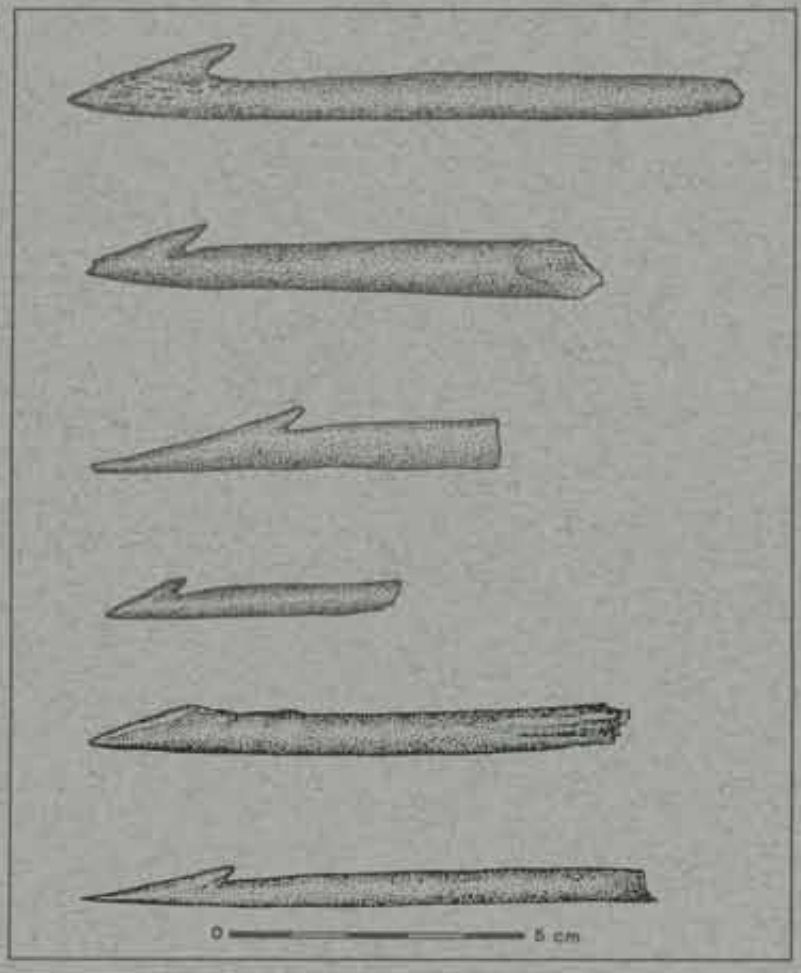
UTAH ARCHAEOLOGY 1992



A Publication of

Utah Statewide Archaeological Society
Utah Professional Archaeological Council
Utah Division of State History

UTAH ARCHAEOLOGY 1992

UTAH ARCHAEOLOGY is an annual publication of USAS, UPAC and the Utah Division of State History. The purpose of this publication is to disseminate information relevant to archaeological research, both historic and prehistoric, in the state of Utah. Subscriptions are available through memberships in USAS or UPAC or for an annual fee of $10 through: Publications, Utah Division of State History, 300 Rio Grande, Salt Lake City, Utah, 84101. Authors interested in publishing should contact the editors for a manuscript guide.

Editors: Kevin Jones, Antiquities Section (UPAC)
Utah Division of State History
300 Rio Grande
Salt Lake City, UT 84101-1182

Robert B. Kohl (USAS)
Jennifer Jack-Dixie Chapter
P.O. Box 1865
St. George, UT 84771

Citations should follow Society of American Archaeology (SAA) style (See Style Guide *American Antiquity* 48:429-442). See example below.

Copeland, James M., and Richard E. Fike
1988 Fluted Projectile Points in Utah. *Utah Archaeology 1988* 1(1):5-28.

ISSN 1040-6549

UTAH ARCHAEOLOGY 1992

Editors: Joel C. Janetski, Utah Professional Archaeological Council
Robert B. Kohl, Utah Statewide Archaeological Society

Editorial Assistant: Kathy Driggs

Vol. 5 1992 No. 1

CONTENTS

ARTICLES

REPORTS

NOTES

REVIEWS

Front Cover: Bone harpoons from Utah Lake (see Martin this volume).

MESSAGE FROM THE EDITORS

UTAH ARCHAEOLOGY 1992 is the fifth annual volume of this journal and is a landmark issue in a couple of ways. We feel that after five years *UTAH ARCHAEOLOGY* is established as a tradition in the archaeological literature of the region. We continue to receive adequate manuscripts for each volume with little solicitation and very much appreciate the support of those who submit manuscripts. Without those manuscripts the journal would quickly fail. We also feel good about the response to the Notes section. We recognize that archaeology is a material science and builds its understanding about human behavior and past societies on the tangible remains found in the ground. We hope, therefore, that this focus on material culture will contribute to our understanding of the past; it certainly emphasizes the importance of obtaining maximum contextual information for these often fascinating objects if their cultural role is to be defined.

Finally, this is the last year that Joel Janetski will serve as Utah Professional Archaeological Council (UPAC) editor for the journal. He has enjoyed very much the interaction with the archaeological community during his tenure as editor and has tried, with his Utah Statewide Archaeological Society (USAS) counterparts, to create a quality journal that does justice to the fascinating archaeology of Utah. Kathy Driggs, the manager of the Office of Publications in the Museum of Peoples and Cultures at Brigham Young University and who has served as an assistant editor of *UTAH ARCHAEOLOGY* since its inception, will also be replaced. Kathy's contribution has been greater than most realize and the editors thank her for her commitment and contributions over the last five years.

In part the decision by Janetski to give up the editorship was based on the need to set a precedent for change in the editor's position. A new editor will bring fresh energy and ideas. The editors are confident that Kevin Jones will bring that new energy to the journal. Of course, Bob Kohl will continue as editor for USAS and will provide important continuity.

Joel C. Janetski, UPAC editor
Robert B. Kohl, USAS editor

IN MEMORIAM

KENNETH WAYNE RUSSELL
1950–1992

Kenneth W. Russell died unexpectedly on May 10, 1992, in Amman, Jordan, after a brief illness. His untimely death at the age of 41, in the prime of his scholarly career, leaves his friends and colleagues with a deep sense of loss.

Ken was born October 7, 1950, in Lakeport, California, where he graduated from high school in 1968. He received his B.A. from Sonoma State College in 1973 and his Ph.D. in anthropology from the University of Utah in 1986. He taught courses at the University of Utah and at Weber State University, where he was an Assistant Professor.

He began his career in archaeology in 1972 while an undergraduate student in California and was involved with a variety of prehistoric and historic archaeological projects in Utah up to 1989. In addition to his cultural resource management work with P-III Associates, Salt Lake City, Ken supported the efforts of the Promontory-Tubaduka Chapter of the Utah Statewide Archaeological Society. He taught Levels 1 and 2 in the state certification course and lead chapter members on several field trips. He nurtured the chapter when it was still in its infancy and gave many members their first introduction to archaeological fieldwork.

As his career grew, Ken became a Louis Leakey Foundation Fellow in 1986 and a National Endowment for the Humanities Post-Doctoral Research Fellow in 1990. Since the autumn of 1989, Ken lived in Amman, Jordan, a part of the world he deeply loved, and a culture in which he was so genuinely comfortable. In early 1990, he directed the excavation

of a Bedouin rockshelter near Petra, Tur Imdai, and later worked as an archaeologist for the American Center for Oriental Research (ACOR) projects at the Amman Temple of Hercules and at the port of Aqaba (Islamic Ayla).

Ken's first love was the history and archaeology of Petra, the capital of the Nabataean kingdom, an Arab trading state, and a major city that persisted through Roman times and into the early stages of the Byzantine period. He participated in archaeological surveys and excavations at Petra from 1973 to 1977. In 1986 he returned to begin the first of three field seasons (1986, 1988, and 1990) investigating the history and ethnoarchaeology of the *Bidul* Bedouin, the modern residents of Petra.

At the time of his death, Ken was working in Petra, beginning an excavation of the find of his life, a Byzantine church. He had known about the structure since 1973, but other activities and the fact that individual structures are often lost in a sea of antiquities in a place like Petra, prevented him from formally recording it until April 1990. The church is sizable and contains evidence in the fill and roof collapse of extremely fine mosaics. Based on the distinct possibility that this was the Cathedral of the Episcopal See of Third Palestine, known only through ecclesiastical texts, the church may contain some of the oldest mosaics in the world. With substantial funding Ken planned for this major excavation and restoration until his death. Queen Noor of Jordan was scheduled to commence formally the excavation on May 15, 1992.

Ken was also a writer. Among his publications, he is best known for his work on earthquake chronologies for Palestine and Northwest Arabia and for his tome on plant and animal domestication, *After Eden: The Behavioral Ecology of Early Food Production in the Near East and North Africa*. At the time of his death, he was working on a book manuscript, *The Bidul Bedouin of Petra: Studies in the Ethnoarchaeology of a Pastoral-Agricultural People in the Near East*, which will be brought to completion in his memory.

Known for his colorful style and his infectious enthusiasm, Ken blended the qualities of empathy and compassion with a brilliant mind, a love of learning, and tireless scholarship. His irrepressibly positive attitude toward life enriched those who had the good fortune to know him.

Ken's qualities and his attitude toward life were apparent in his association with the *Bidul* Bedouin. During the first years he worked in Petra (1973–1977), he befriended the *Bidul* while working as an area supervisor for the American Expedition to Petra. After nearly a nine-year absence from Jordan to continue work on his doctorate, Ken returned to begin an ethnoarchaeological project with an undetermined Bedouin group. Not initially planning to work at Petra this time, he nevertheless visited to renew his acquaintances. He found the *Bidul* not only remembered him, but honored him with stories of his compassion, recalling a particular event that had happened years earlier. When an accident on the excavation had injured a young worker, Ken had carried the boy down the hill to medical attention. The boy had since become a man with a wife and children and had spread his appreciation as he relived the story. Ken also contacted other *Bidul* he had befriended earlier and found that this tribe was engaged in a series of behaviors that served as excellent analogs for ethnoarchaeological study. Ken wrote back to the United States that plans had solidified, and he had unexpectedly found the best group to work with was his old friends. Surely a case of destiny, Ken became a champion of the *Bidul*. A comment was repeated often as Ken walked the hinterlands of Petra examining Bedouin sites never before recorded because no one had deemed Bedouin archaeology worth doing, "They are the ones searching for all the old places—studying the history of the *Bidul*."

A memorial service was held in Amman on May 14, and the next day Ken was buried at Petra—on a promontory overlooking the ancient city. The place was chosen by and given to Ken by the *Bidul*.

ACKNOWLEDGMENTS

My thanks to the following for contributing information to this memorial: Kay Russell-Smallman, Carol Jennings, Mark Stuart (USAS), and Robert Schick (ACOR).

