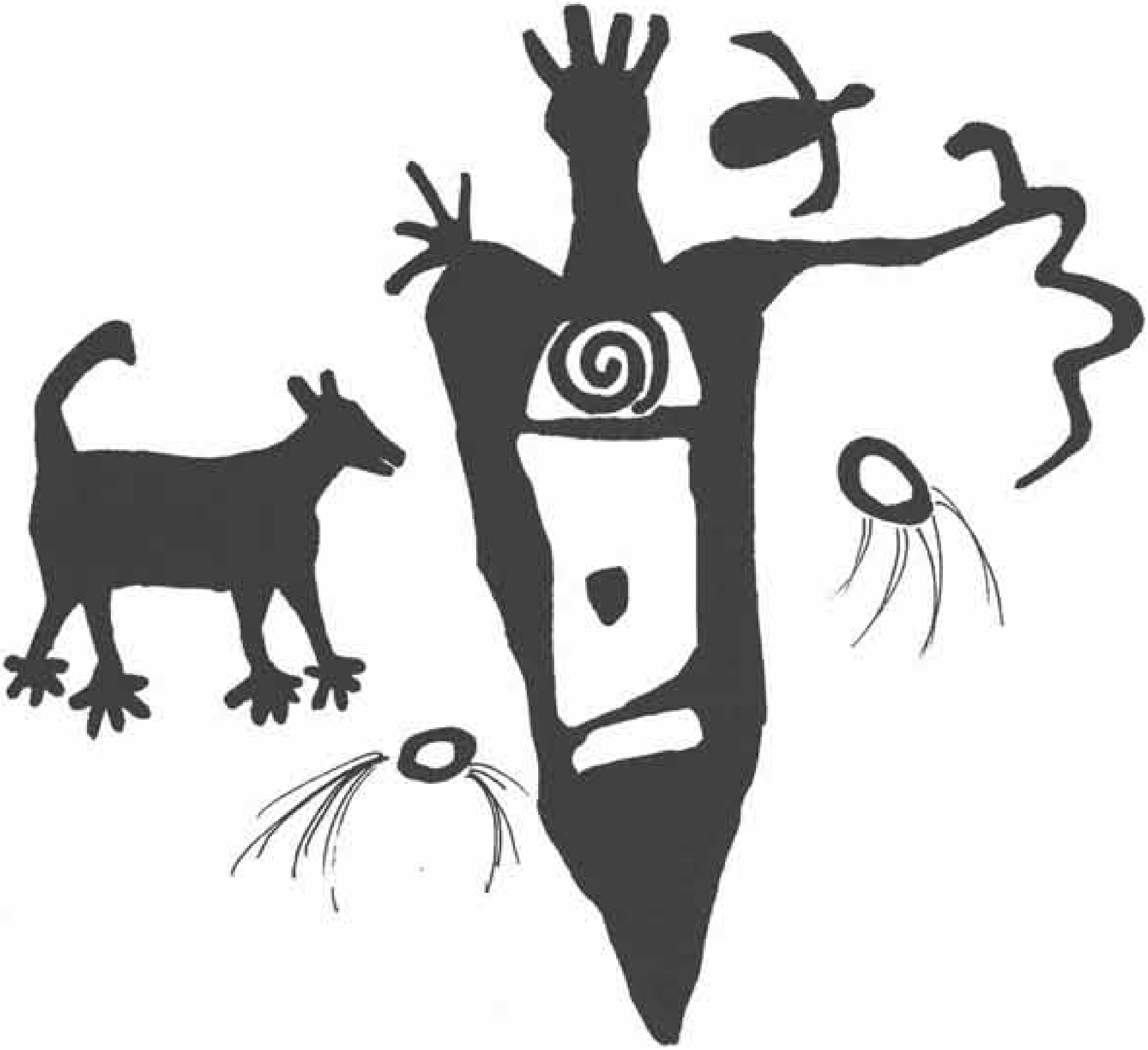

PROBABLE METASTATIC CARCINOMA IN A PREHISTORIC GREAT BASIN SKELETON

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A 30-35 year old female recovered in 1990 from site 42Wb48, Weber County, Utah, was carbon-dated at 1020±70 B.P. Major portions of the skeleton proximal to the elbows and knees exhibited destructive lesions suggestive of metastatic carcinoma (cancer). Likely sources of the primary tumor are discussed. This remarkable anomaly, rare in ancient populations, establishes the possible presence of certain diseases in the prehistoric Great Basin.

INTRODUCTION

Evidence of cancer is relatively rare in prehistoric skeletons. The most common malignancies are those which begin in soft tissue and later spread (metastasize) into bone. These secondary malignancies tend to occur most frequently in older individuals (Steinbock 1976), and most prehistoric people died of other causes before secondary tumors could become a serious problem. Furthermore, many environmental factors recently implicated in the development of malignancies were not present in antiquity.

During 1990, the skeleton of a 30-35 year old female was recovered from site 42Wb48, Weber County, Utah. Osteolytic defects (bone destruction), suggestive of metastatic carcinoma (cancer), occurred on major portions of the skeleton. A ^{14}C date of 1020±50 B.P. (CAMS-4060) (calibrated range A.D. 888-1178) aligned the burial with the Fremont culture.

The individual was interred in a tightly flexed position in a prepared pit (68 cm x 48 cm). Grave goods included a two-handed mano under the lower back and both valves of an *Anodonta californiensis* shell near the hips (Simms et al. 1991).

ANATOMIC FINDINGS

The skeletal remnants were placed in correct anatomic position for study. Sex was determined from innominate and skull configuration and from femoral measurements (Bass 1987). Age was estimated from pubic symphysis metamorphics (Suchey et al. 1988) and dental attrition (Ubelaker 1978). Radiographs and photographs were taken to facilitate diagnosis.

Major portions of the skeleton exhibited discrete and confluent destructive, irregularly-shaped lesions. There was

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no evidence of new bone growth. The base of the skull was almost totally eroded from the foramen magnum (where the spinal column enters the brain) to the nasal cavity (Figure 1). Skull lesions which were round to oval in shape (4-15 mm in diameter) appeared to start in the center of the bone (medullary space) and erode to the inside and outside (Figure 2). Multiple lesions occurred on the postcranial skeleton with the exception of the bones below the elbows and knees where there was only a single lesion (Figure 3, Figure 4). Bone structure was thin and sparse, suggesting osteoporosis. Other anomalies included fusion of the middle and distal bones of a finger (probably a congenital defect), severe dental wear, transverse lines on several long bones (suggestive of disease or dietary stress during growth), and abnormal development of the mastoid bone (indicative of ear infections [otitis media] in early childhood).

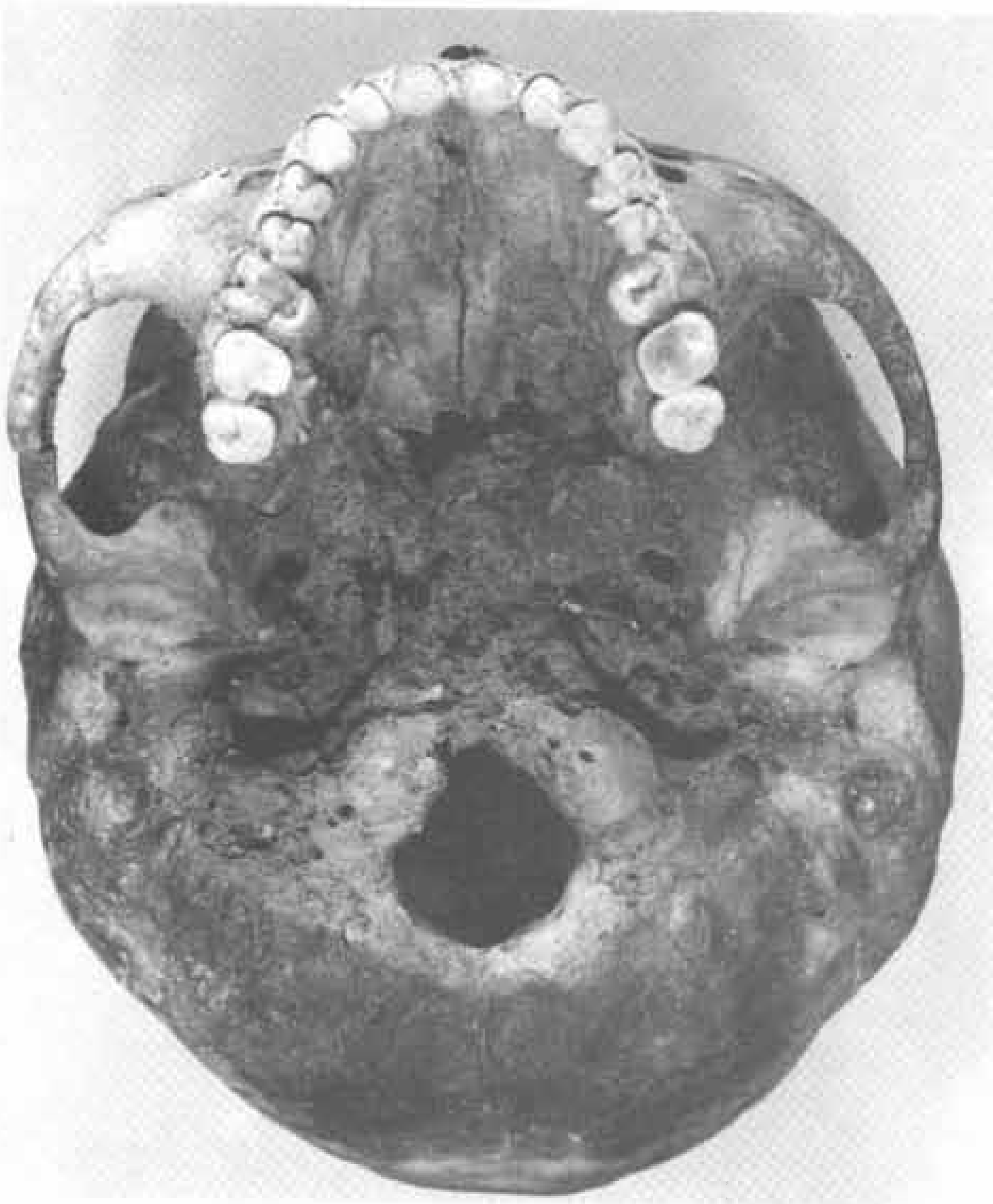

Figure 1. Severe destruction of the skull base occurred between the foramen magnum and nasal cavity.

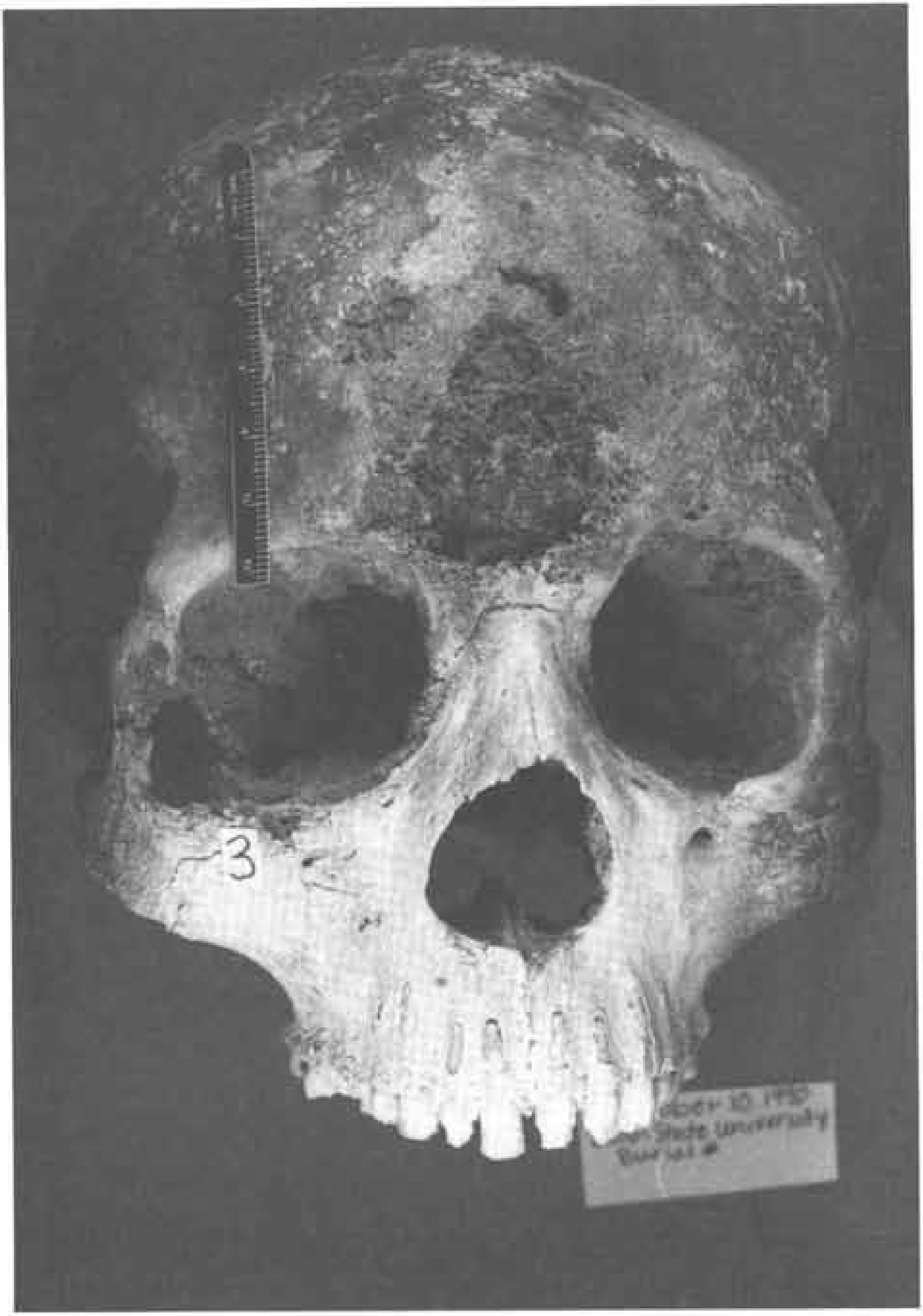

Figure 2. Numerous lesions occurred on the skull. Those present in the eye orbits probably affected her vision.

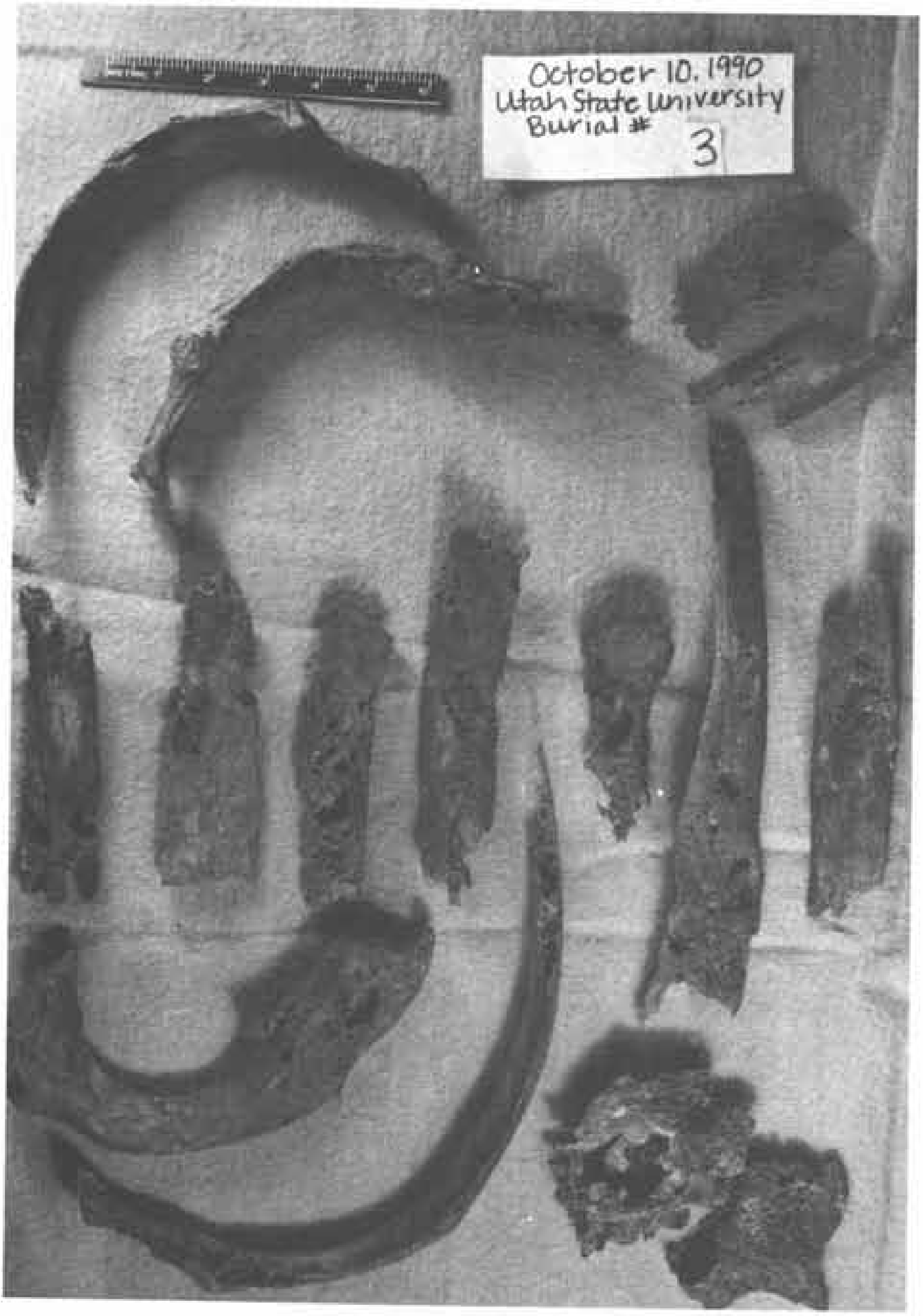

Figure 3. Destructive lesions on the ribs and sternum (bottom right) attest to the severity of the disease.

Figure 4. Major portions of the hip (innominate) were completely destroyed. Lesions are evident throughout the hip bones.

DISCUSSION

The magnitude of the destructive process in the skeleton attests to the severity of the disease, which was probably a factor in her death. Given the extent of bone destruction, one can assume that she was in a great deal of pain. During her illness, other members of her group undoubtedly cared for her.

Since few reports of malignant tumors exist in New World paleopathology literature (Steinbock 1976; Allison and Gerszten 1980; Ortner and Putschar 1981; Gregg et al. 1982; Lagier et al. 1982; Cybulski and Pett 1981), this case is very significant. A more technical discussion of the findings reported here can be found in Loveland et al. (1992).

Today, the best possibilities for primary sources of widespread osteolytic skeletal metastases in females the age of Burial 3 include breast, thyroid, and nasopharynx. Breast carcinoma, the most common source for metastases to bone in females today, has a peak incidence between 35-55. The pattern of metastases is similar to that in Burial 3 although occasionally there are lesions on the foot bones. Breast carcinoma is sometimes osteoblastic (building new bone), as well as osteolytic. The course of the disease is variable (Coley 1960).

Thyroid carcinoma occurs most frequently in females, but it usually strikes older women. The disease usually progresses slowly. Lesions tend to be large (Coley 1960).

The pattern of anatomic changes and radiographic findings in the skeleton of Burial 3 are most typical of those associated with nasopharyngeal carcinoma. This cancer starts in soft tissue near the tonsils and subsequently invades the nearby bones. Distant metastases, carried by the lymphatic or hematogenous routes, soon spread to other parts of the skeleton (Shanmugaratnam 1982). The course of the disease is rapid.

In clinical medicine today metastases to the skull base (nasopharynx) are rare (Strouhal 1978); however, metastases from the nasopharynx to other parts of the body follow a pattern similar to that observed in Burial 3. Nasopharyngeal cancer occurs in a younger age group than other neoplasms which spread to bone (Peters et al. 1988), a factor to be considered given the age of Burial 3. It is more common among males than females today (2 or 3: 1) (Levine and Connelly 1985). This fact, while not ruling nasopharyngeal cancer out in the case of Burial 3, underscores the necessity of definitive laboratory studies to corroborate the hypothesized source of the neoplasm.

Today, nasopharyngeal carcinoma is most common among southern Chinese, other groups in southeast Asia, and Eskimos (Shanmugaratnam 1982). Epidemiological factors implicated in nasopharyngeal cancer are: (1) ingestion of large quantities of salted fish, (2) breathing smoky or polluted air, (3) history of ear, nose and throat disease, and (4) the Epstein-Barr virus (Henderson et al. 1976; Levine and Connelly 1985; Shanmugaratnam 1982). Although ethnographic sources suggest that Great Basin people dried, rather than salted, their fish, they did utilize large quantities of salted insects (Madsen and Kirkman 1988). Furthermore, plant resources in the marshes adjacent to the Great Salt Lake include salt tolerant species (Chamberlin 1911; Simms 1987); thus, Burial 3 probably consumed large quantities of crude salt. Most activities were probably conducted out-of-doors, but cold, wintery weather likely forced the Indians to spend long hours in a smoky environment.

CONCLUSION

This case represents the first known instance of probable metastatic carcinoma from the prehistoric Great Basin and one of the few examples from the New World. Although it is impossible to determine the location of the primary tumor, three foci seem most likely: nasopharyx, breast, or thyroid.

Rapid advances in the study of DNA in ancient skeletal remnants afford optimism that new techniques will make it possible to learn more about the disease that affected Burial 3, provided the skeleton is not reburied first. Meanwhile, these skeletal remains have added significantly to our knowledge of the antiquity of cancer.

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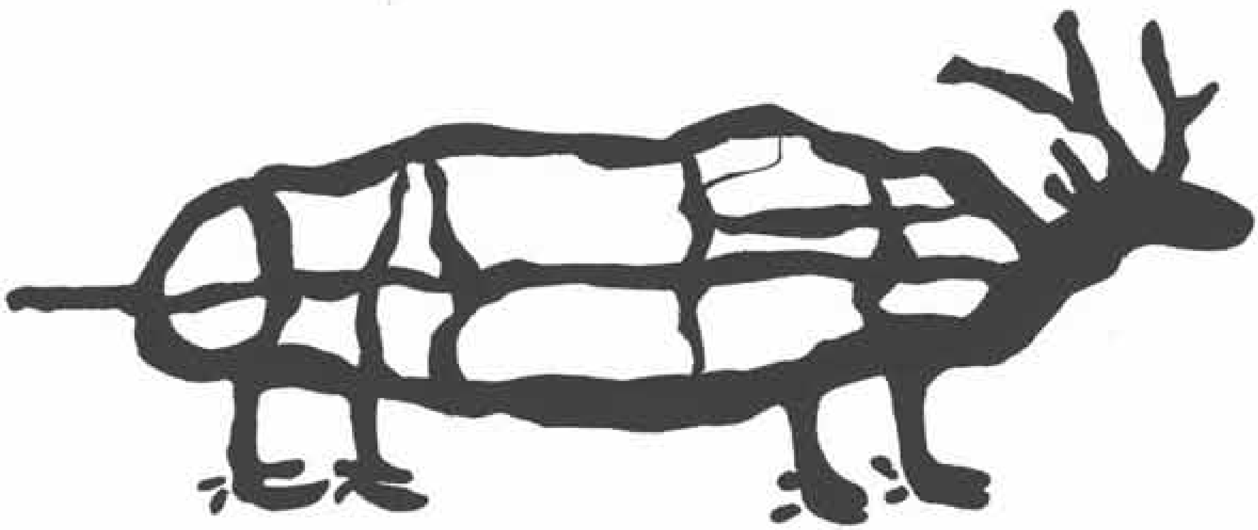

A BIFACE CACHE FROM 42BO796 IN NORTHWESTERN UTAH

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A cache of ten complete and three fragmentary chert bifaces was found during a Bureau Of Land Management archaeological survey in northwestern Utah. The ellipsoidal-shaped bifaces were knapped from white to gray chert and had a mean size of 10.3 cm by 5.8 cm by 1.6 cm thick. The bifaces were found within a larger site, 42Bo796. This paper reports details on the bifaces including site location and setting, archaeology of the area, cache description and characteristics, a comparison of this cache to others, and some interpretive comments.

LOCATION AND SETTING

The cache was located in the Goose Creek Mountains in the far northwest corner of Utah about 6 miles west of the town of Grouse Creek (Figure 1). The site lies on the southwest facing slope of the White Rock Creek drainage that then drains into Grouse Creek. Swallow Shelter (Dalley 1976) is located about a mile northwest of the cache location, and can be seen from the cache site.

The Goose Creek Mountains run generally north-south and are fairly typical of Great Basin ranges. They are extensively faulted, are composed of rocks of a variety of ages, and reach an elevation of 8,690 ft. The outcroppings at the site are volcanic tuff with intrusions of igneous rock. The cache was located below a white rock bluff on a low ridge which drops down to a relatively flat area toward a usually dry White Rock Creek. Two large boulders mark the spot of the cache.

The biface cache was found within site 42Bo796 which contained 20 other lithic tools including 2 Pinto points and 1 Elko Corner-notched point. 42Bo796 measures 110 meters by 280 meters. 42Bo796 was classified as Archaic based on the points found.

CACHE DESCRIPTION

The cache consisted of 13 chert bifaces (Figure 2) that was found in an area measuring less than one square meter, on the surface, and in front of two large boulders. Ten are complete (one of the ten is broken) and 3 are fragments (each fragment is also broken). Table 1 identifies the measurements, weights, color, and processing stage for the bifaces. The bifaces are quite uniform in appearance and the standard deviations for the measurements are also small. The chert from which the bifaces were prepared is gray or white with orange, gray, and white markings as noted in Table 1. The bifaces have frequent hinge flake fractures, little to no edge preparation, and no visible worked edges. They appear to be blanks and not working tools. The bifaces have a smooth, slick feel indicating they may have been heat treated. Pot lids were found on three of the bifaces which also indicates they may have been heat treated. The 13 bifaces have cracks and flaws and 4 of the 13 did break after being knapped.

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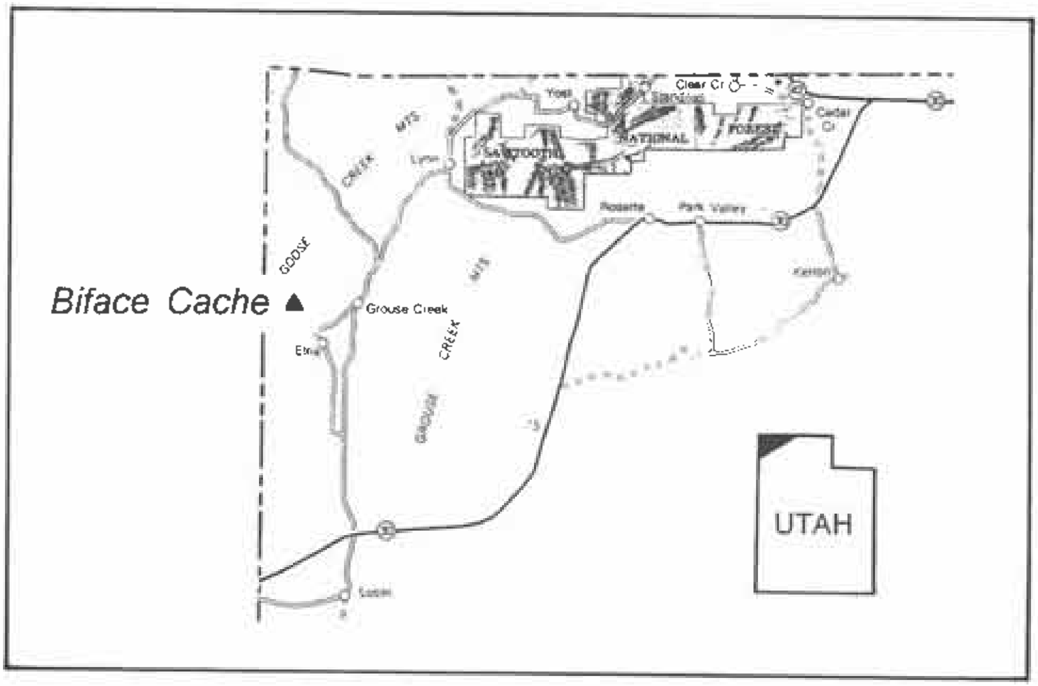

Figure 1. Biface Cache Site Location in Northwestern Utah.

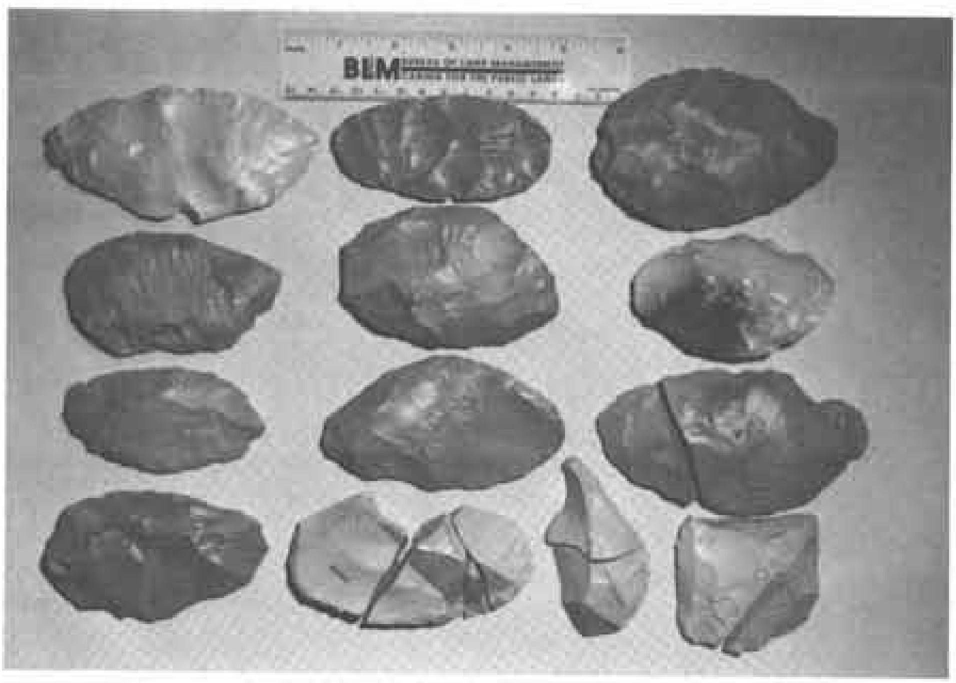

Figure 2. The 13 bifaces from the Cache. Specimens 14, 31, and 27 (top row), 17, 21, and 30 (second row), 20, 29, and 19/24A (third row), 26, 23/33, 16/15, and 24/25 (bottom row).