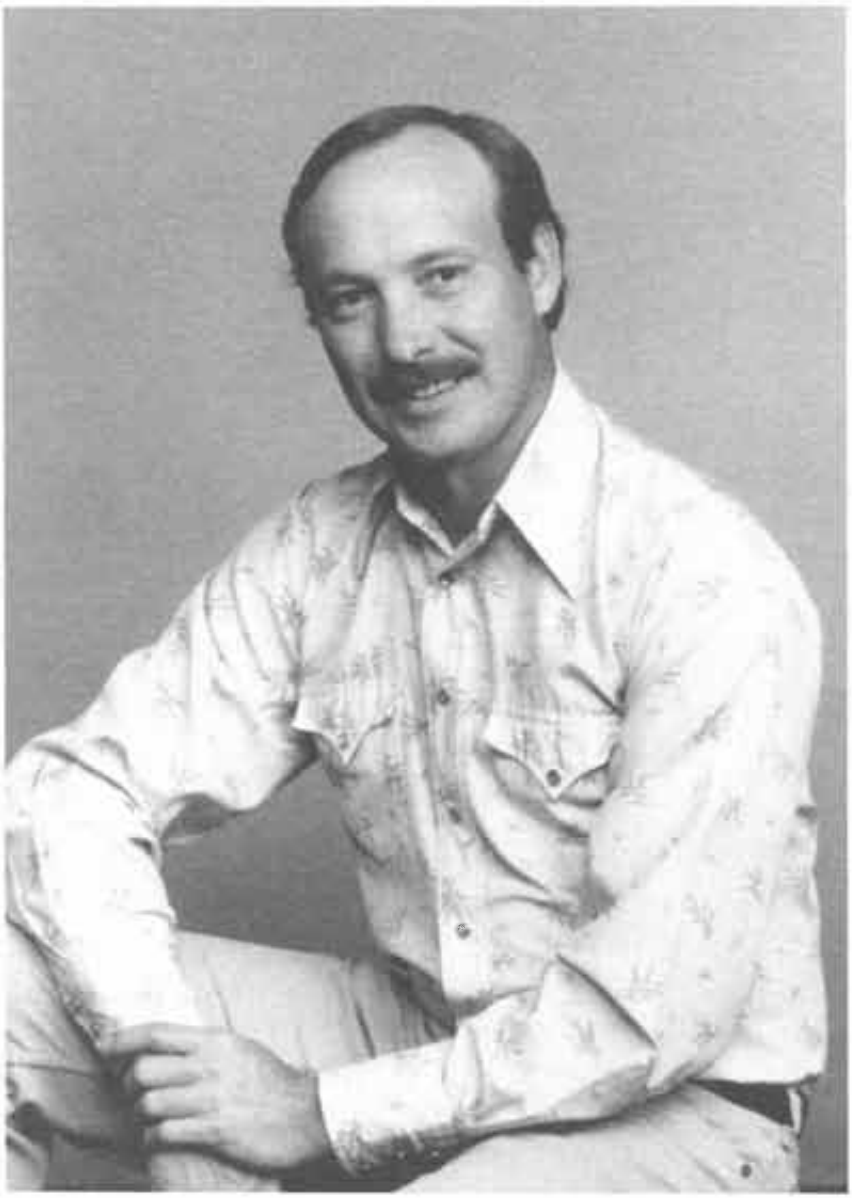
Steven R. Simms
Utah State University
Department of Sociology, Social Work,
and Anthropology
Logan, Utah 84322-0730

THE KENNETH WAYNE RUSSELL MEMORIAL TRUST

A memorial trust fund has been initiated to support students at the American Center for Oriental Research (ACOR) and to provide assistance for the education of the children of the *Bidul* Bedouin. As the trust will be endowed, only the interest earned will be used to support the program. Donations earmarked for the Russell Trust may be made payable to:

ACOR
c/o ASOR
3301 North Charles Street
Baltimore, MD 21218

VONN LARSEN
1950–1992



A PERSONAL TRIBUTE TO AN AMATEUR ARCHAEOLOGIST

Asa Nielson introduced me to Vonn Larsen a few short years ago as an old friend who was interested in archaeology. Vonn had developed that interest while growing up in Richfield and had carried it with him to Utah Valley where he lived for a number of years. Over the next few months, he and I became close

friends due to our common backgrounds and interests. Within the bonds of that friendship, Vonn began sharing some of the vast amount of knowledge about archaeological sites in Utah that he had accumulated over his relatively short life. His appetite for archaeology and information about the past was intense, and we regularly spent afternoons visiting places he knew about that he felt were important archaeological sites. When weather precluded field trips, we simply talked about local sites and discussed their potential for learning more about Utah's prehistory. Vonn had thought about these sites and topics at great length over the years, and his ideas flooded out of him as we talked. I learned a great deal from those discussions.

Vonn's contributions to Utah archaeology were many. He was a member of the Utah Valley Chapter of the Utah Statewide Archaeological Society (USAS) and was one of the most dependable volunteers on field projects. As with other USAS members, Vonn had many years of experience looking for or at artifacts and was an excellent, well-informed field archaeologist. He put in countless hours as a volunteer.

One of Vonn's most important contributions to Utah archaeology was to draw attention to the sites in the Yuba Reservoir area. I give Vonn full credit for the measures now being taken to protect the many sites there. He convinced me and La Mar Lindsay, former Richfield Bureau of Land Management (BLM) archaeologist, to visit and record the sites that were being eroded by lake action and the intense, off-road vehicle traffic. The BLM, with the help of Southern Utah State University, is now excavating in the area and several of the roads that were seriously damaging sites have been closed. Vonn also worked closely with Diana Christensen, then with the Salt Lake District BLM office, on survey projects in the uplands at the southern end of Utah Valley.

Vonn was a collector of artifacts all his life but had recently come to recognize the loss of knowledge that collecting causes. In several cases, Vonn took archaeologists to sites he had dug illegally, knowing he was taking some risk. However, his interest in knowing more about the people who had lived in those places, when that was, and what they had done while living there, was so great that he was willing to take that risk. In this Vonn had made a significant leap in his career as an avocational archaeologist; he recognized that artifacts were an essential stepping stone toward understanding past lives and communities but were not an end in themselves.

Vonn also recognized that to make a lasting contribution to our knowledge of the past, information must be published. His first (and only) article was "A Fluted Point from Clear Creek Canyon" published in *UTAH ARCHAEOLOGY 1989* recognized its importance, and contacted U.S. Forest Service archaeologist Bob Leonard at Richfield. After analysis, Vonn returned the point to Bob Leonard who placed it in the Fremont Indian State Park collections for display and future research. Vonn was working on an article describing a collection of enigmatic inscribed stones from Utah Valley at the time of his illness, but was not able to complete it.

Vonn was very good at archaeology: he knew the sites, he was familiar with the artifacts, and he had read the literature. He was an amateur archaeologist in the best sense—he did what he did out of love for the past and past peoples. His fascination with the past never diminished. Three days before he died, he visited our Goshen Island project with his son, Brandon. He sat on a bucket, watched the excavations, and we speculated at length about the site's place in Utah Valley prehistory.

Vonn's physical participation in archaeology was cut short by leukemia. His legacy, a wealth of information about site location and content in several regions of the state, has only begun to be explored. That legacy will continue to contribute to our understanding of the past over the coming years.

Joel C. Janetski
Department of Anthropology
Museum of Peoples and Cultures
Brigham Young University
Provo, Utah 84602

THE LOBED-CIRCLE IMAGE IN THE BASKETMAKER PETROGLYPHS OF SOUTHEASTERN UTAH

Steven James Manning, Utah Archaeological Research Institute, 791 Nancy Way, North Salt Lake, Utah 84054

ABSTRACT

In the Anasazi Basketmaker area of southeastern Utah there exists a distinctive, enigmatic, petroglyphic image that has often been discussed, but not identified. The image consists of a round-to-oval shape from which there is a rounded-rectangular extension or lobe. The shape exists both in the rock art and in physical objects. A method for determining theoretical interpretation for rock art images is proposed and then applied to arrive at a meaning for the image. The image occurs in a variety of contexts that suggest the image is associated with fertility. It is proposed that the image is a representation of a uterus. Further, Southwestern architecture has an overall form nearly identical to the lobed-circle image. This suggests the existence of ideological ties between the shape of these structures and the uterine image. The analysis also suggests that many rock art panels are mythological in nature.

INTRODUCTION

This article discusses the distribution, cultural affiliation, context, cognitive modes, and a proposed interpretative hypothesis for an intriguing petroglyphic image found predominantly along the San Juan River drainages in southern San Juan County, Utah. Some popular interest has recently developed concerning this distinctive image (Hurst and Pachak 1989:20; Cole 1990:113, 116, 153). There is, however, no general agreement nor substantive idea of what the image represents.

The image consists of a round-to-oval shape from which there is a rounded-rectangular extension or lobe (Figure 1). The area within the round portion of the image is most often left unmodified, i.e., not pecked out. This characteristic gives the impression that the entity being represented is hollow. In discussing these images with a number of individuals, the images have been informally referred to by a variety of names, most of which hint at their resemblance to contemporary objects (some apparently with an attempt at humor). Names that have been used include: Ping-Pong paddles, toilet seats, light bulbs, pears, avocados, and gourds. Names from literature include: keyhole-shaped images (Cole 1990), tabbed circles (Hays 1990), lobed circles (Hurst and Pachak 1989), circular rings with a rectanguloid projection on one side (Morris 1980), and doughnut-like elements with tabs (Schaafsma 1980). The diverseness of these designations shows that an understanding of what the image represents is absent. Likewise lacking is the information and the implications about the Anasazi that the image provides once its meaning is known.

The term lobed circle is perhaps the most suitable name, and it is used here. The name is not totally accurate, however, because it fails to be adequately descriptive—as do all the above terms. It is, however, suitably concise. The name is inaccurate because the circle portion of the image is not always a circle. It often exists as a slight-to-prominent oval, and some of the images have a slightly lopsided form, which is unique.

Information on the lobed-circle image has been accumulated by the author since 1982. The study area for these images is concentrated within Utah and includes over 8,000 rock art sites (Manning 1990a:148). There has also been some limited investigation into neighboring states. Sixty-seven examples of the lobed-circle image have been located to this date. The distribution of the lobed-circle images discussed here is shown in the dark shaded area in Figure 2. The lighter shaded area indicates the presence of perhaps a related image (i.e., that of a simple circle with a single, descending short line). This other image is discussed below.

All of the lobed-circle images located to this date are petroglyphs (i.e., pecked-out images). This suggests that the lobed-circle images exist only as petroglyphs. However, the possibility that painted images exist, or that the images themselves were part of a painted and pecked assemblage, cannot be ruled out. Since all the images so far located are on cliff faces in exposed locations, painted features once present could easily have eroded and by now have vanished. Because of the great variety of techniques

UTAH ARCHAEOLOGY 1992
pp. 1-37

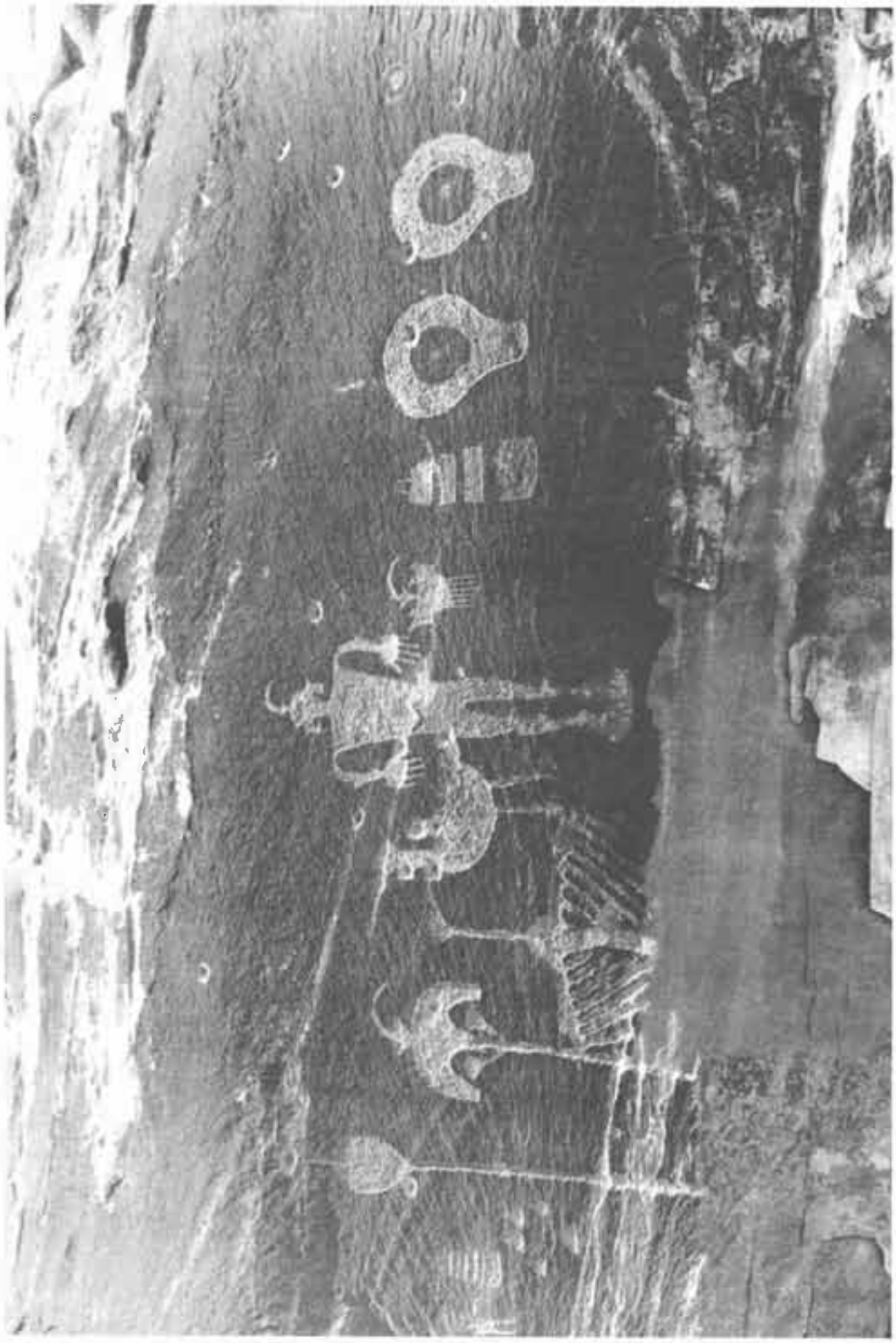


Figure 1. Basketmaker petroglyph panel north of the San Juan River. The panel shows the characteristic form of the primary lobed-circle image.