Table 1. Attributes of the 13 Bifaces from the Cache

Specimen Number	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Color	Process Stage
COMPLETE BIFACES						
14	121	59	13	89	White/orange stains	4
17	95	53	12	63	Gray/white spots/orange stains	2
20	92	48	14	49	Gray/white & orange sports	2
21	97	63	17	109	Gray/orange stains	3
26	99	59	19	100	Gray/white & orange spots	3
27	111	72	20	166	Gray/orange tint	3
29	108	60	15	86	Gray/orange streaks	2
30	89	55	20	83	White/large orange spot	3
31	99	47	11	43	Gray	4
BROKEN COMPLETE BIFACE						
19/24A	121	64	21	142	Gray/white spots	3
Mean	103	58	16	93		
Sigma	10.9	7.2	3.5	36.8		
BIFACE FRAGMENTS						
23/33	104	58	22	-	White/orange stain/gray area	
24/25	65	-	-	-	White/orange stripe	
15/16	-	-	-	-	White/orange stain/gray area	

The bifaces were classified by processing stage following Callahan (Callahan 1979; Bloomer et al. 1992). Using this technique, flake scars on the bifaces are examined and based on the type and number of flake scars found the bifaces are classified by stages from 1 to 5, with stage 1 showing no reduction and stage 5 the finished biface. The bifaces are thinned and shaped from stage to stage. Detailed descriptions of each stage of biface reduction can be found in Tosawihi Quarry report (Bloomer et. al. 1992:87-90). Five of the complete bifaces are in a stage 3 process, 3 are in stage 2, and 2 are in stage 4. Figure 3 shows the bifaces arranged by length to thickness ratio. The length to thickness ratio should increase as the processing stage increases because the biface is being thinned much faster than they are loosing length. However, the bifaces classified as stage 2 do not follow this sequence. This is because specimens 20, 29 and 17 are large thin flakes that did not need to pass through the stage 3 process to be ready for stage 4. They show few thinning flake scars. The large thin flake bifaces in the Tosawihi collection were classified as stage 3 because of their length to thickness ratio (Bloomer et al. 1992) even though they had few thinning flake scars. As Figure 3 indicates, the other 7 bifaces fall into the expected length to thickness ratio of their processing stage.

Ultraviolet light stimulates certain minerals to fluoresce in different colors when exposed and when other sources of light are not present. Ultraviolet light can sometimes assist in locating the source of lithic materials based on mineral content (Bloomer et al. 1992). Results from ultraviolet light tests on the biface cache, from both short (2600 angstroms) and long (3500 angstroms) wave length sources, are shown in Table 2. Ultraviolet light tests run under the same conditions as shown in Table 2 on lithic material removed from the Tosawihi Quarry gave similar results to the 13 specimens from the 42Bo796 cache.

THE ARCHAEOLOGICAL RECORD IN THE AREA

Major archaeological sites in the area that have been extensively studied include Danger Cave (Jennings 1957) about 100 km to the south with radiocarbon dates back to about 10,000 BP, Hogup Cave (Aikens 1970) about 75 km to the southwest with radiocarbon dates back to about 8,000 BP, and Swallow Shelter (Dalley 1976) about 2 km to the northwest with radiocarbon dates back to 5,400 BP. Because Swallow Shelter is so close to 42Bo796, it will be used as the main study reference.

Radiocarbon dating at Swallow Shelter indicates an occupation from at least 5,460 to 1,170 BP. This spans the Middle Archaic Period to the time of the Fremont. Swallow Shelter was an intermittently occupied hunting camp instead of a place people stayed over extended periods of time. The shelter was used more extensively during the Middle Archaic and Fremont Periods than during the Late Archaic and Late Prehistoric Periods, based on the number of artifacts found from these periods (Dalley 1976).

Fourteen other archaeological sites have been recorded within a 1 km radius of the biface cache. All the sites were basically classified as lithic scatters, but some ground stone, hearth stains, and fire cracked rock were also found. Most of the sites are of unknown age while the rest are likely Archaic, based on the type of points found. The number of artifacts found indicates the area was extensively used by prehistoric people.

OTHER STONE TOOL CACHES

A number of stone tool caches in the Great Basin have been reported in the literature and will be summarized here. Five bifaces caches were found at the Tosawihi Quarries site northwest of Elko, Nevada (Bloomer et al.

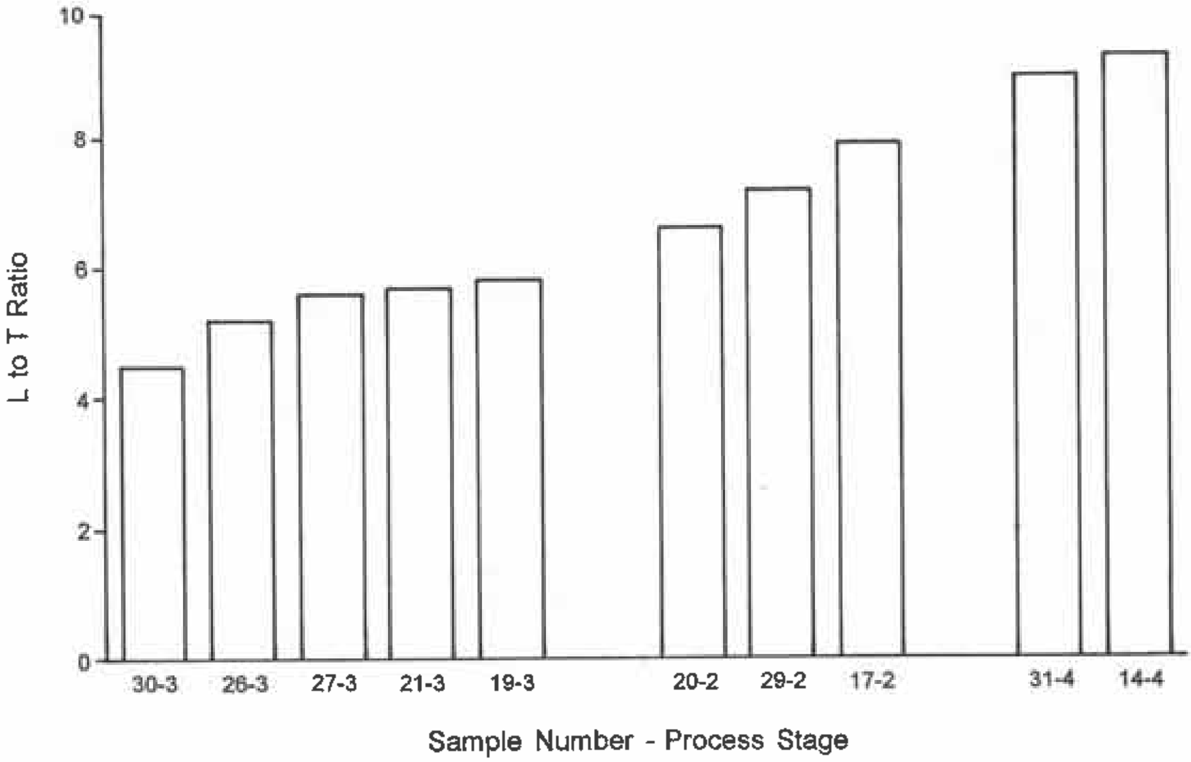

Figure 3. Biface length to thickness ratio.

1992; Elston and Raven 1992). Tosawihi is the largest known chert quarry site in the Great Basin and contains large quantities of white opalite and gray breccia. A total of 84 bifaces were found in the five caches. The bifaces have a mean length of 13.6 cm, a mean width of 7.9 cm, and a mean thickness of 2.4 cm. Seventy three (87%) of the bifaces were classified as processing stage 3, 6 (7%) stage 4, 3 (4%) stage 2, and 2 (2%) stage 1. Forty were knapped from opalite, 40 from breccia, 3 from quartzite, and 2 from jasper. The caches were very similar in general appearance, processing stage, and quantity per cache to the bifaces found at 42Bo796, but somewhat larger. The purpose of the caches at Tosawihi is described as follows:

> Biface caching at Tosawihi may have been a function of over-production, or of purposeful storage for a return foray; or, they may contain special trade objects, or merely the less successful products of a quarrying episode. The general quality of the cache bifaces, and their careful storage, suggest that the latter possibility is unlikely. Cache bifaces probably were produced and stored for retrieval during times less suitable for quarrying (Bloomer et al. 1992:114).

The Loa Cache (43Wn1674) recorded by Janetski et al. (1988) was located just north of Loa, Utah. The cache contained 10 large obsidian "*quarry blanks*". They are generally oval in shape and vary in length from about 13 cm to 36 cm, in width from 8 cm to 17 cm, and in thickness from 2 cm to 5 cm. The four larger "quarry blanks" were bifaces and the six smaller were large flakes. The cache was found neatly stacked in a 50 cm diameter pit under a basalt boulder. X-ray Fluorescence tests indicated all the obsidian came from the Wild Horse Canyon source located in the Mineral Mountains west of Beaver, Utah which is over 125 km west of the cache site. The area

Table 2. Results of fluorescence to UV light analysis

Specimen Number	Short Wave Length UV 2600 Angstroms	Long Wave Length UV 3500 Angstroms
14	Green bands*	-
17	Green specks	-
20	Green blotches	-
21	Orange blotches	-
26	Orange and green bands	Peach spots
27	Green blotches	-
29	Green blotches	Green edge
30	Green band*	Peach spot and edge
31	-	-
19/24A	Green specs & bands*	Peach edge
23/33	Green bands*	Peach edge & spots
24/25	Green band and spots	Peach edge and spot, peach spots*
15/16	Peach spots, edge and band*	Peach edge

*Indicates biface had a general green glow with UV light. The green color was a yellow green or chartreuse shade. All samples had a dark purple glow in both long and short wave UV light. Tests were run at P-III Associates, Inc., Salt Lake City, Utah with the help of Andre La Fond and Betsy Tipps on May 20, 1994. Similar results were obtained when samples of chert from the Tosawihi Quarry were exposed to UV light. Tests were run by Signa Larralde and Roy Macpherson. Long term (minutes) exposure to UV light seemed to enhance the color of the reflections, particularly with the peach. UV light source for short wave length was model UVG-54 by UVP Incorp. and for long wave length model UVFL-14P, also by UVP Incorp.

around the cache indicates use by both the Fremont and Late Prehistoric people based on the ceramic and ground stone artifacts that were found. The obsidian could have arrived at the site via trade goods, or resulted from direct procurement by the inhabitants.

A cache was located west of Ogden, Utah and south of Willard Bay on the terminal drainage of the Ogden and Weber river deltas, and was reported by Cornell et al. (1992). Eighty-eight obsidian flakes were found in an eroded storage pit 42 to 50 cm in diameter (42Wb326). Fifty primary and 38 secondary flakes made up the cache which weighed over 5 pounds. The mean dimensions of the flakes are 5 cm long by 3.6 cm wide by 1.3 cm thick and most of the flakes measured close to these dimensions. Three of the flakes representing the maximum range of visual variation were tested by X-ray fluorescence, which indicated they all came from a source about 27 km north-northwest of Malad, Idaho, about 95 km from the cache site. Other artifacts at the site and in the surrounding area indicated the past presence of Fremont and Late Prehistoric people. The report suggested the obsidian flakes were probably a tool stone cache for local use. Other nearby lithic flake caches noted by Cornell et al. include

42Wb31, 42Wb32, and 42Wb150. All three of these caches were classified as Late Prehistoric or Fremont.

The Simon Site, located 200 Km to the north of Grouse Creek in the Big Camas Prairie, contained 29 "chipped stone tools" (Butler 1963). All the artifacts were found within an "18 foot diameter" area but were found after the area had been plowed and then scraped to form a road. Five of the tools closely resemble Clovis Points and 23 of the remainder are pointed bifaces that could be Clovis preforms. This assemblage could be a Paleoindian cache but this is difficult to determine because of the way the artifacts were found.

The Borden site in west central Idaho held 4 caches (Butler 1980). One consisted of 9 obsidian blanks or preforms and an obsidian side notched (Northern or Bitterroot) point. The second was a cache containing 165 items. Of the 165 items 154 were triangular obsidian blanks or preforms, 4 were side notched obsidian (Northern or Bitterroot) points, and 1 was a large chert Turkey Tail point. The third contained 4 triangular obsidian points or preforms, 2 large oval bifaces, and 1 flake. The fourth contained 3 chert end notched points, 2 large oval blanks, a beaver incisor, and 2 bone awl fragments. The fifth contained 3 Turkey Tail points, 1 Turkey Tail scraper, 1 obsidian side notched point, and 5 other items. Butler reported that the Borden site appeared to be of Early Archaic origin.

Outside the Great Basin but in the general area lithic caches have been found and documented. Some of these are presented in Table 3. There are undoubtedly many other lithic caches in the west but the caches referred to above give some indication of the types that have been found and reported in the literature.

COMPARISONS AND DISCUSSION

The source of the stone used for the bifaces from 42Bo796 is difficult to determine. There is a quarry (42Bo625) located about 5 Km east-southeast of the biface cache that contains gray to white chert about the same color as the 13 bifaces. 42Bo625 stone gives ultraviolet light test results similar to the 13 bifaces. The quarry stone has a more crystalline or granular appearance than the bifaces, but experimental heat treatment of the quarry stone did make it smoother and less crystalline. The Tosawihi Quarry is another potential source for the raw material. The 13 bifaces are similar in color, size, shape, and processing stage to the bifaces at the Tosawihi caches. Ultraviolet light tests on the bifaces (see Table 2) give similar results to sample material removed from the Tosawihi quarry. Without more definitive data it is difficult to establish the source of the stone, but based on the fact that 42Bo625 is so close to the cache location it is probably the source.

The cache could be trade goods, reject or excess material based on the number of flaws in the bifaces, or "insurance goods". Binford (1983) reports from ethnological studies with Nunamiut Eskimos that they place caches of all kinds at strategic locations to support future potential needs. To retrieve a cache it would be necessary to have it well marked. The biface cache is marked by two large unique rocks, is in front of a very visible white bluff, and Swallow Shelter is visible from the biface cache location. The analysis of Swallow Shelter indicated it was used on an intermittent basis (Dalley 1976), so the people of the area were residentially mobile. Also in north western Utah residentially mobile hunter-gatherers were reported at Danger Cave (Jennings 1957), Hogup Cave (Aikens 1970), and by many other authors. Based on this information it is possible that this cache was "insurance goods".