available to the prehistoric artisan, and utilized in the Basketmaker culture, it is likely that painted images do exist.[1]

METHODOLOGY

Specific theoretical interpretations for Utah rock art images are either based principally on weakly substantiated speculation, or are absent. The functional aspects of rock art, and thus of meaning, has been neglected due to the extreme emphasis on style as the principal classification methodology for rock art studies (Manning 1992). There does not exist a well-defined process for determining inferences and testing hypothesis for meaning of rock art images. The methodology developed and followed here for formulating specific theoretical interpretations for rock art images consists of several discrete steps. The steps, however, are not necessarily followed in the order presented below. This is because the different approaches taken when working with rock art utilize slightly different procedures. One approach is to work within an established data base. Another is to work on a panel-by-panel basis, as new panels are discovered, the appropriate steps may be repeated and the information added to a growing data base.

The first step in determining a theoretical interpretation for a rock art image should be to classify images by form (Manning 1992). Determining the areal distribution of the form is the second step. The third and fourth steps are determining temporal distributions and cultural associations of the image and its variations—where possible. The fifth step is determining the context of the image within as large a sample as possible. This includes the context of the image within the panel (i.e., in relation to other images), and the context of the geographic location. The sixth step is establishing ethnographic parallels—again where possible. These steps should lead to a secure hypothetical interpretation for specific images. Hypothetical in this context means a premise that explains, within a theoretical framework, a set of facts which can in addition be used as a basis for further work—including hypothesis testing. A recently developed procedural classification is added to this methodology. The method consists of classifying images in categories other than style, with emphasis on cognitive modes (Manning 1992). These steps are followed below in determining a theoretical interpretation for the lobed-circle image.

CULTURAL IMAGE MODES OVERVIEW

Since classification by modes (Manning 1992) is a new procedure to rock art analysis, a brief explanation is included here. The basic concept of a mode is borrowed from archeology, but then the meaning of the word as applied to rock art research is extended and modified. Mode then is a homonym when compared to its use in archaeology. Modes are a fundamental unit of archaeological classification that have been used for many years (Rouse 1939, 1960; Whiteford 1947). The term mode, as used by Rouse (1960), indicates any standard concept or custom that governs the behavior of the artisans of a community. Rouse (1960:313) further stated that modes are handed down from generation to generation, and they may spread from community to community over considerable distances. Rock art images are a product of discrete concepts in the minds of their creators. If the meanings that are represented by the images are standardized concepts, then it follows that the images themselves would be standardized (i.e., consistent in form, attributes, and context). If the images are consistent, they would be a product of cultural and cognitive norms and thus represent modes. Rock art then should be classifiable into modes.

The term mode is applied in rock art, not only to the cognitive processes that produced the images, but also to the images themselves. This duality is necessary to facilitate classification and discussion. Cognitive modes form the basis for establishing meaningful consistency in the image. To classify rock art by mode is to categorize the images by basic form, attributes, and context. The primary goal of classification by mode is to determine the meaning of the images. Classification by this method, instead of by such an ambiguous concept as style, will more readily define and establish the ideas that the rock art was created to express. It will also make possible a more narrow delineation of cultural associations and intra- and intercultural variations. Since meanings are directly related to function, once meanings have been established, hypothetical functions can be proposed and tested. This is the first paper to utilize the concept of rock art mode in establishing a specific meaning for a particular image (i.e., the lobed circle).

The lobed-circle image occurs in at least eight different cultural modes in the San Juan area. These cultural modes are listed and briefly described below. Four of these image categories are at present felt

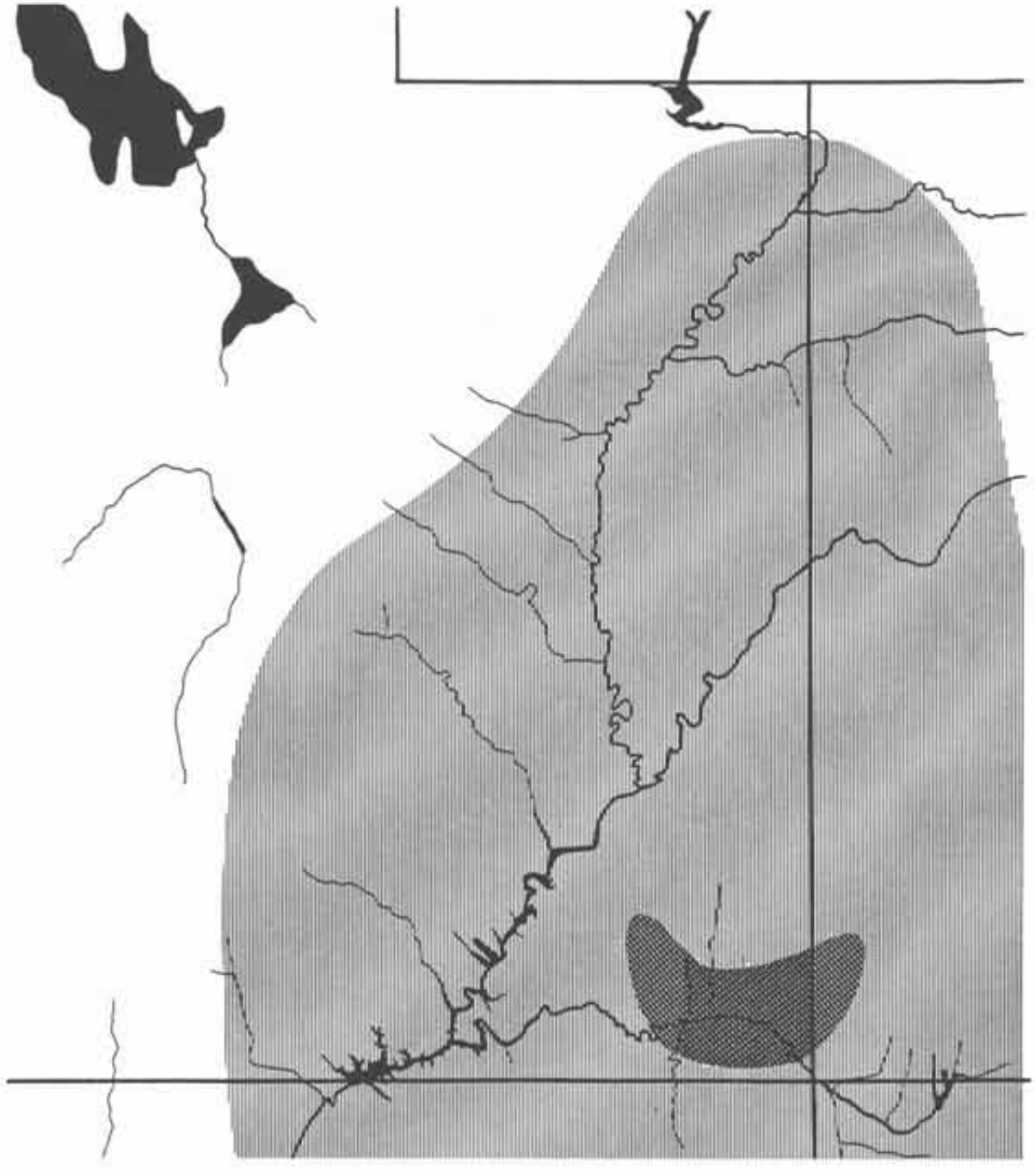


Figure 2. The dark shaded area shows the distribution of the Basketmaker lobed-circle images located by the author. The lighter area shows the highest concentration of a simple circle with a single pendant line.

lacking in sufficient numbers to firmly establish a mode classification. Nevertheless, it seems appropriate to designate and define categories here for these images because, as has happened often in the past, it is likely that more examples will be found. A more detailed analysis of the individual images comprising the modes and the context of the individual figures within sections of representative panels is given below.

CLASSIFICATION: SPECIFIC DESCRIPTIONS

A brief definition of each of the eight mode classes differentiated to this date is given below. Illustrations found throughout this article provide examples of these classes.

1. Primary Lobed-Circle Mode. The lobed circle occurs principally, and most explicitly, as a primary image (Figure 1). The term primary, as used here, indicates that the image is a discrete unit by itself. It is not part of (i.e., attached to) another figure, nor is it inside another figure. In all the modes of the lobed-circle image, the primary form is the largest size. It is also possibly the smallest size. The primary lobed-circle images are distinctive, and they occasionally have a characteristic form; instead of being symmetrical along the vertical axis, the images are asymmetrical. They have a very slightly lopsided form. This form is significant in the determination of a hypothesis for the meaning of the image (which is discussed below). The images of the lobed circle in the primary mode are generally well made. The primary form of the image most often occurs in pairs and occasionally appears in a dominant position in the panel. The primary lobed-circle mode may be further classified into several varieties. For example, occasionally the central area of the hollow lobed-circle image contains a small, pecked-out area or dot. The dot may be in the center, or it may be located at the bottom (Figures 1 and 3). The meaning of the dot has not been determined.
2. Lobed-Circle-Anthropomorph Mode. The lobed-circle image appears as the body of an anthropomorph. In these instances the lobe points down, and a head is attached opposite to the lobe. Features appearing to represent arms are attached to the side of the circle. The lobe is split slightly, apparently to represent legs. These figures also occur in pairs.
3. Horizontal, Lobed-Circle-Headed Anthropomorph Mode. The lobed-circle image occurs as the head of small anthropomorphs. In these figures the image is horizontal, or nearly so, and the lobe is always positioned over the anthropomorph's back. The lobed-circle-headed anthropomorphs occur in pairs in all examples located so far.
4. Vertical, Lobed-Circle-Headed Anthropomorph Mode. The heads of many Basketmaker anthropomorphs are depicted by a simple circle. Sometimes the entire circle is pecked out. The head is attached to the body generally with a short line. This line has a variety of widths. Wide lines have a tendency to give the appearance that the head and neck form a lobed-circle image. Because of this technique, it is not easy to determine whether the head represents a purposefully designed lobed circle, or the form is simply a coincidence.
5. Lobed-Circle-Being-Carried Mode. The lobed-circle image appears as an object being carried by a human figure. In the one known example there are two objects being carried, one in each hand. The lobe of each points downward.
6. Lobed-Circle-Fetish Mode. The lobed-circle image occurs as a pendant attached to each side of the head of an anthropomorph. These lobed-circle images appear to represent an object attached to each ear of an anthropomorph. Again two lobed-circle images are present.
7. Lobed-Circle-on-Interior-of-Anthropomorph Mode. The lobed-circle image occurs on the interior of anthropomorphs. It is generally placed in what would be the lower abdomen. In all three known examples the lobe points down. This image has not been found in pairs.
8. Inverted-Lobed-Circle-on-Chest-of-Anthropomorph Mode. An image somewhat similar to number seven above, but inverted, occurs on the chest of anthropomorphs. In all known examples these images exist in pairs.

Additionally, physical objects having the form of the lobed-circle image have been found as pendants on the chest of human remains excavated in northern Arizona. Some of these pendants were covered with turquoise mosaic. Physical objects similar in form to the lobed circle have also been found as ear pendants (Jernigan 1978; Tanner 1976). This occurrence

Figure 3. Petroglyph panel along the San Juan River west of Bluff. This panel shows the pecked dot in the lower part of the lobed circle, and the complexity present in some Basketmaker panels with lobed circles.

appears to correspond to the image discussed in number six above. These physical objects are discussed in detail below.

DISTRIBUTION

The highest concentration of the lobed-circle images in Utah, so far discovered, occurs along the San Juan River and its northern tributaries, as shown in the dark shaded area in Figure 2. Sixty-seven examples have been discovered by the author in this area. All but six are within the San Juan River drainage, and all but two are southeast of the Colorado River. Cole (1990:153) reports the existence of an example of the primary lobed-circle image from the Dolores River drainage in west central Colorado (i.e., just north of the San Juan River). The image has also been found (in two instances) as far north as the Uintah Basin, a not unexpected occurrence (Manning 1991).

A determination of the distribution of the lobed-circle image has not yet been accomplished. Because of the image's abundant and characteristic presence in San Juan Basketmaker petroglyph panels, and the presence of physical objects closely paralleling the lobed-circle image in Basketmaker contexts south of the San Juan River (as will be discussed below), it is presumed that the distribution of the images will correspond to that of the Basketmaker Culture (McGregor 1941:Figures 79, 96, 103; Plog 1979; Schaafsma 1980:73, Map 3) and extend south into northern Arizona. It is also presumed that the presence of the lobed circle will exist among the Fremont (but to a far lesser extent) and that the density of occurrence will decrease northward with distance from the San Juan River drainage.

CULTURAL AFFILIATION

Because the highest concentration of the lobed-circle image occurs in the upper San Juan River drainage in Utah, it is presumed that the lobed-circle image dates from the Basketmaker Period. The presumption is based on distributional similarities between the image and Basketmaker cultural remains. Also, many of the lobed-circle images occur in panels in the San Juan River drainage that are classified under a style designated by Schaafsma (1980) as the San Juan Anthropomorphic Style. Schaafsma (1980:109) has suggested that this style dates from the Basketmaker II Period. The images also occur with figures indicative of the Basketmaker III–early Pueblo I period, as suggested by Schaafsma's Chinle Representational Style and Rosa Representational Style (see also Cole 1990:151-153). The association of the lobed-circle images with these styles and types appears to suggest that the images, and associated ideologies, continued into the early Pueblo period. Superimpositions also support this conclusion.

Note that the Chinle Representational Style contains small, paired anthropomorphs, some of which play flutes (Schaafsma 1980:124:Plate 15). These anthropomorphs appear to correspond to the small, paired, twin, lobed-circle-headed mode described above.

CONTEXT: DESCRIPTION OF IMAGES IN ROCK ART

This section describes by cultural mode the location, occurrence, and context of the lobed-circle images in a representative sample of the various panels. Since the large primary images are the most prevalent they will be discussed first.

Primary Lobed Circle

The immediate context of the lobed circle, as a large primary image, is shown in the figures described below. The panels are not presented in any particular order. The drawings were taken from color slides of the panels from the author's personal files. Because the drawings were taken from slides, rather than made as scale drawings while at the panels, there is some occasional distortion due to camera angle. Since the drawings were taken from slides, some representational errors will also occur in the drawings. This is due to lack of clarity in the photographs (caused by weathering of the images). Additionally, the purpose of the drawings is to indicate to the reader the general context of the lobed-circle image within the panel, not to provide an absolutely accurate reproduction of every image in the panel. Furthermore, not every figure in the immediate area of the lobed-circle images was included in the drawings. These were omitted for the sake of clarity (see Figure 3 as an example of the complexity present in some panels). In all instances, the images in the drawings that are associated with the lobed-circle images are of the same level of patination and appear contemporaneous, unless specifically noted. Right and left in the descriptions are indicated as facing the panels.

Before describing the individual panels, it is appropriate to point out some general observations. All of the panels are situated on cliff faces. None are in rockshelters. The only protection therefore offered the panels is an occasional outward curvature of the cliff face. No apparent consistency is evident in the placement of the lobed-circle images within the panels. The images appear above, below, at the left, and at the right side of the panels, and are similarly placed relative to various images in the panels. The primary lobed circle also occurs in a range of physical sizes.

There are three, easily observed, contextual occurrences that exist often in the panels. First, the extension or lobe of the circle points downward, except when depicted horizontally as part of another image. This orientation is present in all examples located to date. Second, two nearly identical, lobed-circle images generally appear together, side by side. Third, the primary lobed-circle images most often occur in association with (or in proximity to) anthropomorphs.

The primary lobed-circle images are occasionally superimposed over other Basketmaker figures and earlier images. This superimposition provides the opportunity to determine the placement of the image in time relative to other images. It therefore provides the opportunity to place the cultural modes and ideologies responsible for the images within a relative time frame.

Examples

The panel shown in Figure 1 is located in a northern drainage of the San Juan River. The panel is situated on a west facing cliff in a small, narrow canyon. The primary lobed-circle images are placed on the far right side of the panel. Two nearly identical images appear side by side. In the center of each image is a small, pecked-out area or dot. This center pecking occurs in five other panels. The lobed-circle images are large in comparison with the other figures in the panel and are thus prominent. This panel exhibits an excellent example of the Primary Lobed-Circle Image Mode.

At the far left of the panel, there are images associated with fertility, human sexuality, and ritual. These include a reclining flute player, crook staffs, what may be a copulation scene, two female anthropomorphs—identified by the presence of what appear to be aprons or menstrual pads (see Figure 4) (these female images are discussed below). Cole (1989, 1990) has also discussed this panel. The general theme of the panel appears to center on the concept of human fertility or sexuality. The prominent position of the two lobed-circle images and the two females suggests an importance for duplicates or pairs associated with human fertility.

Another panel containing primary lobed-circle images is located along the San Juan River west of Bluff, Utah (Figure 3). Three lobed-circle images exist next to each other and are located near the top of an extensive panel. Both below and to the right of these two images there is another large, lobed-circle image with another smaller one beneath it. Only three are shown in the photograph. This panel illustrates the complexity of superimposition present in several of the panels containing the lobed-circle image. There are in this panel numerous anthropomorphic forms of various sizes. Basketmaker forms are superimposed over what appear to be Glen Canyon Style 5 images, as defined by Turner (1963). Basketmaker anthropomorphs are also superimposed over other Basketmaker anthropomorphs. Also in the panel there are geometric and abstract elements and sheep with what appear to be atlatl darts protruding from their backs. There is one well-made image of a yucca in blossom. The large Basketmaker anthropomorph to the right of the two lobed-circle images has male genitals displayed. Several other anthropomorphs, both male and female, are analogously illustrated. One female anthropomorph has a smaller anthropomorph inside its body. This panel again appears to express the theme of fertility, both plant and human.

Figure 5 occurs at a site along the San Juan River. The lobed-circle image was placed above two small anthropomorphs. They are very similar in form; each has similar body shape and widely spread fingers and toes. The panel is interspersed with several wide, abraded grooves. These grooves appear the same as bedrock metates, except they are on a vertical cliff face. Above the lobed-circle image there is a snake or wavy line, the tail of which appears to make a right angle to travel through the left side of the lobed circle. The lobed-circle image appears to be deeper than the wavy line and may have been constructed last. In the lower right corner there is a circle with a short line descending from it. This is an example of the image that is similar to the lobed-circle image, as was discussed above. It is unknown if the circle with a short line represents another lobed circle. In this panel the lobed circle is again associated with two comparable anthropomorphic images and appears to represent pairs or perhaps twins.

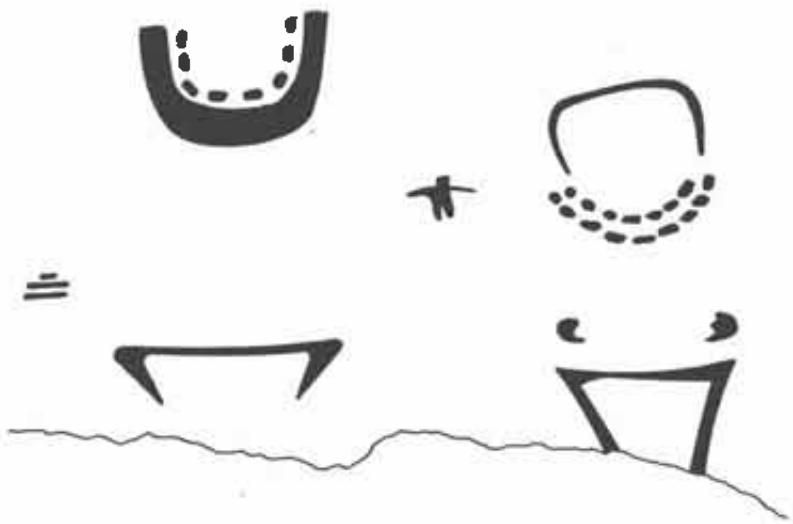


Figure 4. The pecked remnants of painted and pecked female Basketmaker anthropomorphs. The upper images are necklaces and the lower are menstrual aprons.

Nearby is another panel that illustrates a single lobed-circle image (Figure 6). The image is situated at the far upper right side of a panel. To the right of the image there is a single anthropomorph. To the left and below the lobed circle there are several images that have the appearance of bells (only one is illustrated here).

The Figure 7 panel, also located along the San Juan River, contains a single lobed-circle image. The lobed circle appears to have been superimposed over an abstract image consisting of a long horizontal, oblong shape with widely spaced, vertical lines. Nearby are mountain sheep (not illustrated) and some simple crudely formed anthropomorphs.

The panel shown in Figure 8 contains two large, well-made, primary lobed-circle images. In general form these images appear nearly the same. The image on the right contains the usual pecked-out area in the center, but the interior of the image on the left is amorphous—shown solidly pecked here. The center of the image contains some pecking, and it appears as if the figure was never finished. Note that the lobed circle on the left has a distinctive, lopsided appearance.

The lobed circles are on the edge of a large spall and the lower portions of the lobed circles, and whatever was below them, have been lost to erosion. Just to the right of the lobed circle there is a bird-headed figure. The bird-headed figure appears to be characteristic of the Basketmaker III period (Grant 1978:171-175; Schaafsma 1980:122-128). The large lobed circles appear to have a barely perceptible lower level of patination than the bird-headed figure. This suggests that the bird-headed figure was created first. If these conclusions are correct, the large primary lobed-circle image existed during or following the Basketmaker III Period. This conclusion is further confirmed by other examples at other panels.

Above the lobed circles there is a reclining flute player, a simple anthropomorph with a large round body, and what appears to be an anthropomorph associated with two or three wavy lines or snakes. The figure appears to have one snake at the end of a stick or cord, another attached to his head, and yet another attached to his back. The image of a reclining flute player generally carries with it a connotation associated with fertility and human sexuality. Perhaps the anthropomorph with the large round body represents pregnancy. The general theme again appears to be fertility.

Figure 9 represents a small panel along the San Juan River. It contains a single, small, primary lobed-circle image. Above the image there is a circle adjacent to two simple anthropomorphic forms. One is smaller and may be inside the larger figure. Above the circle there is a much smaller anthropomorph. To the right and below the lobed-circle image there is a human form that appears to be standing on an abstract

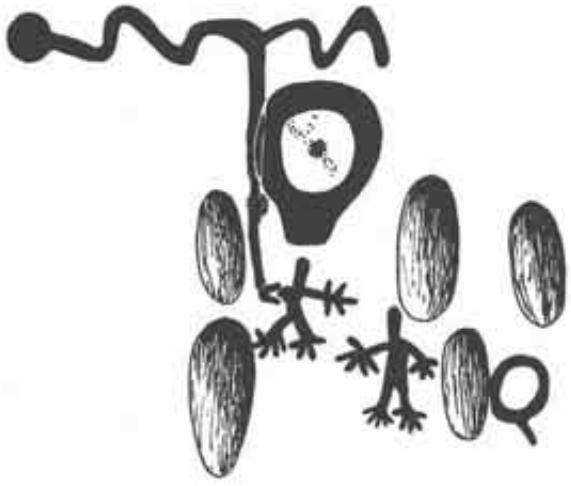


Figure 5. Petroglyph panel exhibiting the lobed circle and a similar form. Note the presence of the two nearly identical anthropomorphs and the abraded areas.

image that may represent a rain cloud. The rain cloud and the small human figure, apparently inside the larger one, again suggests the context of fertility.