In "The Three Sides Of A Biface" Kelly (1988) describes three "organizational roles" for biface manufacturing: 1) as cores, 2) as long use-life tools, and 3) as a by-product of the shaping process. Biface cores are used in logistically mobile hunter-gatherer societies where resources require foraging over large areas. During these foragings a variety of sharp tools were needed that could be prepared by carrying a low weight and low bulk item. Biface long use-life tools were used in situations where extreme raw-material scarcity and low residential mobility

Table 3. Other Lithic Caches

Cache or Site Name	Type and Content	Location	Reference
Broadbent Cache	39 points and 1 biface Points later typed by Schroedl as Mount Albion Corner-Notched	Northeastern Utah	Broadbent 1992 Schroedl 1993
Rattlesnake Ridge	"Mortuary" 39 bifaces plus a drill	East Central Wyoming	Lippincott 1985
Wind River Canyon	"Mortuary" 50+ lithics including 19 bifaces, 12 points or point forms	Eastern Wyoming	Frison & Van Norman 1985
Carter County	1) Biface core and flakes in stone lined pit, 2) Lithic flakes, 3) Five bifaces	Southeastern Montana	Clark and Fraley 1985
Lower 30 Cache	18 bifaces and 18 flakes	North Dakota	Beckes 1985
Elk Creek Cache	36 lithics including 17 bifaces	Central Montana	Eberhard 1985
Big Horn Mountain	65 bifaces	Central Wyoming	Bentzen 1961
Crow Butte	58 lithics including 5 scrapers	Northwestern Nebraska	Grange 1964
Snake River	9 obsidian points or blanks	Eastern Idaho	Pavesic 1966
Dodge Cache	29 Mckean points and bifaces	South Eastern Montana	Davis 1976
Timber Creek Cache	157 chipped stone items including 99 points or blanks and 2 bifaces	North Western Wyoming	Laurent and Eckertly 1983
Draper Cave	38 chipped stone knives (bifaces or preforms)	South Central Colorado	Hagar 1976
Great Blades Cache	69 complete or fragmentary large, bifacially flaked tools in early stages of reduction	West Central California	Rick and Jackson 1992
Caballo Biface Cache	16 obsidian bifaces or fragments	West Central California	Gray and Mclear-Gray 1990

are found. Bifaces as by-products were used where bifaces were shaped to fit hafting, because the preparation of the hafting becomes the time consuming task. The 13 bifaces are cores, not finished tools, hence would have fit into a logistically mobile hunter-gatherer society.

The bifaces are very uniform in size, shape, knapping technique, and stage of completion (see Table 1). Since they were found in one location and are so similar, they were probably knapped by one person. Dating the biface cache is also very difficult based on the data that is available. They were found within a large site that contained Pinto and Elko Corner-notched points, suggesting that they date to the Archaic Period.

The large number of caches that are reported in the literature illustrates that prehistoric people set aside useful and valuable stone tools for future use. This is with the exception of the "Mortuary" caches. Analyzing the caches helps to better understand how these people functioned. The strong similarity of the Tosawihi biface caches and the 13 biface cache indicates some tie between these two areas.

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NOTES

ASPECTS OF THE VIRGIN ANASAZI TRADITION IN GRAND CANYON

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When viewed from Grand Canyon on the southern boundary of the Virgin Tradition, there appear to have been slight differences between them and those of the Kayenta Tradition between A.D. 1100 and 1150. While architectural differences are notable, ceramic variations are not always easy to discern. This paper suggests that sites of the Virgin Tradition are not generally found east of Kanab Canyon, but attempts to establish fixed boundaries are not intellectually productive.

With well over 2000 prehistoric sites now recorded in Grand Canyon National Park and its immediate environs, we should now be in a position not only to make some statements about the environmental effects of that great gorge upon human use, but also about the identity and other cultural aspects of the prehistoric people who lived there.

This culture history involved the Archaic split-twig figurine complex and some rare Archaic pictographs in western Grand Canyon; the Cohonina; Cerbat; Kayenta and Virgin Anasazi; and the proto-historic Southern Paiute, Havasupai and Hualapai (the Pai), and Hopi. My purpose here is to present some of my thoughts about one of those traditions, the Virgin Anasazi in Grand Canyon.

The reality of this tradition, not to mention its diagnostic characteristics, has been subject to a lack of consensus over many years. Some of this has been occasioned by gaps in our research coverage but also by some with superficial field experience often resulting in dogmatic views by a few who have voiced opinions either in print or at meetings.

This is not the place to discuss all the past pros and cons of the validity of the Virgin Tradition (see for example F. Lister 1964; Jennings 1966; Gumerman and Dean 1989). As Altschul and Fairley (1989:77) have noted in a recent synthesis of Arizona Strip archaeology, "This issue continues to be a subject of controversy."

Suffice it to say, I believe that there are slight differences between the Virgin and Kayenta traditions. I use that latter term—"traditions"—because it seems less formal and better fits with the data than the term "branches" which commonly has been used in connection with subdivisions of the Anasazi. These variances, however slight, nevertheless should be taken into consideration in this discussion.

The distinctions appear to be most clear in the areas of ceramics and architecture. Parenthetically, I agree with Aikens (1966:5) who noted that there had been too much emphasis on ceramics in considering Virgin-Kayenta questions. However, that's exactly where some of the differences appear.

For the purposes of this paper, I'll restrict my remarks to the period between A.D. 1000 and 1150, mostly Pueblo II. There are not many earlier or later sites in Grand Canyon affiliated with the Anasazi.

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Some archaeologists who have worked in Grand Canyon believe that Kayenta Anasazi occupation there lasted into the early 1200s but I have always maintained that the general exodus was earlier, about A.D. 1150. The reason for this differing opinion has to do with the presence of Flagstaff Black-on-white which some believe dates after A.D. 1150 (Dean 1981). However, in Grand Canyon, Flagstaff B/W is common on Kayenta sites in association with Black Mesa (ca. 900-1100), Sosi (1070-1150), and Dogoszhi (1070-1150) black-on-whites that did not extend beyond A.D. 1150. Furthermore, the later Tsegi Orange Ware polychromes are extremely rare in Grand Canyon sites. There are, however, several ^{14}C dates from sites in and around Grand Canyon that extend into the 1200s (Brown 1982:75; Schwartz et al. 1980; Jones 1986; Westfall 1987) if indeed these dates are at all accurate.

Architectural differences seem to be present in the late PII period. Masonry pueblos of the Virgin Tradition often have a different configuration from those in the Kayenta area. Ten or 15 room Virgin structures with a C-, U-, L-, or E-shape sometimes with windbreak walls filling the open ends are not uncommon. The presence of true kivas is problematical.

In the sphere of ceramics, Virgin series of Tusayan Gray Ware with North Creek Gray and North Creek Black-on-gray predominate on PII Virgin sites. Many analysts have difficulty distinguishing the undecorated gray types from Kayenta gray pottery. But, as Geib and his colleagues (1990:70) noted from sites on the Kanab Plateau, in some specimens of Virgin Series graywares, "the paste appears spongy, frothy, or subvitrified," not seen in the Kayenta series. In my own examination of North Creek sherds from the Arizona Strip, the paste surrounding the temper appears to be "platy"—that is, there are small horizontal voids in the clay when the sherd is viewed in cross section; this does not appear in Kayenta series graywares.

Shinarump Gray Ware, referring to sherds "with a dark slate gray or purplish cast, abundant sand or crushed fine-grained sandstone temper (which may appear as fine white angular fragments to the naked eye), and a characteristically vitrified paste" (Geib et al., 1990:71), has often been included in the Virgin Tradition. One center of its manufacture apparently was a few miles east of Kanab, Utah. It may have been made with clays with a manganese content thus giving it a purplish cast; there was at one time a small manganese mine near the Vermilion Cliffs in the Chinle formation (Westfall 1985:96). This pottery is fairly common in the eastern Grand Canyon, especially on the North Rim in association with Kayenta ceramics and I have thought it to be associated there with that tradition rather than Virgin. Parenthetically, at those Vermilion Cliffs sites, which are earlier, 77.9% of the sherds were typed as Shinarump while the analyst recorded only 20.8% as "Virgin-Kayenta" (Wilson 1985:117-118). Douglas McFadden (personal communication, August 5, 1993), who knows the archaeology of the area east of Kanab well, has noted that Shinarump ceramics are associated with Virgin Tradition traits; after A.D. 1050, according to McFadden, Kayenta traits suddenly were introduced there.

It may be that, in attempting to draw boundaries between Virgin and Kayenta, archaeologists have not duly considered the chronology of the areas and of the sites being analyzed.

Walhalla Gray Ware and Walhalla White Ware, originally described by Marshall (1979:97-104), ceramics attributed to the Virgin Tradition by Schwartz, Marshall, and Kepp (1979:83), are, in my opinion, not valid wares. They are virtually indistinguishable from Tusayan Gray and White wares, the only noticeable difference being a reddish patina on some of the quartz sand temper.

We really don't need to discuss in any detail Moapa Gray Ware with its olivine temper. This Virgin Tradition ware occurs in western Grand Canyon on Virgin sites and is occasionally found as trade on the western south rim of the Canyon on Cohonina sites.

For the present, little can be said about the socio-political or economic organization of Virgin Tradition sites in Grand Canyon proper. Few such sites have been recorded and almost none excavated. These appear to have been seasonally occupied each by an extended family or two and the inhabitants were primarily involved in the procurement of wild foods, both plant and animal. Trade seems to have been carried on only in a superficial fashion with the Cohonina on the south side of the Canyon. Unlike efforts to reconstruct socio-political and economic patterns in the Lost City area of southern Nevada (Rafferty 1989, 1990; Lyneis 1992), Virgin evidence in Grand Canyon does not provide sufficient data nor a basis for comparison with those other Virgin areas.

With these characteristics in mind, what can we say about the geographic distribution of the Virgin Tradition? To give but one example, Westfall and Davis (1986:8-9), in a proposal relating to the Arizona Strip, identified the maximum extent of the "Virgin Branch of the Kayenta Anasazi" as "north to the Zion Park uplands, east toward the Kaiparowits Plateau in Utah, south to the Colorado River in Arizona, and west-southwest along the Muddy River in Nevada."

Examination of sherd collections as well as field work, leads me to believe that in the Grand Canyon vicinity, Virgin Tradition sites are generally not east of Kanab Canyon; certainly sites on the North Rim of Grand Canyon, including the Walhalla Plateau, were affiliated with the Kayenta. Along the Colorado River through Grand Canyon, Virgin sites do not appear until just below Kanab Creek (Fairley et al. 1991:68ff).

The analyses of surveys conducted on the Paria Plateau (Mueller et al. 1968:49) are somewhat ambivalent in terms of ceramics. While biased toward decorated types, most of the gray wares were considered in the Virgin series, while most of the white wares were included in the Kayenta series.

At the Gnatmare Site (a most descriptive name and one with which I am intimately familiar after seven field seasons on Black Mesa in northern Arizona) north of the Paria, Metcalfe (1980:53) "placed the ceramic material . . . within the cultural affiliation of the Kayenta Branch" and felt "that the Virgin-Kayenta ceramic distinctions are not significant . . . ." Aikens (1965:7) reported Bonanza Dune, in Johnson Canyon, as a Virgin ruin. Perhaps there was some intermingling of the Kayenta and Virgin peoples in these areas east of Kanab or perhaps the occupations occurred at different times.

Certainly by now it should be clear that any attempt to rigidly draw fixed boundaries between the Kayenta and Virgin Anasazi is an exercise in futility and in reality not intellectually productive. As David Madsen (1989:24) cogently noted in addressing classifications of the prehistoric Fremont of the Great Basin:

> . . . we cannot always expect to define clearly recognizable sets of traits that identify prehistoric 'cultures,' and that the problems Fremont archaeologists have had over the last half-century is trying to define the limits of the Fremont culture and its variants, may not be due to poor excavation techniques or to insufficient amounts of data, but to the fact that such limits do not exist.

Recent attention to Virgin Tradition archaeology is most encouraging as is the publication of results of this attention by governmental agencies as well as by private archaeological firms. Since this symposium is being held in honor of Rick Thompson, whom I am pleased to say I have known and admired for more than 30 years, I should like to note the importance of his *Western Anasazi Reports* and I hope ways and means can be found to continue that series.

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THE PECTOL/LEE COLLECTION, CAPITOL REEF NATIONAL PARK, UTAH

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Recovered by local collectors in the early decades of this century, the archeological museum holdings of Capitol Reef National Park are mostly without provenience or other documentation. Nevertheless, they are a significant resource that may be useful to researchers studying the Fremont and later occupations. The complex story of the artifacts' history, their local, family, and Mormon religious significance, of NAGPRA compliance issues, and of the likely loss of the entire collection from public domain raises a number of issues pertinent to archeology, social history, and museum studies alike. Collection history and a small part of the collection are described here.

INTRODUCTION

Capitol Reef National Park, Morss's (1931) type locale for Fremont culture, holds a small but excellent and little-known collection of Fremont and Shoshonean artifacts. Most of these artifacts were collected before 1932 by residents of Wayne County, who left few known records of the locations or contexts of their finds.

The purpose of this article is not to provide thorough and detailed documentation of each artifact, a task better left to scholars with specific research questions in mind. Rather, its primary purpose is generally to acquaint archaeologists and museum professionals with Capitol Reef's holdings, and to trace the increasingly complex history of the beautiful but problematic collection. Secondarily, this article is intended to illustrate the difficulties surrounding the scientific use of unprovenienced artifacts, while acknowledging the good intentions and generosity of those who have collected and donated such antiquities to the park. To this end, the history of Capitol Reef's archeological collection and brief descriptions of some of the artifacts are presented here.

HISTORY OF THE PECTOL/LEE COLLECTIONS

In 1932, the General Land Office (GLO) investigated reports that two Wayne County, Utah residents had amassed archeological collections worth over $50,000 from sites on public lands, in violation of the Antiquities Act of 1906. The alleged violators were a well-respected Mormon bishop and soon-to-be state legislator, Ephraim Porter Pectol, and an enthusiastic artifact collector, Charles W. Lee, both of Torrey. GLO Geologist G. G. Frazier, sent to investigate the claims, found the collections on public display at a local business owned by Pectol (Figure 1), and in Lee's basement "museum." Frazier established through personal interviews with Pectol and Lee that some of their artifacts had, indeed, been removed from Federal lands in and around what was soon to become Capitol Reef National Monument. Frazier confiscated those items, which included eight baskets, two "jars" (ceramic pots), several pieces of deer hide, one grinding stone, and a jar of corn from the Lee collection; and three painted buffalo

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Figure 1. Ephraim Pectol, wife Dorothy, and Della Hickman Chaffin (seated), in Pectol's artifact storage garage in Torrey, ca. 1940.

hide shields, one piece of tanned buffalo hide, a metate, a digging stick, and one "stone ball" from the Pectol collection (Frazier 1932).

Stating that the commercial value of the collections as a whole had been highly exaggerated, Frazier felt that crating and shipping the confiscated artifacts to the Smithsonian Institution was not worthwhile. Accordingly, he left the government's property in the possession of Pectol and Lee, upon their word that they would maintain the artifacts and collect no more from Federal lands. No charges were pressed against the two men, in part because of Frazier's evident respect for Pectol's civic-mindedness and cooperation (instrumental in the 1937 establishment of Capitol Reef National Monument, Pectol always intended to donate his collection to the monument's museum), but also because the geologist believed that public interest was better served by education than by punishment (Frazier 1932).

At some point before 1939, Pectol and Lee loaned their collections, including the government's artifacts, to the Temple Square Mission and Bureau of Information, which operated a museum for the Church of Jesus Christ of Latter-day Saints (LDS) in Salt Lake City. Now in poor health, Lee requested the return of his relics in 1941, hoping to raise money by selling them (Pectol 1941a). Although the church museum agreed to the return (Taylor 1941a), Lee died before transfer could be arranged. In a subsequent letter to the Temple Square Mission, Pectol (1941b) wrote that 1/3 of Lee's artifacts belonged to him (Pectol), evidently as collateral on a loan made to Lee.

The bishop offered to purchase the remainder of Lee's collection, and proposed to send for the relics.

At this point, however, Lee's heirs produced a document placing the artifacts in the custody of a Loa attorney, S.E. Tanner, for proper disposition (Pectol 1941c). While the family, its lawyer, LDS museum staff, and Pectol attempted to resolve their various claims, the collection remained in storage at the church museum. With World War II looming, church officials were "anxious to be relieved of the responsibility of (the artifacts') possession, since apparently some of the descendants of Mr. Lee seem(ed) to think they have exceptional value" (Judd 1942), and since museum storage space was limited. Frustrated by continuing delays, Temple Square Mission President John Taylor made several pleas to expedite the transfer (Taylor 1941b, 1942a, 1942b, 1942c), finally threatening to sell the artifacts for nonpayment of storage fees (Taylor 1943). There is no documentary evidence that any artifacts were, in fact sold; neither were they transferred from possession of the church museum for several more years.

Following Pectol's death in 1947, Capitol Reef National Monument Custodian Charles Kelly was directed to reaffirm the government's interest in the seized artifacts, still in church museum storage (Smith 1948a; Nusbaum 1948). Now Kelly, widow Dorothy Pectol and her four daughters began working toward the bishop's goal of bringing his collection back to Wayne County (Smith 1948b). The Lee heirs having released claim to at least part of their collection to the Pectols, left several items on loan to the church museum. Otherwise, legal complications appeared resolved, and transfer of the artifacts to the park service was tentatively approved by all parties.

Sadly, Mrs. Pectol died in 1951 before the plan could be effected, and without finalizing transfer of ownership of the entire combined collection to the monument. Meanwhile, the National Park Service flailed to decide how and where the government artifacts would be stored (Kelly 1951; Tillotson 1951; Lee 1951; Patraw 1951; Smith 1951); and the church museum, left out of family and park service negotiations, evidently lost track of the issues (Smith 1952; Franke 1952a, 1952b).

Shortly thereafter, the church museum reversed its earlier position, requested that all or part of the collections be left for exhibit in Salt Lake City (Franke 1952a, 1952b), and, reasonably, demanded documentation of ownership before relinquishing any artifacts (Kelly 1953a, 1953b; Franke 1953a, 1953b; Nusbaum 1951). Internally, the National Park Service contemplated legal action to secure the government property held by the church (Kelly 1953a, 1953b; Franke 1953a).

Such action was unnecessary, as the church museum under pressure reluctantly agreed to release the seized artifacts, even while insisting that the artifacts would be better left in Salt Lake City (Evans 1953). This position was supported by one of the four Pectol daughters, who felt that certain sacred objects should remain on display under LDS auspices (Devona Pectol Hancock, personal communication). However, on November 30, 1953, Kelly met in Temple Square the heirs of Ephraim Pectol and Charles Lee, and with their consent took possession of the combined Pectol/Lee collection amounting to some 200 objects (Kelly 1953c; Franke 1953). Thus, Bishop Pectol's dream of placing his archeological collections at Capitol Reef finally reached fruition more than 20 years after the government first claimed interest in the matter.

Since that time, numerous items have been on permanent display at the park's Visitor Center. The remainder have been in storage, brought out for occasional viewing by Pectol family members, who consider the collection a family legacy with personal, historical, and religious significance. Family members began coming to terms with the implications of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) for the collection, painfully but graciously acknowledging that Bishop Pectol would wish to do the right thing with respect to the spiritual views of American Indian people. In principle, however, they still object to the possible loss of some of their collection.

The bulk of the joint collection is now in the temporary care of the National Park Service's Western Archeological and Conservation Center (WACC) in Tucson. Regrettable for all interested parties, research into the collection's history, begun as a prelude to NAGPRA-required tribal consultation, has failed to locate any formal documentation of an actual gift of the Pectol-Lee collection to the National Park Service. Instead, several documents clearly refer to the transaction between the Pectol heirs and Charles Keely as a loan, revocable for any of a number of reasons.

Because the park cannot demonstrate ownership, attempted repatriation in light of the Pectol heirs' collective objections is inadvisable. Legal counsel advises the park to return the entire collection to the Pectol family to avoid the appearance of attempting to circumvent NAGPRA. Park staff have begun notifying both tribal authorities and Pectol family members of this decision, and plan to follow through as soon as deaccessioning can be accomplished.

OBJECT DESCRIPTIONS

Except for the three buffalo-hide shields, these artifacts have attracted little attention from professional archaeologists or other researchers. This situation is partly due to the absence of provenience and contextual information, but it is also attributable to a lack of professional awareness of the collection. Aside from a few early articles in LDS publications (e.g., McGavin 1947; Beckwith 1927), which presented the finds as corroborating Mormon doctrine, and brief mention in two professional publications (Morss 1954; Steward 1936), most of the Pectol/Lee collection has received no attention. Neither, evidently, was the transfer of the artifacts into the park's possession publicized in 1953. The following descriptive summary is intended to make researchers aware of artifacts that may have some bearing on their own work.

Buffalo-Hide Shields

Professional interest (e.g. Morss 1931; Malouf 1944; Aikens 1966; Berger and Libby 1968; Schaafsma 1971; Loendorf and Conner 1992, 1993) has focused almost exclusively on these elements of the collection. The three buffalo-hide shields, some of the few artifacts for which provenience is known, were recovered in 1925 by Pectol and his family from a shallow overhang near Sulphur Creek, near the monument (Beckwith 1927; Morss 1931). Wrapped in cedar bark and buried approximately 45 cm deep, the painted shields were well-preserved and nearly complete. The only artifacts in the cache, these were the pride of Pectol's collection: he later described the recovery of the shields as a spiritual experience, and considered them to be 3,000-year-old artifacts confirming contact between Utah and Egypt or "High Priest's vestments" (Beckwith 1927) rather than mere utilitarian shields.

Because of their large size (two are 76.2 cm in diameter, and one is 96.5 cm diameter), the painted shields appear to have been designed for pedestrian, rather than equestrian, use (Loendorf and Conner 1992, 1993). Roughly circular in shape, the heavy shields are painted with green, red, white and black designs on their outer surfaces (one is painted on its inner surface, as well) (Figure 2), and have attached armstraps. One has a 1.9 cm-long tear, possibly sustained in battle, mended with rawhide lacing. More detailed descriptions are provided by Loendorf and Conner (1993).

Researchers have long debated the age and cultural origin of the shields. Morss (1931), comparing the shield designs to those of modern Apache and to Utah rock art depicting such shields in association with horses, initially judged the artifacts to be of recent or historical manufacture. Wormington (1955) ascribed to them Fremont origins, based on shield depictions in Fremont rock art; and Aikens (1966), hypothesizing a Northwestern Plains origin for Fremont culture, concurred. Arguments intensified as radiocarbon dating yielded post-Fremont dates ranging between A.D. 1650 and 1750 (Grant 1967; Berger and Libby 1968; see Loendorf and Conner 1993 for a more detailed review of arguments).

Most recently, a leather strap sample submitted for AMS radiocarbon dating yielded dates of 364 $\pm$ 91 years B.P.; 459 $\pm$ 89 years B.P.; and 397 $\pm$83 years B.P. (Loendorf and Conner 1992, 1993). These dates place the

Figure 2. Pectol with shields, ca. 1940.

shields at approximately A.D. 1500, making them the oldest known leather shields in North America (Loendorf and Conner 1992:22). Now the foremost experts on the Pectol shields, Loendorf and Conner (1992) caution that the cultural configuration of the Colorado plateau at ca. A.D. 1500 is too poorly understood to allow the shields to be attributed to any particular cultural group. Consequently, this issue remains unresolved.

Two of the shields are currently displayed at the Capitol Reef Visitor Center; the third is stored at WACC.

Figurine in Cradleboard

Another unique artifact is a fired clay figurine with a long, pinched nose and slitted, applique eyes, carefully wrapped in cotton cloth and rabbit skin and tucked into a willow cradleboard. The figurine, approximately 17 cm long, has a prominent chin and no mouth, and its cheeks and mouth area are painted with two rows of short red and white, vertical stripes.

The cradleboard, approximately 42 cm long and 23 cm wide at its broadest point, is woven of willow, with a checkerboard pattern visible on the back. The "infant" is cradled in a funnel-shaped half-basket of willow bound with bark to the flat backboard. A woven, hide-covered visor curves across the top of the cradleboard to shade, protect, and partially conceal the figurine's face. A hide strap is attached for carrying the cradleboard. All components of the artifact are in remarkably good condition. It is reported and described in detail by Morss (1954) and by Steward (1936), who suggests that such figurines were toys or were carried by women for fertility purposes.

The original context of this object was unknown to park staff until recently, when a Pectol family member recounted during a public meeting his childhood recollections of the artifact (Keith Holt, personal communication). As a child of about eight years, Mr. Holt helped Charles Lee and son Glen Lee excavate the cradleboard from a Fremont grave site northwest of Torrey. The elder Lee, evidently to discourage them from digging unsupervised, told the boys that the figurine "god" would "get" them if they returned to the site. Holt recalls being terrified of the artifact and refusing to enter Lee's basement museum where the figurine was kept.

The cradleboard was loaned by Pectol and Lee to the LDS museum at Temple Square, where it remained for more than 30 years. (At the request of Lee's son Glen, the artifact remained at the church museum when the other objects were transferred to the National Park Service.) The cradleboard was turned over to the park by the Museum of Church History and Art in 1989, and is now stored at WACC. Although believed to be of Fremont origin, the cradleboard is not radiocarbon dated.

Given the complicated history of the collection and of this object in particular, it is not surprising that some questions have arisen regarding legal ownership of the cradleboard. Further research is underway to resolve that issued. If documentary and other evidence demonstrates that the artifact legally belongs to the park, it will be listed for repatriation as an unassociated funerary object under the Native American Graves Protection and Repatriation Act of 1990. For that reason and other reasons, photographs of the cradleboard have been withdrawn from publication at this time.

Bone Fishhooks

A bundle of six bone fishhooks was part of the original Lee collection. Each v-shaped fishhook is made of a sharply pointed piece of bird bone, bound with plant (perhaps yucca) fiber to a 3.5-cm-long wooden stock or shank (Figure 3). Fiber cordage serves as the fishing line.

Again, these artifacts were part of the Lee collection, and were loaned to the LDS museum at the time of National Park Service acquisition. Once more, no written description of the circumstances surrounding the find have been found. These were left with the church museum at the time of collections transfer, and were returned to Capitol Reef in 1993.

Skin Robes

A set of skin hides or robes was also highly prized by Pectol, who saw in them corroboration of the Book of Mormon account of American Indian origins. The circumstances surrounding the hides is confusing, though, due to conflicting versions of their discovery.

McGavin (1947), purportedly quoting correspondence from Bishop Pectol, states that Pectol himself uncovered the set of tanned hides rolled in a bundle and buried approximately 10 feet from the grave of an infant. The site of this discovery was not reported, but is presumed to be in the Torrey area.

In describing the hides, the article (McGavin 1947:80) quotes Pectol,

> Only one edge of what we call the robe was evened off by the knife. By the mark we call the left breast mark is a patch of splendid workmanship, indicating that this mark was wanted or it also would have been patched over. Placing this mark at the breast, and letting the skin fall as it naturally would, a mark appears in the proper place for the navel mark and very similar. Fold the skin about you and another mark like that of the knee comes to the proper place. Now from the left breast, passing the skin under the arm and then over the right shoulder, a perfect right breast mark appears at the right place. Four belts of equal length that would fasten this robe to the body were in the bundle. We liken these to the girdle. A skin tanned with the hair on we call the apron, and another smaller one we call the cap. The marks are in the robe.

Considering them from his Mormon paradigm, Pectol identified the hides as "The High Priest's Vestment" or Nephite burial clothes, and interpreted the patches as Masonic emblems (McGavin 1947). A photograph published by McGavin (1947) shows an individual modeling the garment. That photograph is not clear enough for reproduction here.

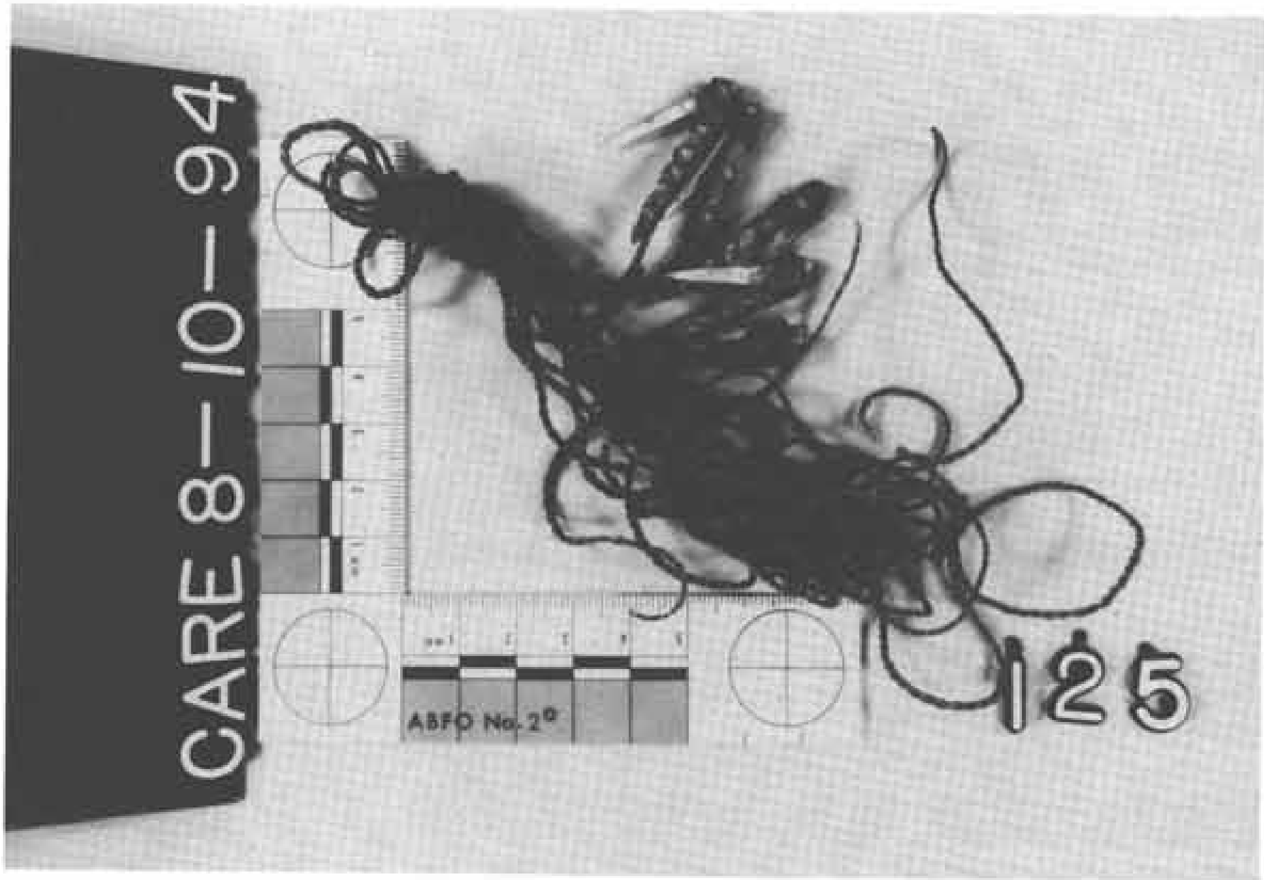

Figure 3. Fishhooks from the Charles Lee collection.