There are many primary lobed-circle images illustrated in one large panel that also occurs along the San Juan River (Figure 10). Two of these images are located at the feet of a large tapering rectangular-bodied anthropomorph. The lobed-circle images are another example where there is a pecked dot in the center. The smaller anthropomorph to the right appears to have as a head the same lobed-circle image. This is a common occurrence with Basketmaker petroglyphs, as was discussed previously. Both of the anthropomorphic images display male genitalia. The presence of these two male images again suggests the generative power of human sexuality or fertility as a theme in the panel.

Figure 11 depicts a portion of a panel containing two nearly identical, primary lobed-circle images together with an example of a typical variant of the Basketmaker bird- or turkey-headed anthropomorph. The primary lobed-circle images occur near the left of a panel that contains several images that represent atlatls. Of particular interest is the occurrence of near duplicates of several objects in the panel. For example, there are two atlatls, each with what appears to be an accompanying spear. An atlatl/spear pair occurs on the left side of each of the two lobed-circle

Figure 6. Lobed circle in association with what appear to be bells.

images. The atlatl shaft on the far right appears to be pecked over the lobed circle, suggesting that the atlatl was constructed after the lobed circle. Since atlatls were most likely used by males for hunting, the placement of an atlatl next to each lobed circle suggests that these lobed circles are associated with the male sex. Just to the right there is a presumed female anthropomorph, as indicated by the typical triangular waist feature and necklace (Figure 12). This anthropomorph has features that are not typical of most pecked Basketmaker anthropomorphs. These features consist of two upward curving rows of two necklaces, and facial features, notably eyes. This kind of anthropomorphic ornamentation is not common in the Utah San Juan Basketmaker area, except in one location. The features seem to always be associated with females. These elaborate necklaces parallel Fremont rock art images farther north and thus suggest a relationship (Manning 1991). This elaborate decoration seems to suggest that the image represents a female of importance.

Figure 13 contains two of the primary lobed-circle images in association with an example of the Horizontal-Lobed-Circle-Headed-Anthropomorph Mode. The two primary lobed-circle images are at the top of the panel. Below and to the right and left respectively of each lobed circle there is an anthropomorph. The anthropomorph on the right has a head that is the same shape as the lobed circle. Below the arm of this anthropomorph there is an image similar to the abstract image in Figure 7. It again consists of a long oblong shape with widely

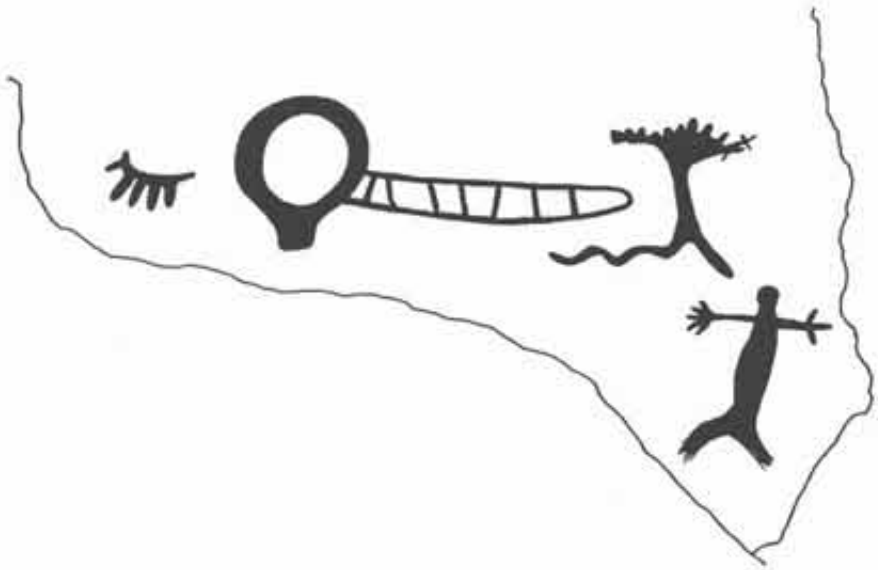


Figure 7. Petroglyph panel showing the association of the lobed circle with apparent plant forms and other abstract images.

spaced vertical lines. Below and between the lobed circle there are two twin anthropomorphs with the lobed circle as a horizontal head (these images are discussed below). To the right of this small panel, there are two other small, simple twin anthropomorphs (not illustrated). The presence of two primary lobed-circle images and two sets of nearly identical small anthropomorphs again illustrates the importance given to twin figures.

A panel containing six primary lobed-circle images is shown in Figure 14. It is located along the San Juan River north of Bluff. Three of the lobed-circle images are large and three are small. The panel also contains a considerable amount of superimposition, not all of which is illustrated. The lower portion of the panel has been lost to erosion. It is difficult to determine the order of placement of all the images, however, it appears that the three large, primary, lobed circles were constructed last. The primary lobed-circle image on the far right is placed over the headdress of a large Basketmaker anthropomorph, which appears to have been placed over a Glen Canyon Style 5 anthropomorph (Turner 1963:Figures 74 and 77). The large primary lobed circle just to the left is also superimposed over a Basketmaker anthropomorph, as are the two small lobed circles just below it. The anthropomorph appears to have the same headdress as the anthropomorph on the right, which was described above. All of the lobed-circle images have a small, deeply pecked-out dot in the center. On top of both the two lobed circles on the far left, there is a small anthropomorph.

The Figure 15 panel occurs south of the San Juan River. The entire panel is shown. It contains two primary lobed-circle images that are similar in form. Standing on the left side of each lobed-circle image there is what appears be an anthropomorph. The anthropomorph on the right is shown in a frontal position with one hand apparently resting on the lobed circle. The anthropomorph on the left is shown in profile view facing away from the lobed circle. These anthropomorphic images are very faint and not as well made as the lobed circles. There are also several grinding grooves below the panel. These are nearly identical to those shown in Figure 5.

The panel shown in Figure 16 is found along the San Juan River south of Bluff. It contains two large and one small lobed-circle image. The two large lobed circles are side by side. The small lobed-circle image is above and to the right of the two larger images. The smaller lobed circle appears to have a liquid substance flowing down from the bottom of the lobe. It flows across the right side of one of the larger lobed circles. To the left of the two lobed circles is a

Figure 8. Petroglyph panel showing the association of the lobed-circle image with a Basketmaker bird-headed anthropomorph, flute player, etc. Note the distinctive lopped-sided form of the lobed circle on the left.

phallic anthropomorph, and just beyond him, is a sitting flute player.

Directly above the two large lobed-circle images there is a female anthropomorph. Only the lower portion is illustrated, most of it is difficult to discern because of erosion and superimposition by other images—like the rows of circles illustrated in the drawing. A representation of the female pubic area is evident as circle with multiple lines attached to the bottom. Directly above the pubic area there is a representation of a headdress. It is shown as a rectangle with two arcs attached to the top. There are several variations of this headdress. In this variation the arc on the right is always longer. This headdress is found on anthropomorphs and on images representing detached human heads. Figure 1 contains an example of a closely related variation of headdress. It is present three times in the photograph. The headdress in Figure 16 appears to be generally found on male images, which suggests that the symbol is in some way an indicator of the male sex. Its placement at the location in the female figure where a uterine is located suggests that the creator(s) of the panel may

Figure 9. Lobed-circle image in association with a small anthropomorph inside a larger one and a possible rain cloud symbol.

have been expressing the concept of the pregnancy of a male child.

To the left of the female figure and above it there is a male anthropomorph with genitalia represented. Only the lower portion is shown in the drawing. This anthropomorph is placed above the reclining flute player. Between the legs of the male anthropomorph, and on the right side of his right leg, there are two paired anthropomorphs with round heads and short stubby arms. These figures suggest babies because of the oversize heads and short arms.

The images in this panel suggest that the context of the panel centers on fertility and human sexuality. The images of a male and a female anthropomorph, two anthropomorphs that suggest babies, two large lobed-circle images, and the presence of a symbol apparently denoting the male sex—in the abdomen of the female figure—suggests further that the context of the panel centers on the birth of twins, most likely male twins.

Figure 17 is high on a cliff face near Bluff. Two primary lobed-circle images appear near the left side of the panel. The panel contains, among other elements, anthropomorphs, two handprints, an atlatl, two long vertical wavy lines, and an image apparently representing a spider. Just to the right of the spider are two twin anthropomorphs (not illustrated). There are two nearly identical anthropomorphs below the two lobed circles. Above the lobed circle on the left there is a triangular-shaped image that is similar to the aprons of other proposed female anthropomorphs, only upside-down. This appears to suggest a relationship

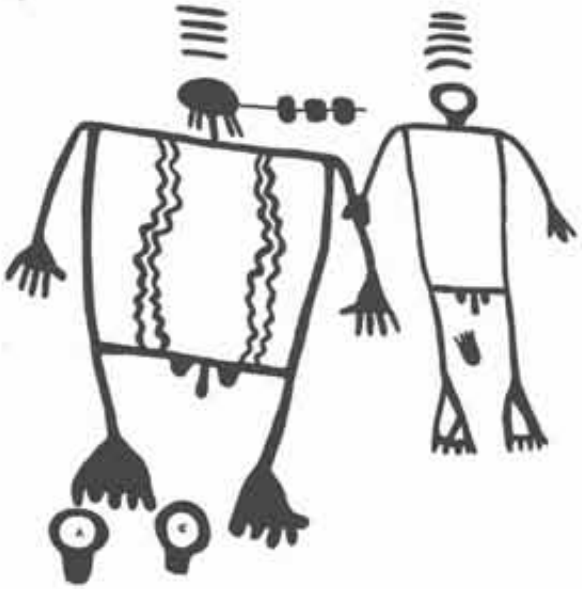


Figure 10. Lobed circles in association with typical large male anthropomorphs. Note that the head of one anthropomorph resembles the lobed circle.

between this apparent female symbol and the lobed-circle image. Above the other lobed circle there are two handprints.

Figure 18 occurs on a cliff high above the San Juan River. The panel contains two of the primary lobed-circle images side by side. The lobed circles are smaller and not as well made as at other panels. To the left of the lobed-circle image there is a circle below which are two bird tracks. A line connects the top of the circle with the left side of the lobed circle farthest to the left. On the right side of the two lobed circles there is an image that appears to be a spider. This is the second of two sites in which a spider is associated with the lobed-circle images. A leg of the spider appears to be superimposed over the right edge of the lobed circle suggesting the spider was added following construction of the lobed circle. The spider is also superimposed over what appears to be a very faded, eroded, anthropomorph from an earlier age. Other images in the immediate vicinity consist of abstract forms, groups of mountain sheep, and one flute player. There is also one image slightly similar to the lobed circle. It appears to have two legs attached to it, with three toes on each leg (not illustrated).

Figure 11. An example of a panel containing two lobed-circle images together with a typical variant of the Basketmaker bird-headed anthropomorph. Note also the presence of two atlatls and two spears.

The panel illustrated in Figure 19 is situated nearby. The two primary lobed-circle images are again side by side and appear near the center of the panel. They are surrounded by a variety of anthropomorphs, apparent plant forms, and abstracts. Three of the adjacent anthropomorphs have what appear to be the lobed-circle image on their chest. This feature is discussed below. Below and to the right of the lobed circles is an image that is similar to the lobed circle, except that the lobe is split. Inside the circle there is a small anthropomorph.