Despite this written account of the discovery, other documentary evidence and the recollection of Pectol's daughter, Devona Hancock of Salt Lake City, indicate that at least two of the robes were recovered by another local collector, Earl Behunin of Torrey. Mrs. Hancock believes that the entire bundle was found together, probably by Behunin, and she is at a loss to explain McGavin's claim that the bishop himself excavated the bundle (Devona Hancock, personal communication).

Behunin's role is confirmed by his son, Clyde, who remembers the hides from his childhood, and who was able to take the author directly to the site where they were discovered. Clyde Behunin recalls no grave, mention of a grave, or other artifacts associated with the find, and believes that his father alone excavated only the two large hides (Clyde Behunin, personal communication). If Behunin in fact found only two of the hides, then exactly how those became associated with Pectol's Nephite garment bundle remains uncertain.

Although Earl Behunin had repeatedly expressed interest in having his hides returned to him, his claims evidently were overlooked or forgotten by the time the transfer took place: no mention of Behunin claim to any artifacts appears in the transfer documentation. After the deaths of Pectol and Lee, these objects were absorbed into the combined collection and turned over to the park.

The largest piece is approximately 168 by 64 cm in size. One edge is trimmed by a knife, and it is patched in four places. A second hide, tanned with the hair remaining, measures approximately 97 by 99 cm. There is also a third, smaller piece (the "cap"), and four buckskin strips or belts approximately 10 cm wide and of varying

Figure 4. A buckskin moccasin from the Pectol collection.

lengths. All are flexible and in good condition, although the hair on two of the hides is brittle and loose.

The hides have not been radiocarbon dated, and their cultural origin and original use are not scientifically determined. The artifacts were on display at the LDS museum from 1939 to 1964, when they were delivered to Capitol Reef.

Buckskin Moccasins

A pair of heavily used and repaired buckskin (deer and possibly sheep) moccasins (Figure 4) were recovered by Pectol from an unknown provenience. The moccasins rise high over the ankle and forefoot, and the soles are stuffed with grass and juniper bark. The upper portion of one moccasin is stained with hematite; both shoes have leather ties. Possibly of Ute or Paiute manufacture, the moccasins are flexible, in good condition, and recent in appearance.

Stone-headed Club

A stone-headed club of unknown provenience is among the artifacts (Figure 5). The wooden handle is 12.5 inches long and exhibits desiccation cracks. The stone head, 3.75 inches in diameter, is diamond shaped in profile, somewhat like a child's spinning top. A hole is drilled through the head, and leather thongs are strung through that hole, out along grooves in the head, and through holes in the haft, thereby securing the head to the handle.

This artifact and several others (a wooden sword and maul-shaped grinders) may, in fact, have been collected by Pectol when he served as a missionary in New Zealand. It is reminiscent of similar stone-headed clubs reported from Polynesia (e.g., Buck 1964).

Miscellaneous Artifacts

The Pectol/Lee collection also includes a number of beautifully preserved baskets, pottery, a bone necklace, chipped and ground stone artifacts, a stick-and-fiber torch, a wood-stemmed clay pipe, assorted small figurines and figurine fragments, antler, horn, and bone artifacts, domesticated plants, a wooden flute, sandals, snares, and more (Figure 6). Unfortunately, space constraints prohibit detailed description of these enticing artifacts at this time.

CONCLUSIONS

The research potential of the Pectol/Lee collections is limited by an absence of spatial or contextual information. Nevertheless, dating of the artifacts, possible identification of their cultural affiliations, and comparisons to similar

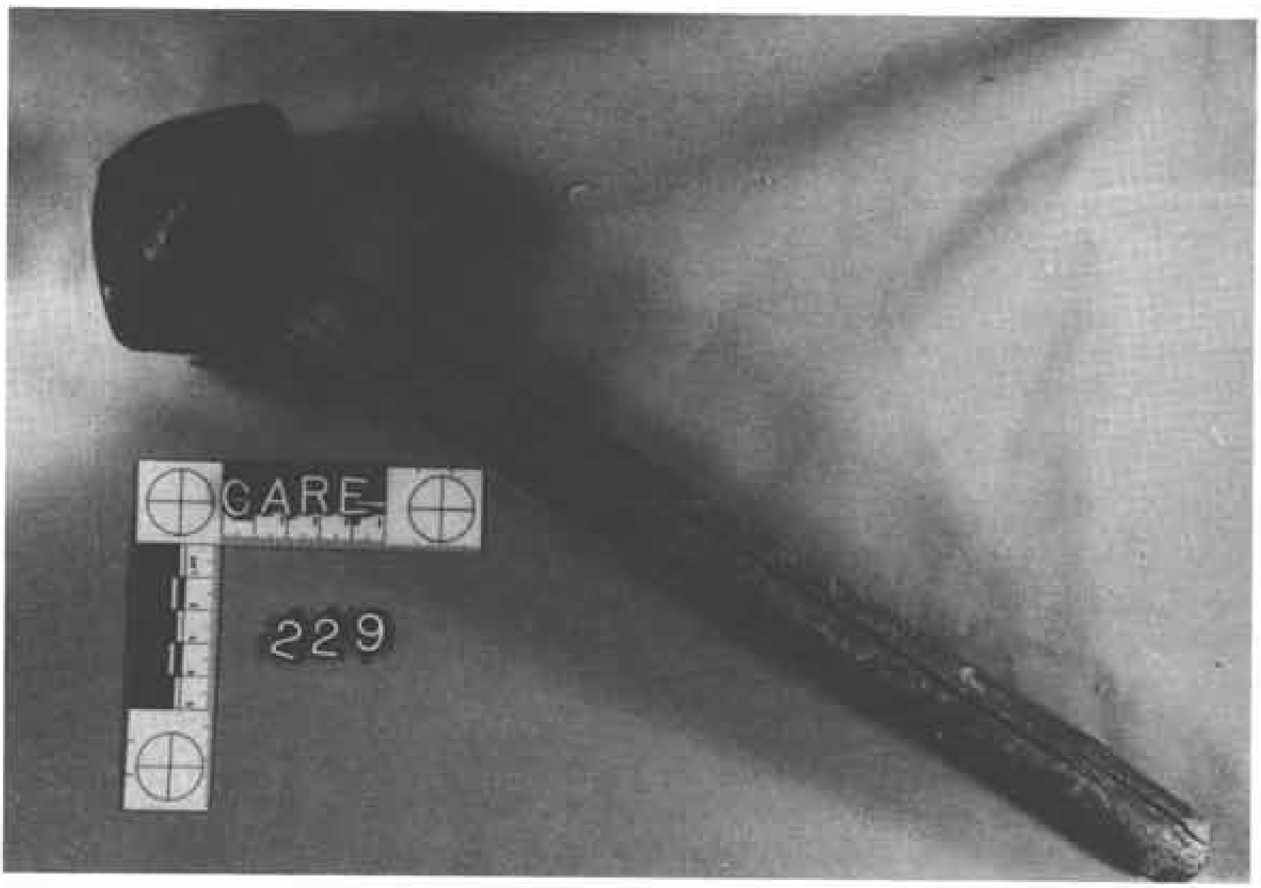

Figure 5. Stone-headed club from the Pectol collection.

finds in other parts of the state will help broaden our understanding of Utah's prehistory. Likewise, a study of the collection's historic contexts (i.e., Pectol's religious interpretation of the artifacts, his motivations for collecting, and the church's interest in the collection) may provide an added dimension to local, state, and church social histories. Such research is now, of course, dependent on the permission and cooperation of the collection's private owners.

Figure 6. Ephraim Pectol with his collections, ca. 1940.

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THE PREHISTORIC BASKETS FROM THE LEO C. THORNE COLLECTION, PART 1

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Editor's Note: The following descriptions and accompanying photographs of baskets from the Leo Thorne collection by C. Lawrence and Rhoda Thorne DeVed are an important contribution to knowledge of basketry from in and around the Uinta Basin. Archaeologists have known about the collection for some time and have been anxious to learn more about the extraordinarily diverse basketry. For reasons of space, the article will be published in two parts, in the 1994 and 1995 issues of Utah Archaeology.

THE COLLECTION

Leo Thorne realized in the early 1920's that if someone did not gather together and care for the things being uncovered by people, valuable material would be lost or destroyed. He began to acquire artifacts as they became available and included them in his own collection which was displayed in his photographic studio on South Vernal Avenue.

The Vernal City Office was moved to the 18 West Main location in the 1940's and Mr. Thorne was asked to place his collection there so it would be more accessible to the public. The Lions Club had cases built and the collection was moved there in 1943 or 1944. When the city office was moved to larger quarters in the 1950's, Mr. Thorne moved his studio into the building. The collection continued to grow and is now composed about equally of things Mr. Thorne was in some way instrumental in finding, and material which others had given or sold to him.

The present project, of which this paper is the first part, was to prepare a photographic catalogue and description of the collection before it was moved or broken up.

The collection was moved to the Uintah County Heritage Museum in the Western Park complex located in Vernal, Utah, for permanent display in May 1994. We are sorry to give up personal custodianship of the collection, but we feel that Mr. Thorne would be pleased.

In the early 1930's, Albert Reagan, then working for the Indian Department at Fort Duchesne, employed Mr. Thorne as photographer and general assistant during the two seasons he worked in the Ashley-Dry Fork area. He made the first systematic record of the rock art of the canyons as well as investigating many dry overhang sites and recording the artifacts collected, which is what most field workers were doing at that time.

At that time, Mr. Thorne also had a limited correspondence with the staff at the Carnegie Museum in Pittsburgh and the Peabody Museum at Harvard University regarding the significance of artifacts that were in his possession.

By the 1940's changing conditions, including the necessity of devoting more time to his photographic business, left Leo Thorne less time to pursue his other interests.

The descriptions of the artifacts accompany each photograph (Figures 1-16) will begin with the copying of Mr. Thorne's descriptions or notes when these are available and can be identified with the artifacts. A brief description of the object will then be followed by any comments or information that might be known about it.

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Figure 1. Specimen LTC.BT.1; Worn-out carrying basket found upside-down, as pictured. "Width at top 21-1/4 inches, width at bottom 10-1/2 inches, depth 11-1/2 inches. Funnel-shaped, well made, uniformly decorated with four black double zigzag lines. Found in Dry Fork Gorge three miles north of Dry Fork Settlement by Joseph Massey." Construction: Coiled - split rod and fiber bundle with close stitches. Dimensions: Diameter = 56 cm (top), 28 cm (bottom); Height 35 cm. Coils = 5 mm; Stitches = Close. Scale (bottom) = inches.

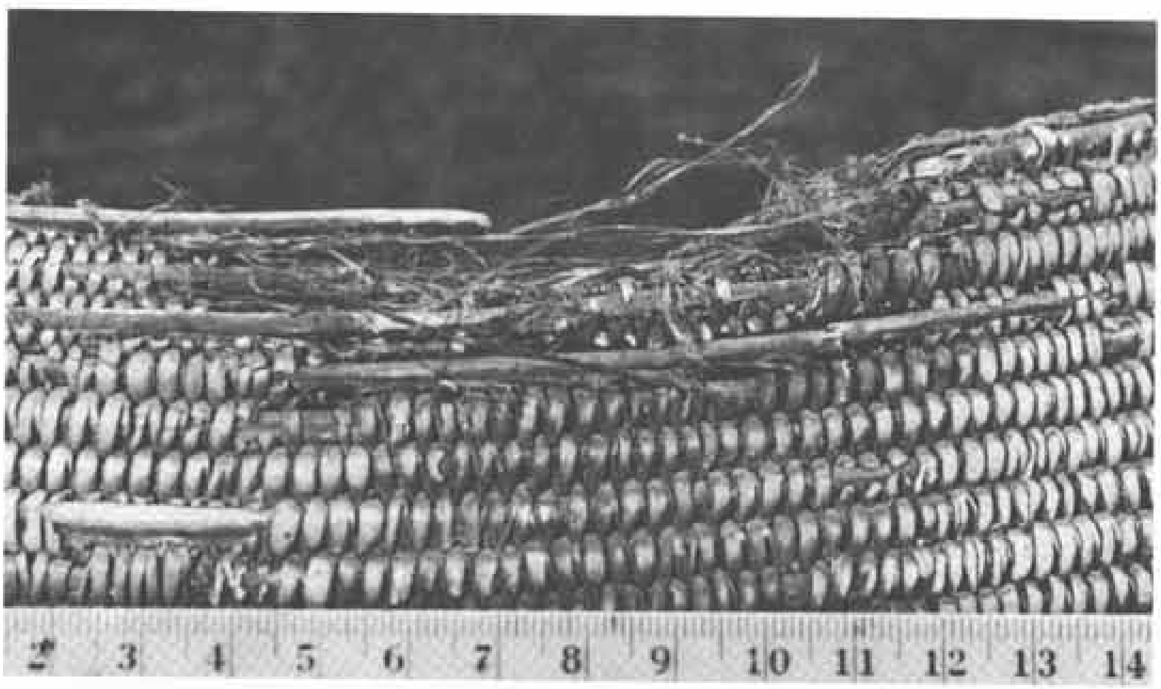

Figure 2. Photograph showing construction, LTC.BT.1. Scale (bottom) = cm.

Figure 3. Specimen LTC.BT.2; Grass storage basket found with LTC.BT.1 in Dry Fork Gorge. Construction: Coiled - a twisted grass rope forms the foundation. Split twig stitching. Dimensions: Maximum Diameter = 43 cm; Height = 25.3. Coils (grass rope) = 9 mm; Stitches = 14 mm apart. Scale (bottom) = inches.

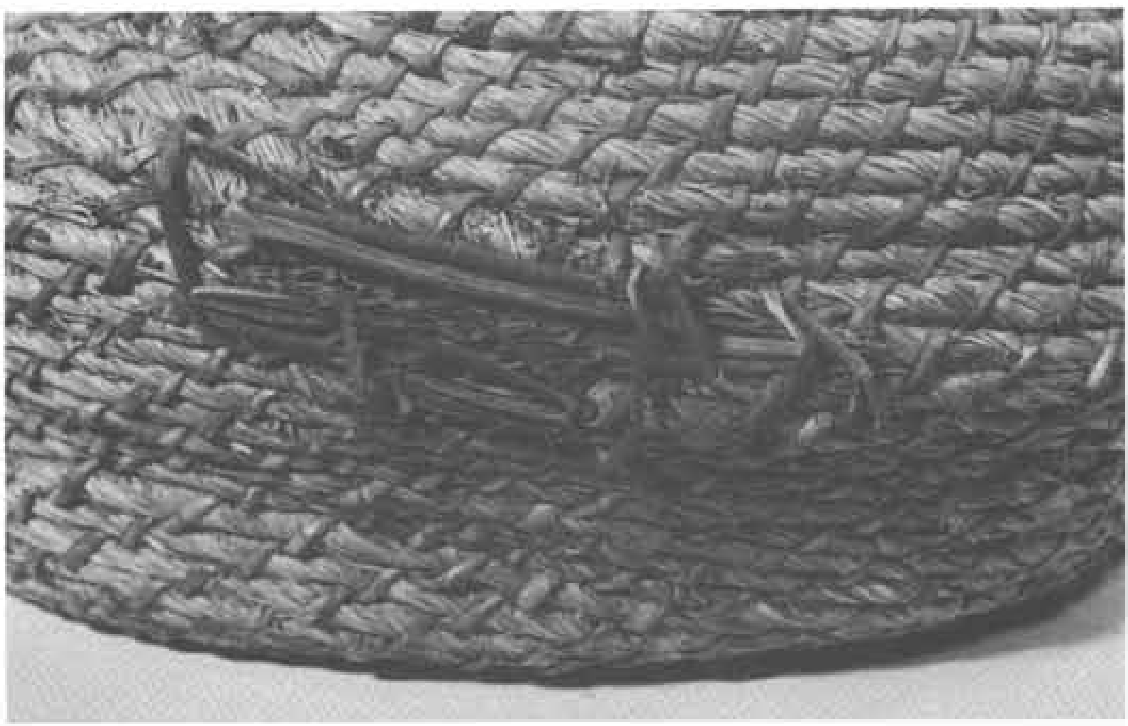

Figure 4. Detail of construction, LTC.BT.2, including area repaired with twigs.