Two primary lobed-circle images appear at the top of the panel shown in Figure 20. The images are placed side by side. Below them there is a row of ten phallic flute players. The flute players are divided into two groups of five, and they face each other. Between them there is a plant form that resembles a yucca in blossom. A similar yucca blossom image (not

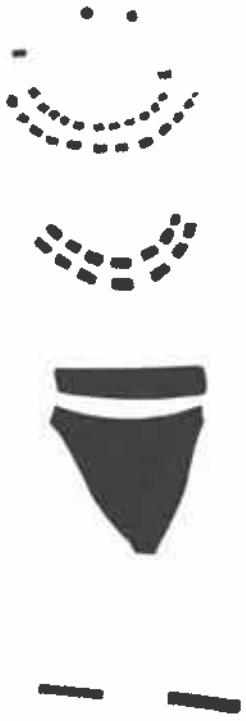


Figure 12. Pecked remnants of a painted and pecked female anthropomorph, as indicated by the typical triangular apron and also the elaborate necklace and the leg or knee bands.

illustrated) is found in the panel that is shown in Figure 3. The flute player on the far left has what appears to be a lobed-circle image on its body. This flute player, and one of the flute players nearby, appear to have a lobed-circle image for their heads. The primary lobed circle at the top left of the panel appears to have the lobe placed just over the lobed circle head of one the flute players. The presence of the phallic flute players and the apparent yucca blossom suggests the context of fertility. The presence of two primary lobed circles and two lobed circles as heads of flute players again suggests emphasis on pairs.

Related Images

There are also other images in the San Juan area that somewhat resemble the primary lobed circle. These images consist of a plain circle with a single short line attached at the bottom of the circle (see

Figure 13. Example showing the context of the primary lobed-circle image and twin lobed-circle-headed anthropomorphs.

Figure 5 for an example). An untabulated number of these images have been found by the author throughout most of Utah. The highest concentration of these images seems to occur in the lightly shaded area in Figure 2. It is not clear if these images have a uniform meaning throughout Utah, or if they represent the same object, or if the concept is different among the San Juan Basketmaker. Cursory evidence suggests that the concepts and use of the two disparate images are different. This tentative conclusion was reached because the images appear to exist in different contexts within most rock art panels. This evidence suggests that these other images may represent something entirely different from a lobed circle. An indication of their dissimilarity is that sometimes these other images have the short line pointing upwards. The easily identifiable, well-made, primary lobed circles have never been found in this position.

There are a few of these other images, however, that do have a context analogous to the primary lobed circle. For example, the well-known panel at Sand Island contains several of these images. Two of these images occur next to each other. There are also in this panel many figures associated with fertility, for example, phallic flute players exist in abundance. The panel however lacks any of the large, well-made, distinct, lobed-circle images. It may be that these other images represent an earlier form of the concept or, perhaps, an abstract or idealized form. Clearly, further research needs to be done.

Figure 14. Petroglyph panel showing lobed-circle images superimposed over other anthropomorphs. Note the consistency of the pecked dot in the center.

The Lobed-Circle Anthropomorph

The lobed-circle image appears as the body of anthropomorphs in the panel illustrated in Figure 21. These images, and one nearly identical image not shown, are the only images located to date where the lobed circle appears clearly as the body of an anthropomorph. The human shape is formed by the addition of a head opposite the lobe. The head has a single, broad, short, upward pointing line as a headdress. Features appearing to represent arms are attached to the side. The lobe is slightly split, apparently to represent legs. Two very similar figures are placed side by side. Beneath them is a single figure with a similar form. This figure has a different headdress. The headdress consists of an arc from which there are two upward projections similar to the features that represent arms.

One of the important features of this panel is the presence of two nearly identical images. The two upper images suggest that they are twins and reflect again the importance and the relationship of pairs, or twins, to the lobed circle. The effect of placing the headdresses on opposite sides of the heads of these images seems to suggest that the creator of the images was expressing the idea of symmetry or mirror images.

Horizontal-Lobed-Circle-Headed Anthropomorph

Figures 13, and 22–26 illustrate examples of a mode where the lobed-circle image appears as the head of small, paired anthropomorphs. In this mode the lobed circle is horizontal, or nearly so. The lobe in most of these examples is apparently positioned over the anthropomorph's back. This interpretation appears likely since in most instances the anthropomorphs appear to be in profile (i.e., both arms are on one side of the body). Figure 23 is an example of a variety of this mode where the anthropomorphs are positioned in a frontal posture.

An important feature and characteristic of this mode is that in all known instances the figures occur in pairs. This again illustrates, and reinforces, the importance of the images and the lobed circles as pairs or twins. There is within this mode some variation in the illustration of arms and hands. In eight of the nine known examples, the pairs of anthropomorphs have both arms outstretched. In only one instance is only

Figure 15. Two lobed-circle images with possible male and female anthropomorphs.

one hand outstretched. In several occurrences hands are not illustrated. This may be because the smallness of the images prevented the construction of distinct hands. In other examples the hands are shown and may even appear oversized. Outstretched arms, sometimes depicting hands, are an important feature of these paired lobed-circle-headed anthropomorphs.

The lobed-circle-headed anthropomorphs shown in Figures 24 and 26 share a common characteristic. The rows of dots above the heads indicate influence from the Virgin Branch of the Anasazi. The two panels occur just outside the northwestern limit of the San Juan River Drainage. The images are situated in a canyon that drains into the Colorado River. The Virgin Branch occurs far to the west of the San Juan River Drainage. Easily a thousand images with rows of dots above the heads of anthropomorphs have been observed by the author in the Virgin Anasazi area. It should be noted that paired, small anthropomorphic images also exist in the rock art of the Virgin Anasazi area.

In the panel illustrated in Figure 24, the two anthropomorphs with lobed-circle heads have outstretched arms and open hands and appear to reach out toward, or approach, two phallic anthropomorphic images. Since the two phallic images are male, and since the context where the lobed circle occurs often suggests sexuality, the two figures with lobed circle heads may be members of the female sex. Note also that the panel illustrated in Figure 24 contains two animal paw prints. The panel shown in Figure 1 also contains two animal paw prints.

The presence of two nearly identical lobed-circle-headed anthropomorphs in all these examples again suggests the dominant theme and importance of pairs to the creators of the panels.

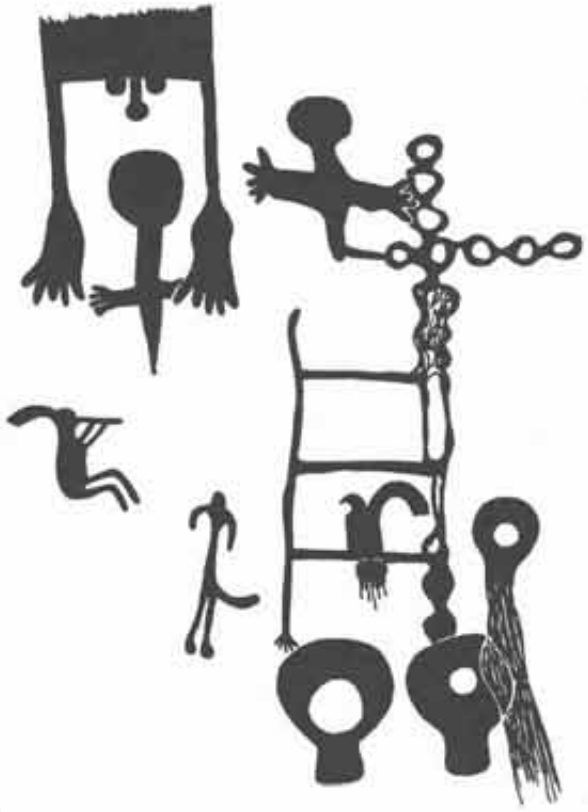


Figure 16. Panel showing the context of lobed-circle images with male and female anthropomorphs, two large-headed anthropomorphs appearing to represent babies, smaller lobed-circle with fluid coming from the lobe.

Vertical, Lobed-Circle-Headed Anthropomorph

The anthropomorph illustrated in Figure 27 appears to have a vertically positioned lobed circle as its head. As indicated above, the heads of many Basketmaker anthropomorphs are formed by a simple circle (for example see Figures 10 and 13). When the head is attached to the body by a wide line it gives the appearance that the head and neck form a lobed-circle image. This makes it difficult to determine if the head is actually a lobed circle or if the appearance is just coincidental. The head of the particular anthropomorph in Figure 27, however, appears to be separate from the body. Therefore the concept of an

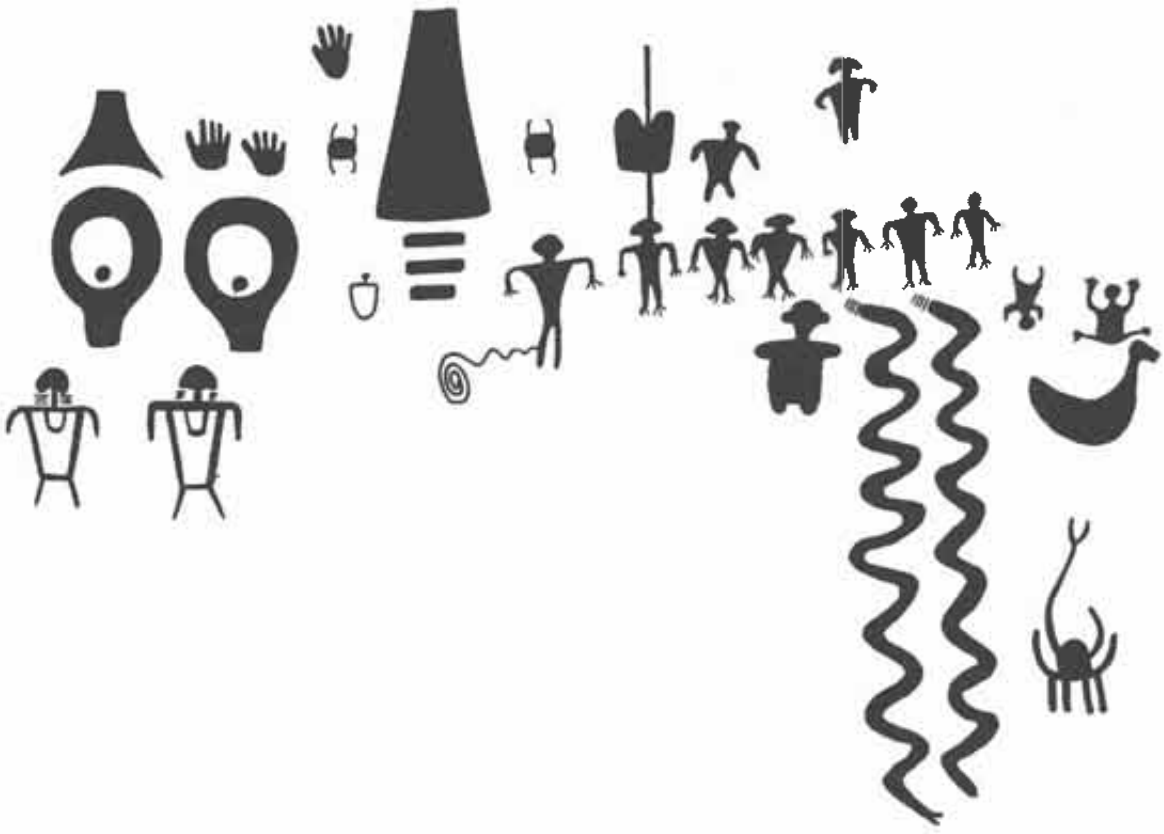


Figure 17. Large panel showing association of lobed-circle with twin anthropomorphs, a spider, and other Basketmaker images.

anthropomorph having a vertical, lobed circle as a head appears unambiguous. It is important to note that this anthropomorph is male.

In other examples the diameter of the lobe is clearly larger than the diameter of the body, which appears to emphasize that the head is unmistakably a lobed circle. Examples are the two images shown in Figure 28, which seem nearly identical. They appear to have the lobed-circle element placed vertically as their heads, as evidenced by the larger diameter of the lobe. These figures also are phallic, have a headdress, and appear to be playing a flute. (Two of the flute players shown in Figure 20 also have these characteristics.) The importance and significance of pairs, or twins, is again indicated in this panel.

It appears that perhaps the position of the lobed-circle on the head of these anthropomorphs may, in some instances, correspond with its sex. Where the lobed-circle image is placed vertically the resultant anthropomorph is male (Figures 10, 20 and 28), but when the lobed circle is placed horizontally (based upon the supposition above) the anthropomorph is female. As is shown below this conjecture is very tenuous.

Two anthropomorphs with vertical lobed-circle heads are shown in Figure 29. These figures are beneath a roughly pecked-out circle. The lobed circle in these images, unlike example two above, contains an unmodified area. These figures have one arm outstretched. An interesting feature of these figures is that the one on the right could represent a male and the other could represent a pregnant female. This explanation differs from the presumption stated above in that the position of the lobed circle as a head relates to, or defines, the sex of the anthropomorph; both should be male, but they apparently are not. However,

Figure 18. Two lobed-circle images with a spider.

there are several reasons that would explain this apparent inconsistency. One, the interpretation of the sex of the anthropomorphs could be incorrect. Two, the presence of absolute standardization in the use and meaning of images in Basketmaker rock art, especially over large areas occupied by diverse individuals, would not likely exist. The absence of standardization in rock art meaning may likely correspond to the lack of standardization in the spelling of words in early American script. Also, meanings change over time. Three, the lobed circles on these images are not filled in as are the images discussed above. Perhaps there is a different meaning attached to the filled-in lobed circle as opposed to the open circle. Perhaps an open circle, as a head, is not tied to any certain sex. Certainly, more examples need to be located before any conclusions can be reached.

If the supposition that one of these anthropomorphs is male and the other is female is correct, then the context of these images (phallic image and pregnancy) could also relate to human sexuality or fertility. The two images do not appear to be a pair, but they still could be twins.

Lobed Circle Being Carried

Figure 30 illustrates two of the lobed-circle images being carried. The human figure has one in each hand. It is interesting that the lobed circles are being carried in the position of the large primary lobed-circle image mode. This figure suggests that the lobed-circle images exist as actual physical objects. The image also suggests an idea of the size of these lobed-circle objects, that is, if the size is accurately represented.

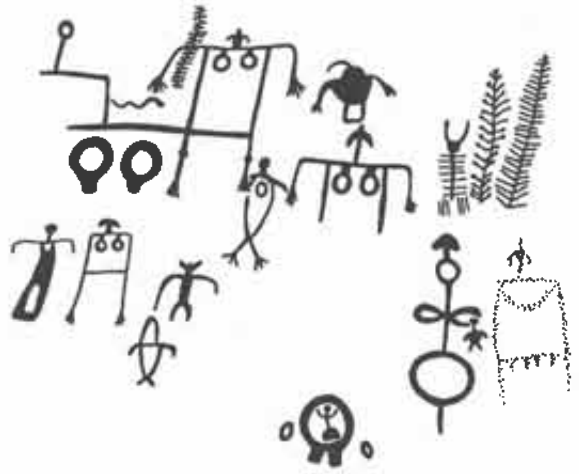


Figure 19. Panel showing the association of two lobed circled with inverted lobed circles on the chest of anthropomorphs. Note also the anthropomorphic image inside the lobed circle at the bottom of the panel.

The anthropomorph carrying the lobed circles also has what appears to be a pack on his back. This suggests that the person was transporting materials or traveling some distance. The presence of two lobed circles being carried further substantiates that the presence of a pair is very important.

Lobed-Circle Fetish

In the panel illustrated in Figure 31 there are two anthropomorphs. One is above and to the right of another. The upper anthropomorph appears to be holding a long wavy line (a snake?) in its hands. A lobed-circle image appears to be hanging from each side of the anthropomorph's head. This suggests that the lobed circle may exist as a small object of adornment. This representation, if interpreted correctly, suggests that the lobed circle also obtained status as a fetish. A fetish is a material object, or a likeness of that object, that is believed among primitive cultures to possess magical power.

The other anthropomorph is phallic and has a headdress that appears to be a lobed circle. This figure appears to be playing a flute and is holding a crook staff in one hand. Since this image is the only one known with a headdress of a lobe circle, the image was not classified as a cultural mode.

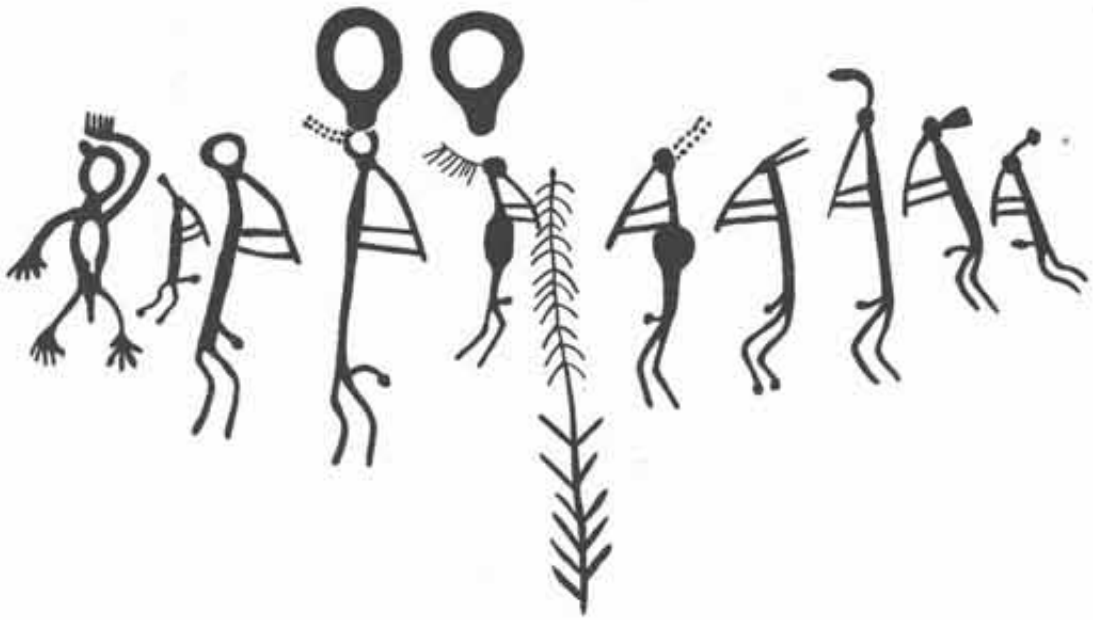


Figure 20. Panel showing the association of flute players with the lobed circle.

Lobed Circle on Interior of Anthropomorph

Figures 32 and 33 illustrate two examples where the lobed circle appears as an object in the interior of anthropomorphs. In both examples the lobe points downward and both are placed in the abdomen of an anthropomorph. Above the lobed circle in Figure 32 there is a bird. It appears to be the same form as the typical bird on the Basketmaker, bird-headed anthropomorphs. Beneath the lobed circle and apparently between the legs of the anthropomorph, there is a circle with a dot in the center.

Figure 33 is the more typical Basketmaker anthropomorph. Partially behind the lobed circle in the abdomen of this figure there is a small anthropomorph. In other figures a small image in the abdomen suggests pregnancy. Since the lobed-circle image occurs with the small anthropomorph there appears to be a relationship.

Inverted Lobed Circle on Chest of Anthropomorph

On the chest of three anthropomorphs illustrated in Figure 19 there are two lobed-circle images. This drawing depicts a portion of a large panel. The lobed-circle images are positioned with the lobe pointing upward and oriented so that the lobe joins the line that forms the top of the shoulders. These figures again suggest the importance of pairs of these images.

HYPOTHESIS

Having classified the lobed-circle images as cognitive modes, and having examined the form, attributes, and the panel context of these images; I propose that the lobed-circle image is a representation of a uterus (Figure 34). In many instances the image appears to represent a human uterus, while in other panels, it carries with it the simple symbolism of reproduction.

Often the lobed-circle (uterus) images are clearly in proximity to, and in association with, figures depicting concepts of human fertility and sexuality. This is unambiguous even with our cultural biases and limited understanding of Basketmaker intent. The association of the uterus with reproduction is especially prominent in the panel illustrated in Figure 16. In this panel the two uterine images are in association with a flute player, a phallic anthropomorph, representations of male and female genitalia, and of two apparent babies. At the far right of this panel, there is a smaller image of the lobed circle (uterus). There appears to be a liquid substance flowing downward from the lobe of this image. A reasonable interpretation of this image

Figure 21. Anthropomorphs in the form of the lobed circle.

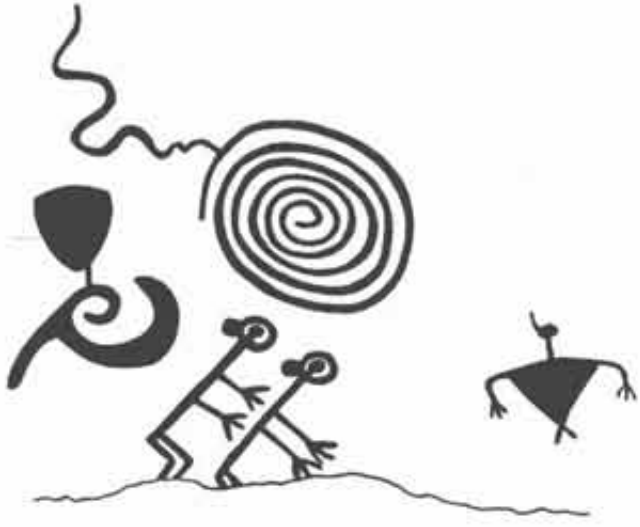


Figure 22. An example of the lobed-circle-headed anthropomorph that appears as twins.

becomes evident once a uterine definition is presumed, especially with respect to sexuality and birth. The fluid issuing from the opening of the uterus likely represents either water or blood, both of which are associated with birth and fertility. Considering the reproductive context of the panel, the liquid may be a representation of the amniotic fluid that precedes the birth of child.

Figure 17 depicts a triangular image above one of the uterine images. This image likely represents what has been called an apron. Aprons are a characteristic Basketmaker female adornment (Cole 1989:66, 1990:116; Mails 1983:88-90; Morris 1980:122). Figure 12 and, to a lesser extent, Figure 4 contains the Basketmaker apron. The presence of an apron not only indicates female attire but also suggests a menstrual association. Concerning aprons that were excavated from Basketmaker sites Morris (1980:104) states, "Nearly all of the aprons were stained in the central portion of their length, indicating their use by woman during their menstrual period. Most of them were subsequently folded and tied into a neat bundle so that the stain was hidden." The association of an apparent menstrual apron fits with the proposed hypothesis, since these objects are incidental to reproduction and fertility. The presence of two female anthropomorphs (Figure 4) along with two uterine images (Figure 1) in the same panel suggests that there is a contextual association between the two images. This is further confirmed by the presence of the female image shown in Figure 12 adjacent to the two lobed circles shown in Figure 11.

Other figures provide further support for the uterine hypothesis. For example, the images illustrated in Figures 32 and 33 depict a lobed-circle image inside an anthropomorph. In each instance the lobed-circle images are located in the correct anatomical position for a uterus. Another occurrence supporting the uterine hypothesis is that when the lobed circle occurs on the interior of anthropomorphs it only occurs as an individual feature. It has never been found in pairs inside an anthropomorph. This suggests that the creators of the panel knew that women have only one uterus and so illustrated this in the images.

At the bottom of Figure 19, there is a small anthropomorph located inside the lobed-circle image. The lobe, which is pointing downward, is split. This may be a representation of a baby about to be born. If the lobe is the cervix, then the cervix appears to be in the process of opening.

The two lobed-circle images on the chest of the three anthropomorphs above this image may indicate a concept associated with birth. The images, located in the position on the chest where the breasts are located, appear to suggest an association between the female breast and the uterus. What relationship is

Figure 23. Front facing lobed-circle-headed anthropomorphs.

there to birth and breasts? When a baby is born the female breasts began to lactate. Certainly breast feeding would be associated with a baby being born.

The two uterine images in Figure 21 are positioned above a panel that illustrates many concepts associated with fertility. The phallic flute players, the yucca in blossom, the uterine image as the head of two anthropomorphs, and the uterine image in the body of the anthropomorph on the left all suggest rituals with the principal theme of sexuality and reproduction.