Figure 5. LTC.BT.3; "Large grass storage basket found in cave one mile south of Blytho's Spring by Frank Peters in July of 1932. It contained approximately five pounds of corn kernels, a hank of sinew, corn husks, a small stone ball, two fragments of pumpkin shell, a piece of fringed buckskin, one legging, one small basket over the opening as a lid, plus some unidentified material. The location is given either as the NW1/4 of Section 27 or the NE1/4 of Section 28, Township 3 South, Range 21 East, SLB&M. Albert B. Reagan's "Cave 34" (Reagan 1933:51). Construction: Coiled. Dimensions: Diameter = 43 cm; Height = 34.3 cm. Coils = 1 cm diameter, tightly twisted grass rope; Stitches = 1.3 cm apart. Scale (bottom) = inches

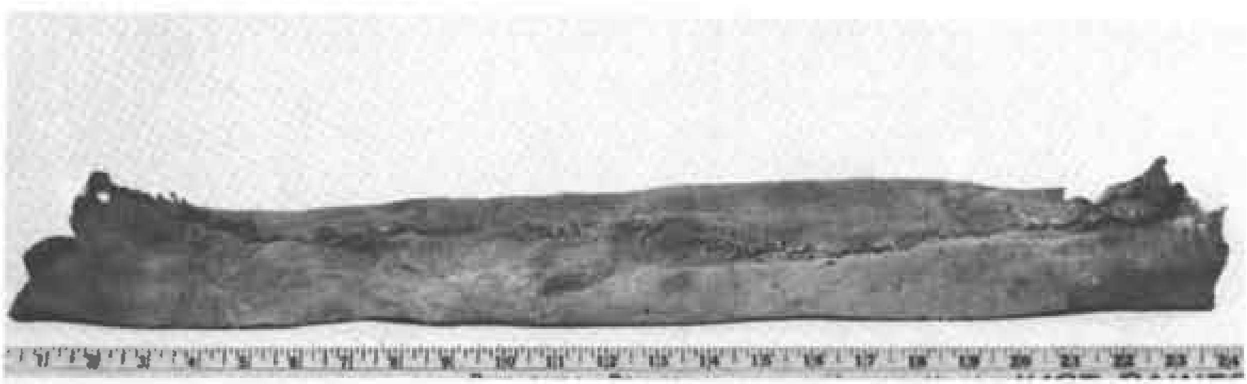

Figure 6. Specimen LTC.LR.1; Tanned buckskin legging. Most of fringe worn off. Length = 61 cm; Width = 15.5 cm. Scale (bottom) = inches.

Figure 7. Close-up of two neatly done patches and seam, LTL.LR.1.

Figure 8. Specimen LTC.BT.4; a small, heavily worn tray basket. One split rod and fiber bundle foundation; The basket appears "greasy" inside. Construction: Coiled. Dimensions: Diameter = 18 cm; Depth = 5 cm; Coils = 3 mm; Tightly stitched.

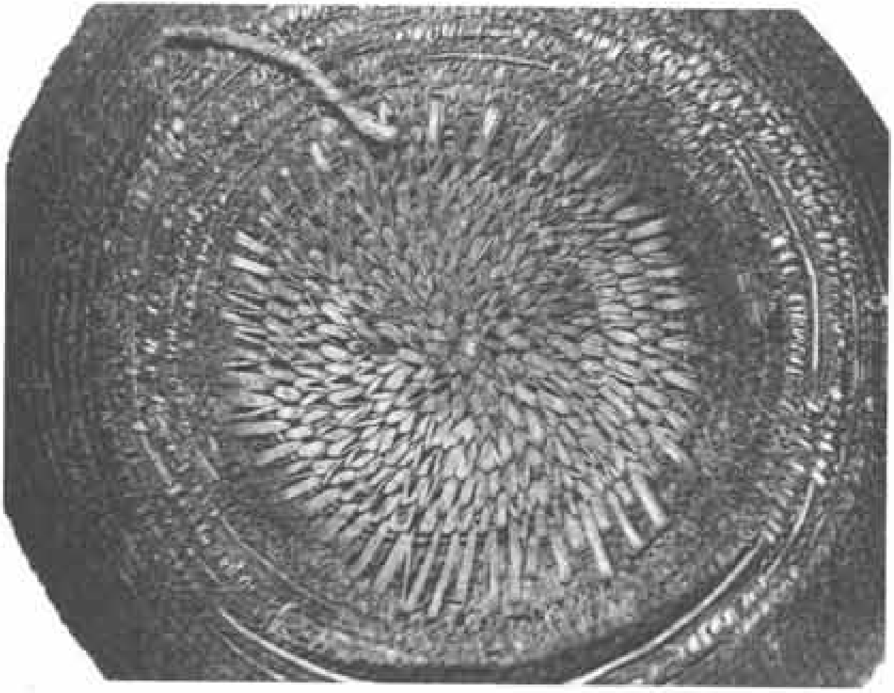

Figure 9. Bottom of LTC.BT. 4 showing apparent patch stitched into bottom of basket.

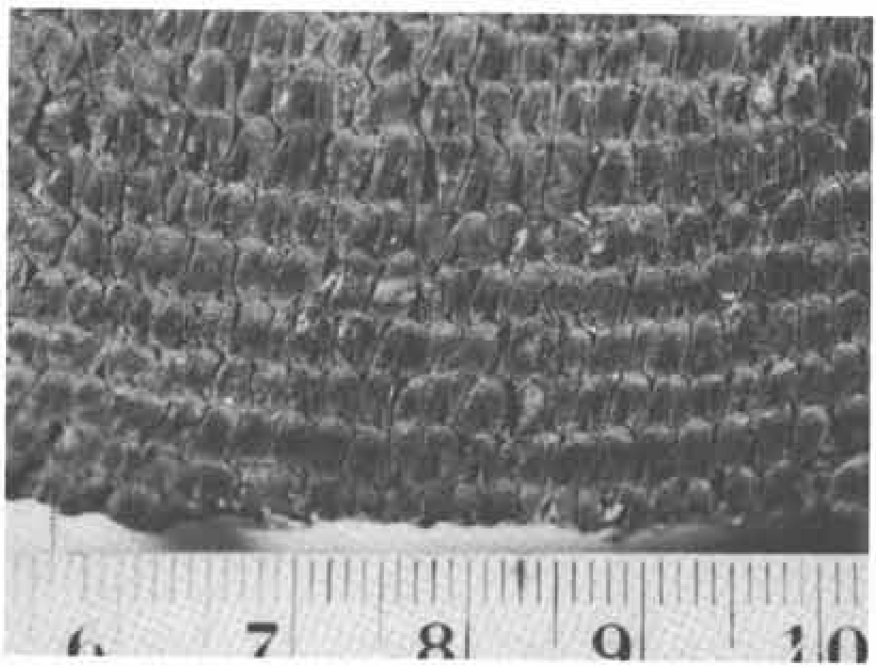

Figure 10. Detal of construction, LTC.BT.4. Scale = cm.

Figure 11. Specimens LTC.BT.5 (right) and LTC.BT.6 (left); small coiled basket "bowls". LTC.BT. 5, Dimensions: Diameter = 14 cm; Height = 5.6 cm; Coils 3 mm; Stitches = 5 mm. Split rod sewn closely with split willow. Found in Ashley Gorge by Elmo Schaefermeyer. LTC.BT.6, Dimensions: Diameter = 13 cm; Height = 4.4 cm; Coils and stitches = 3 mm. This basket is damaged on one side; appears to have been burned.

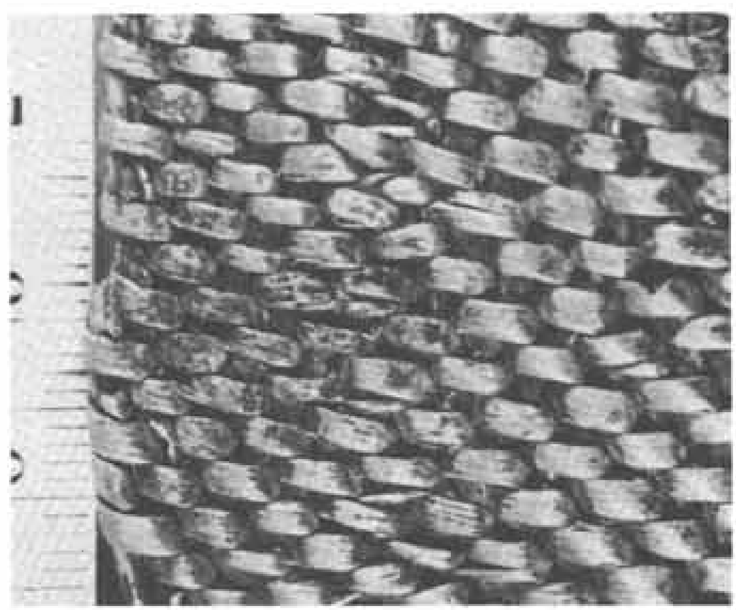

Figure 12. Detail of construction, LTC.BT.5. Scale = cm.

Figure 13. Specimen LTC.BT.7; damaged grass storage basket found in Steinaker Draw by Lawrence Beck. Construction: Coiled. Dimensions: Diameter of base = 38x46 cm; Height = 18 cm. Coils (grass rope) = 1.2 cm diameter; Stitches = 4 cm apart. This basket was severely damaged, possibly by moisture. About a fourth of it is missing.

Figure 14. Construction detail of basket LTC.BT.7. This differs from the other grass storage baskets in the collection. The grass rope is twisted around a stiffening stick of a willow twig. The sewing stitches are also farther apart.

Figure 15. Location (in situ) photograph of basket LTC.BT.7 (left) and pumpkin shell LTC.VF.1 (right) in Steinaker Draw. Other pumpkin shell (center) not in collection.

Figure 16. Pumpkin shell (LTC.VF.1). Diameter = 24 cm; Height = 18.5 cm.

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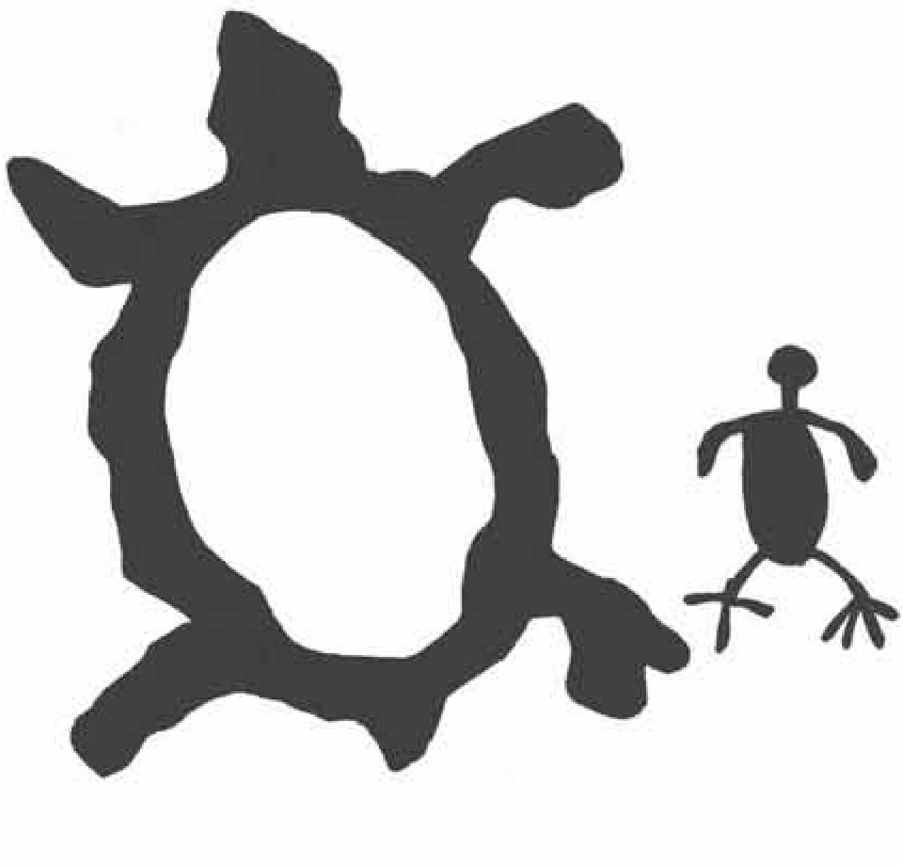

REVIEWS

After the Ice Age: The Return of Life to Glaciated North America, by E. C. Pielou, University of Chicago Press, 1991, 366 pages, B&W illustrations, hard cover, $24.95.

Reviewed by **Robert B. Kohl,** Jennifer Jack-Dixie Chapter, Utah Statewide Archaeological Society, P.O. Box 1865, St. George UT 84771-1865

E. C. Pielou is a Canadian scientist and naturalist. She has won numerous awards including the Lawson Medal of the Canadian Botanical Association and the Eminent Ecologist Award of the Ecological Society of America. Her field studies have spanned North America from Atlantic to Pacific, and include working the high arctic. We repeat these credentials because the author has done a remarkable job in pulling together her own studies as well as hundreds of references with sentence numbers directed to page numbers in the appendix.

The book is a history of the last 20,000 years in North America and the astonishing transformation of the wild land. It is noted that a glacial age is not continuously cold, and that interglacials and glaciations alternate regularly. Citing the Milankovitch cycle, the author reports that those warmer/colder periods are regulated by a number of factors. She cites the shape of the earth's orbit, the tilt of the earth's axis, and a cycle of the equinoxes.

From an archaeological standpoint, the maps of movement of the Laurentide and Cordilleran ice sheets are revealing. Based on geological studies and the movement of flora and fauna, the maps indicate a partially closed corridor 18,000 years ago, and a corridor from Alaska southward since 7,000 years ago. Just as important, Pielou discusses *nunataks*, mountain summits which split the Cordilleran ice sheet and allowed ice to flow through the lower elevations to the Pacific. This, she writes, created *refugia*, ice-free areas along the coast. In these areas, with sun-warmed temperatures and plant growth, early man *could* also have found sea animals and survival. Unfortunately, any record of coastal migration is buried under some 300 feet of ocean.

Perhaps even more fascinating is the "migration" of plant species northward as the ice sheets melted. Pielou traces the movement of not only trees, shrubs, and plants, but all manner of crustaceans, fish, birds, insects, and a great many mammals of all sizes. The author suggests that this floral and faunal movement northward may have eliminated food sources for now-extinct mammals which were further met by early hunters who provided the final *coup de grace*. Pielou admirably discusses all researched opinions about the return of life to glaciated North America before offering her own conclusions, leaving little room for argument. The book is replete with more than 200 original line-drawings to aid the reader in identifying all of the living things discussed in the text. It is readily readable, neatly meshing pedantic terms with conventional explanations where necessary, and highly recommended for scholars and lay readers alike.

The Mythology of North America, by John Bierhorst, Quill William Morrow and Co., New York 10016; 258 pages, B&W illustrations, 1985, paperback $6.95

Reviewed by **Robert B. Kohl,** Jennifer Jack-Dixie Chapter, Utah Statewide Archaeological Society, P.O. Box 1865, St. George UT 84771-1865

There are some contemporary detractors who would have us believe that Native American religious beliefs are merely an "invention" of tribal people in more recent times. This, it is suggested, has been an effort of Native Americans to profess holding ages-old myths that would not only counter the stereotypes of "savage" ancestry but would be an important part of their quest for cultural autonomy in this Anglo-world.

From earliest colonial times the "Indian", as he/she was erroneously labeled, was just a stumbling block in the way of white European expansion. The lack of a Native American written language made it easier to consider them as ignorant aborigines without culture or heritage. They could be disregarded, dismissed, disseminated, and decimated in the view of the Old World newcomers.

The goal of the morally-inclined was to "save the souls" of the native people by baptizing them into one or another Christian beliefs, and eliminating their pagan myths and legends. Even where written beliefs existed with the Aztecs, the Spanish destroyed every vestige of their culture that could be found.

Bierhorst reports that anthropology and ethnology were in their infancy in the New World. Jesuit missionaries had collected a few oral myths east of the Great Lakes in the 1600's. But for nearly 200 years no similar effort was made. Then in 1822, Henry Rowe Schoolcraft, credited with "discovering" the source of the Mississippi River in Minnesota, made another discovery. He wrote about Native mythology, "Who would have imagined that these wandering foresters should have possessed such a resource . . this curious trait which lifts up indeed a curtain upon the Indian mind, and exhibits it in an entirely new character?"

Bierhorst notes that at the turn of the century, Franz Boas and his co-workers began building a science of anthropology in the United States, and it appeared that myths and folktales would play a major role. Newly-collected mythologies of the Navajo, Hopi, Coos, Caddo and Kwakiutul began to be published by scholars. Little by little, the journals of trappers, traders, and explorers revealed more of these myths and legends. Other early and notable works include Lewis Spence's *The Myths of the North American Indians* in 1914; H. B. Alexander's *North American Mythology* in 1916; and Ruth Benedict's *Zuni Mythology* in 1935.

In the 1950's other collectors of myths focused on the age, gender, or psychology of the teller. In the 1960's the focus was narrowed to the storytellers' performance, where he paused to catch his breath, where he changed his tone of voice, and what sounds or comments his audience made. While native groups usually kept intimate details of their sacred ceremonies a secret, many began to publish their own myths and traditional narratives for the sake of their children.

In 1985, Bierhorst put it all together, categorizing the various myths and placing them in cultural areas from the Far North to the Southwest, California and the Great Basin, then across the Plains to the Southeast and Northeast. He discovered great similarities of myths even between people who spoke no mutually understandable language. For example, creation myths are similar throughout much of North America. Many of them are classed as Diver myths. They involve various creatures such as mink or muskrat or beaver, turtles, ducks or loons. All of them dive into a world covered by primordial waters to bring up mud or sand and make a place for mankind.

There are many variations on the actual emergence of man. In the Northwest the raven is credited with opening a clam shell on the shoreline from which humans emerged. Numerous myths involve a difficult series of efforts to bring man to earth through several layers of underworld. The Anasazi and descendant Pueblo people believed that mankind emerged from a hole in the ground called a *sipapu* and covered with a stone slab such a hole in every kiva and in many pithouses.

The historic "Dine", the Navajo, relate man's emergence through four levels of difficulty and conflict, fire and water and ice, with animals encountered, and with climbs up vines or ladders which proved impassable for fat folks who fell back into the darkness.

Bierhorst notes that the Coyote is the Trickster in many myths, able to transform himself into other creatures and sometimes is heralded as the Creator Coyote. In the early days, it is said, all of the animals were people who were later transformed into the animals of today. Everything had life, the rocks and trees and plants, and some of the early animals became the Sun, the Moon, or the Stars.

Many myths contain considerable sexuality and infidelity to the point of specific sexual activities. Women are included in many stories, including Changing Woman of the Navajo; Sedna, the Mistress of the Sea Animals;

Mother Corn of the Arikara and Zuni; and others such as Ocean Grandmother, Spider Grandmother, or simply Our Grandmother, the Shawnee Creator.

Bierhorst points to the telling of these stories and the "rules" that applied. Most myths could only be told in summer, otherwise snakes would crawl into the beds of the tellers. And some groups ruled that the teller had to relate his stories while flat on his back or he might become a humpback.

The book is primarily text but the detailed myths and legends, most of which hold lessons in honesty and morality, will captivate the reader. Bierhorst also makes comparisons with Old World myths of the Greeks, Romans, and Egyptians, to show the similarity but independent thought of Native Americans.

Bierhorst's book may have started a resurgence of interest in these old stories. For those who prefer picture books of color photography, the following two new arrivals are briefly reviewed:

Native American Myths and Legends, edited by Colin F. Taylor, Ph.D., with chapters by 11 contributing authors, Smithmark publishers, New York, 1994, 143 pages, large format, color art and photographic illustrations, hard cover, $25.00.

Reviewed by **Robert B. Kohl,** Jennifer Jack-Dixie Chapter, Utah Statewide Archaeological Society, P.O. Box 1865, St. George UT 84771-1865

This book follows the Bierhorst categories and culture areas and recounts most of the same myths. It might be classed as a "copy-cat" book but its feast of artwork and color photographs makes it a treat for the eyes. The reproductions of artifacts add to understanding the myths and legends. Printed in Italy on heavy stock.

Creation's Journey--Native American Identity and Belief, Tom Hill and Richard Hill, Editors, Smithsonian Press, Washington and London, in association with the National Museum of the American Indian, 1994, 256 pages, large format, color art and photography, hard cover, $40.00.

Reviewed by **Robert B. Kohl,** Jennifer Jack-Dixie Chapter, Utah Statewide Archaeological Society, P.O. Box 1865, St. George UT 84771-1865

This volume also recounts many of the myths and legends in the Bierhorst book. The text is furnished by representatives of various tribes with the announced intent to include Native Americans in the selection of artifacts pictured and their contemporary versions of Native American beliefs. The superb photographs are of objects in the temporary exhibit of the George Gustav Heye collection in the Alexander Custom House in Washington, D.C. This collection was "rescued" from its former location in a dilapidated building in a run-down New York neighborhood. Poor visitation was equalled by extremely poor curation.

The book is really a promotional piece for funding for the National Museum of the American Indian proposed for construction on the Mall by the year 2001. In my opinion, the drawback in the unquestionably beautiful volume is that it wanders far afield from myths and legends in explaining how various objects were made throughout North, Central and South America. It tries to be so all-inclusive that it misses much of the earlier Bierhorst impact of myth collections made much earlier. However, its art and photography make it a truly collector's edition.

In The Shadow of Fox Peak: An Ethnography of the Cattail-Eater Northern Paiute People of Stillwater Marsh. by Catherine S. Fowler. 1992 Cultural Resource Series No. 5. U.S. Department of the Interior, Fish and Wildlife Service, Region Stillwater National Wildlife Refuge. U.S. Government Printing Office. 264 pages, 128 figures, 16 tables.

Reviewed by: **Robert G. Elston**, Intermountain Research, P.O. Drawer A, Silver City, Nevada 89428

This may not be the last ethnography of the Cattail-eater Northern Paiute, many of whom still live on the Fallon Indian Reservation near Stillwater Marsh, but it is surely the last ethnography reflecting as much of pre- and postcontact lifeways. Indeed, reconstruction of such traditional culture is the explicit goal of the exercise. And because the book is an admirable ethnography, it bequeaths another legacy to prehistorians, helping to illuminate prehistory as well as the recent past.

The importance of the marsh in subsistence and settlement strategies of prehistoric people living in the Carson Desert was a matter of debate for decades prior to 1985. Some archaeologists suggested that the marsh was so productive that foragers resided in it as sedentary villagers.

Others argued that marsh ecosystems are less productive than terrestrial habitats at the human trophic level, so foragers should prefer dry land resources. Moreover, said some, marsh productivity and stability are too highly variable to be predicted by foragers. This debate was conducted in the light of a very spotty archaeological record. Although much of the ethnographic material presented by Fowler had been collected, little of it had been synthesized. Thus, those who argued against a central role of the marsh in aboriginal Carson Desert settlement and subsistence could ignore such clues as people naming themselves "Cattail-eaters."

In the wet years of the mid-1980s, the Carson Sink became a huge lake that flooded much of Stillwater Marsh, resolving many prehistoric questions by exposing archaeological evidence of intensive resource use and habitation in the marsh spanning three or four millennia, even if there was little evidence for sedentary village life. Indeed, what recent archaeology suggests is a settlement strategy predicted by none of the extant theories: relatively high mobility, but mostly within the marsh. In the Shadow of Fox Peak provides a similar large scale look at the life of Cattail-eaters as it was lived just before and shortly after White contact.

This view strongly suggests that although they ranged an area of about 10,000 km^2, the lush wetlands of Stillwater Marsh and Carson Lake were at the center of Cattail-eater economic and residential life. If the great flood had not occurred, and we had only this ethnography, the seamless technological and biological knowledge it reveals argues convincingly for great time depth in the central role of the marsh.

In the Shadow of Fox Peak is focused on Wuzzie George, a Paiute women born in about 1880 who died in 1985. Mrs. George and her husband Jimmy are already familiar to readers of Margaret Wheat's (1967) book *Survival Arts of the Primitive Paiutes*, University of Nevada Press, featuring the construction and use of many items of Cattail-eater daily life. Mrs. George learned traditional Cattail-eater ways from her parents, Susie and Sam Dick, and her grandmother, Mattie who was born about 1820 and witnessed the coming of the first White settlers. Mattie and Wuzzie were very close; rather than formal schooling, Mrs. George spent her girlhood in the company of her grandmother learning to forage and process resources of the marsh, fans and mountains of the Carson Desert.

Mrs. George worked hundreds of hours with her collaborators Margaret Wheat, Sven Liljeblad and Catherine Fowler in a self-conscious effort to pass on and preserve knowledge of the old ways. Liljeblad and Wheat also worked with a number of other Paiute people, including Wuzzie's best friend Alice Steve. Fowler and Liljeblad transcribed or reviewed hundreds of hours of taped interviews and reams of field notes for this book. In addition, Fowler marshals other relevant ethnography, many historical accounts, and much archaeology of the Carson Desert.

The book is organized in traditional ethnographic form. The first chapter introduces the study and people participating in it, the second chapter sets the environmental and historical stage, and the third chapter describes traditional camping areas and place names. Chapter four describes subsistence, including accounts of hunting, fishing, and gathering plants and insects; medicines and medical practices are described in chapter ten. Chapters five through seven describe shelters, tools, clothing and personal adornment. Chapters eight, nine and eleven cover social life, political organization, religion, games, music and dance. An appendix expands on sacred traditions and folklore. Another appendix briefly describes assemblages from twenty-one archaeological sites in the Carson Desert that may be associated with ethnographic Cattail-eaters. These sites are distinguished by the presence of both historic and late prehistoric artifacts, and several are mentioned in ethnographic or historic accounts.

This book is a must for the shelves of all Great Basin anthropologists and archaeologists, and will appeal to students of foraging people everywhere. Although it is a formal ethnography, technical jargon is minimized. Consequently, it is fully accessible to teachers, students and the general public. An unfortunate ommission is the lack of an index, making the book much more difficult to use as a research tool than it needs to be.

Bibliophiles will appreciate the quality of the paper and binding. In the Shadow of Fox Peak is nicely designed and laid out. It is set with a readable font and wide margins. Its many photographs and drawings are fascinating as anthropological documentation, but as well, frequently express the dignity and generosity of the Paiute people who remembered the old life for the rest of us, and who made the book possible (cf. Figures 1 and 2, portraits of Wuzzie George and Alice Steve).

MANUSCRIPT GUIDE FOR *UTAH ARCHAEOLOGY*

UTAH ARCHAEOLOGY is a journal focusing on archaeological research within or relevant to Utah. Articles on either prehistoric or historic archaeological research are acceptable and both are encouraged. All articles must be factual technical writing with some archaeological application. The journal is sponsored by the Utah Statewide Archaeological Society (USAS), the Utah Professional Archaeological Council (UPAC), and the Utah Division of State History. The journal is published annually.

Authors submitting manuscripts are requested to follow Society for American Archaeology (SAA) style in text references and bibliography (see October 1992 issue of *American Antiquity*). If you do not have access to a copy of the style guide, write to Kevin Jones requesting a photocopy. Authors are asked to submit one original and three copies of their manuscripts as all submitted articles will be reviewed by three readers. Reviewers will be selected on the basis of paper topic. Manuscripts should be double spaced with margins adequate to allow for comments and should include a short abstract if the manuscript is intended for an article rather than a report or a comment.

Categories of papers are: (1) Articles (up to 30 pages in length) are synthetic; review or overview articles are especially encouraged); (2) Reports (shorter, usually less than 10 pages) are more descriptive; (3) Notes are short, descriptive papers on new (or old) data with a minimum of comparative or interpretive discussion; (4) Comments focus on issues of current interest in *UTAH ARCHAEOLOGY* or on previous publications. Comments on previously published works will be submitted to the author of that work for review and reply; and (5) Book Reviews.

Authors are responsible for figure and photo production. Figures need to be publishable quality and should not exceed 6½ inches by 8 inches in size (including caption). Use pressure sensitive transfer letters or KROY lettering for labels. Figure captions should be submitted on a separate sheet and clearly correlated to figures or photos. Please submit figures as computer generated graphics or as positive mechanical transfer prints (PMTs). If such a process is unavailable, submit figures as photo-ready drawings in black ink. Photos should be black and white glossy and 5 inches by 7 inches in size.

Once the manuscript has been reviewed and accepted for publication, usually with revisions, authors will be asked to respond to the reviewer's comments. A hard copy of the revised manuscript should then be submitted to the editor with a computer disk in either WordPerfect or ASCII. The material will be copy edited, formatted, and returned to the author for final proofreading.

Citation examples:

Beck, Charlotte, and George T. Jones
1994 On-Site Artifact Analysis as an Alternative to Collection. *American Antiquity* 59:304-315.

Janetski, Joel C.
1991 *The Ute of Utah Lake*. Anthropological Papers No. 116. University of Utah Press, Salt Lake City.

O'Connell, James F., Kristen Hawkes, and Nicholas Blurton-Jones
1991 Distribution of Refuse-Producing Activities at Hadza Residential Base Camps: Implications for Analyses of Archaeological Site Structure. In *The Interpretation of Archaeological Spatial Patterning*, edited by Ellen M. Kroll and T. Douglas Price, pp. 61-76. Plenum Press, New York.

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