Further support for the hypothesis is found in a panel north of the San Juan River. Here a lobed-circle image is shown in more detail. Part of the panel, which is illustrated in Figure 35, depicts a human image inside a lobed circle (i.e., a uterus). Note the slightly off-center shape of the image and that the arms of the baby are touching the sides of the uterine wall, pushing against it, deforming it. Any woman who has experienced pregnancy understands the meaning of this illustration. The asymmetrical shape of the lobed circle is evidence of a actual uterus. Figure 34 shows the actual lopsided form of a uterus with a baby inside. Several lobed-circle images have this lopsided form (for example see Figures 8 and 14). This unique form of these images strongly suggests that the lobed circle is a uterus.

Features and associations with the image of the uterus shown in Figure 35 may prove insightful. The "snake" inside the uterus could represent the umbilical cord. The presence of the hummingbirds is also significant. In Pueblo societies hummingbirds are associated with fertility (along with other attributes). Tyler (1979:14) noted that, "Hummingbirds have rainbow hues and suck nectar from flowers. Nectar is a quintessential liquid representing all the moist forces in growth and life." Hummingbirds also, "spend their

Figure 24. Two lobed-circle-headed anthropomorphs approach two male anthropomorphs. Note rows of dots above the heads.

time hovering about the flowers that are a sign of fruitfulness" (Tyler 1979:117); thus, hummingbirds would be associated with fertility and the concept of birth. Another concept involving the hummingbird is related to stillbirth. At Isleta, prayer-sticks are made for the stillborn during the winter solstice ceremony. Several hummingbird feathers are attached to the ends of each stick. This offering is made because it is believed that children who die before they are four days old will be born again (Parsons 1974:299–300) (note the presence of the number four). Hummingbirds likely occur in this context because they aid in rejuvenating the sun as it is "reborn" following winter solstice and so serve the same purpose for stillborn children. These early historic concepts further confirm the concept of fertility in the panel and the possibility of existence of these Pueblo ritual concepts back to the Basketmaker period.

CEREMONIAL CONTEXT

A panel that exists a few km north of the San Juan River provides an exceptional amount of information about the lobed circle in a ritual context. A ritual function is generally presumed for the lobed-circle image because of its common occurrence in Basketmaker petroglyphs, which are themselves presumed to be ritualistic in nature. However, this panel appears to be a depiction of an actual ceremony, or rather, activities preceding a ceremony. Indications of the ceremonial context are provided by figures in the panel. One figure suggests that some lobed-circle images may have been actual physical objects. Whether this indicates the use of an actual uterus, or a replica, is unknown.

Figure 25. Two lobed-circle-headed anthropomorphs with extended arms.

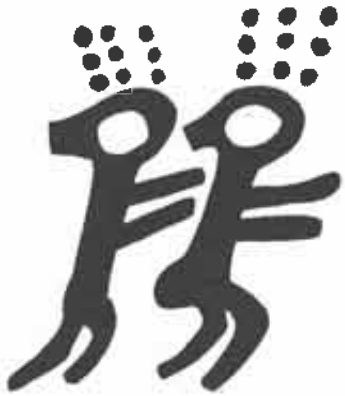


Figure 26. Two lobed-circle-headed anthropomorphs from White Canyon in Colorado.

The site, unfortunately, is receiving a lot of attention and popular publicity recently, which means that it will only be a short time before the panel is damaged. Already the ground beneath the panel has been significantly disturbed; thus, the process of destroying the potential for obtaining scientific information has begun.

The panel is shown in Figures 36 and 37, and portions are illustrated in Figures 29 and 30 (not all the images in the horizontal rows are shown in the photograph). The common, local name for the panel is *The Procession*. The dominant feature and focal point of the panel, is a simple, almost circular ring. There are four rows of anthropomorphs (people) converging on the ring (note again the presence of the number four). Two of the rows are horizontal, one on each side of the ring. Another row is vertical with images coming up to the ring from beneath it. The remaining row comes up to the ring, at about a forty-five degree angle, between the horizontal and vertical row on the right side. The horizontal row on the right contains roughly 130 images, each one representing a person.

It should be noted that four is the most significant and most commonly used number in Pueblo ritual. The presence of four rows of people may suggest an ideological relationship between Basketmaker and historic Pueblo ritual.

Inside the ring are two primary lobed-circle images. Their presence suggests that the ceremonial activities depicted in the panel center on a pair of uterine forms, or the concepts for which the two uterine forms are a symbol.

The presence of a large circle around the uterine images suggests some type of enclosure or structure. The dimensions of such a structure are suggested by both the size of the uterine images and the size of the people approaching the structure. If, however, the number of people approaching the structure is any indication of the actual number of participants, the structure would have to be large enough to accommodate roughly 210 people, assuming of course that they were all going to fit inside. There are evidences that large kivas came into existence during the Basketmaker III period (Vivian and Reiter 1960). There is then a potential for the circle to represent a large kiva, and the panel to have been constructed during the Basketmaker III period. The proposal that the ring represents a large kiva is discussed in more detail below. There are also two large atlatls in the panel. They are to the right and below the ring. The presence of atlatls further suggests a Basketmaker affiliation. Note also the presence of a pair of atlatls in Figure 11.

If the Basketmaker III affiliation of the panel is correct, then the images suggest at least one ceremony involving a large group of people, perhaps from four different areas, took place in the Basketmaker period. Cassells (1983:118) noted, "During Basketmaker III, settlement patterns vary from isolated farmsteads with a single pithouse and perhaps a few surface storage structures made of posts and adobe (jacal), to a cluster of 12 or more houses." Even 12 pithouses would not account for the over 200 people represented in the panel. The panel suggests then an intercommunity assembly.

Figure 27. Vertical, lobed-circle-headed male anthropomorph with large chest pendant.

Perhaps, since this panel is unusual, it may date to the time when large ceremonial events began to take place in the Southwest. It is well known that the early historic Utes (among other Indian groups) recorded significant events, unusual circumstances, or strange objects on cliff faces. The first appearance of trains, horses, metal stoves, and boats appear to be well represented upon the cliff faces; thus, it is suspected that this panel may have recorded one of the first, and at that time unique, intercommunal ceremonial events. Perhaps the lobed-circle images in the center of the circle indicate the reason for the beginnings of large inter-settlement ceremonial gatherings or possibly even the establishment of large communities themselves. Other images in the panel might provide further information toward this idea.

In the rows of anthropomorphs approaching the ring, there are several figures that provide additional indications for the context of the apparent ceremonial activities. The image shown in Figure 30, which was discussed above, is an example. A person is shown carrying a uterus-shaped object in each hand. This image is located in the row of anthropomorphs approaching from the left. It is just beyond the edge of the illustration in Figure 37. This figure suggests that these uterine images, and those portrayed within the ring, represent actual objects. However, as discussed above, it is unknown whether these images represent an actual uterus, a replica, or just ideologies.

Figure 28. Two male flute players with vertical, lobed-circle headed.

The existence of two lobed-circle images being carried again illustrates the importance of the concept of the uterine images being in pairs.

There are also in the rows of anthropomorphs at least four large crook-neck staffs. In the long row on the right side of the ring, there are three widely spaced anthropomorphs each carrying a single crook-neck staff. Figure 37 shows a crook-necked staff that is on the left side of the ring. This particular staff is being held or carried just outside the ring. The presence of these crook-neck staffs implies that they possess ceremonial significance (see also Shearin 1990). Owen Severance and I have found anthropomorphs carrying crook-necked staffs in several locations along prehistoric roads in San Juan County. Owen Severance has also located others that I have not seen. There seems to be an association of the crook-necked staffs with these travel corridors.

There is also in the line of anthropomorphs on the right side, one figure with a lit torch that appears to be leading four other anthropomorphs that also have lit torches. Additionally, the two anthropomorphs with lobed circles for heads (as shown in Figure 30 and discussed previously) are located in the panel in front of two large deer.

The details within the panel may then provide clues to why large ceremonial events began to take place. Thomas Mails (1983:129-130) offers some interesting insights into what may have been happening at this time in history, "Agricultural life was causing them to think in new directions as the need for soil fertility, water, and growth became dominant. The pursuit of ways to propitiate the supernatural forces controlling

Figure 29. Two vertical, lobed-circle anthropomorphs, one possibly male the other possibly female. The image above their heads may represent the sun.

the renewal of these things became essential, and, with the sedentary life as its midwife, the sophisticated ceremonial complex pursued so avidly by the modern Pueblos was being born." The lobed-circle images in the ring suggest that the myths and rituals of fertility surrounding the birth of twins played a significant role in the development of the ceremonial complex that was in existence at the time of European contact with the Pueblos.

TWINS

The often repeated appearance of the paired lobed-circle images in association with images denoting human sexuality, fertility, and birth, along with images apparently representing babies—often in pairs—suggests that the panels in which these associations occur are concerned with the birth and/or conception of twins. Myths about twins are prolific in both Pueblo and Navaho mythology (see references below). The emphasis and significance placed upon the miraculous conception of twins in these myths are widespread. There is a general belief among Pueblo people that the Sun begets all twins (Wright 1988:107). With this strong ideological emphasis, it would be expected that mythological events surrounding twins would appear in the rock art, if rock art is part of the ideological matrix. The presence then of pairs of uterine images in the rock art, and the

Figure 30. Anthropomorph carrying two lobed circles.

associated evidences, suggests that there is a continuity between the Basketmaker images and the Pueblo and Navaho myths about the birth of twins. This subject deserves further investigation.

Myths about twins also exist in Native American cultures in nearby states (McClure 1979) and in other cultures as well. Only those myths associated with the Puebloan people of the Southwest will be discussed here. In Pueblo myths twins are common. Myths of twins may be grouped into three general categories. One group of myths indicates they are powerful Sons of the Sun and even created surface forms of the earth. Another group tells about their exploits as heroes who lead the people and protect them at the time of their emergence (i.e., their coming into the world in which we now live). A third group describes their exploits as hunters who use magic or craftiness to lure prey.

There exists a great variety of Pueblo stories about Twins of the Sun, as they are sometimes called (Benedict 1935; Cushing 1901, 1923; Parsons 1923, 1939; Stevenson 1894, 1898; Tyler 1964; White 1932). Details of their birth and exploits (and their names) differ from pueblo to pueblo, but there is always the presence of a story about the creation or emergence that includes twins as prominent figures. Some of these variations are summarized by Tyler (1964:209-220), Benedict (1935), and Wright (1988). The following quote from Tyler (1964:213-214) illustrates the differences in pueblo myths concerning the birth of the twins.

> The impregnation of the mother of these gods was miraculous. Often she conceives when a ray of the sun falls upon her as she sleeps, or when a drop of water splashes on her from a waterfall. Sometimes both events

Figure 31. Anthropomorph with possible lobed-circle ear pendants, perhaps representing a fetish.

> conspire, and one accounts for the elder brother, and the second for the younger twin. Sometimes the miracle is complete and they are born of the Sun's rays on mist, or again it may be due to pinion nuts. With such possibilities it is not surprising that they have a variety of mothers, and even grandmothers. Sometimes they are the grandsons of Salt Woman. The place of their birth is also a little doubtful. Despite the fact that they seem to have been conceived in the upper world they are the ones who led the people from the underworld.

It is these many varieties, along with the consistent presence throughout the Pueblos of the Twins myths, that suggest a wide spread and ancient ancestry for these myths.

Twins also play a significant role in Navaho emergence myths. Some variations of these myths are similar to the Hopi (for example see Wheelwright (1946:55-90) and Haile (1949)) and may well have been borrowed from the Hopi. In the example from Wheelwright, twins are born to a Son of the Sun and become producers and protectors of game. There are

Figure 32. Large typical Basketmaker anthropomorph with lobed circle and smaller figure inside body.

also the well-known Hero Twins, who in the creation story, slew monsters that were the enemies of man (Haile 1949:103-104).

There is, at least, one additional possibility for the creation of some of the Basketmaker panels discussed here that should be briefly mentioned. According to mythology, the twins have tremendous potential for doing great things (Tyler 1964:213). It is this potential that may have led to the creation of some of the panels depicting the twin uterine image. A woman (or man) desiring the birth of twins, or to have his or her children have the potential for doing great things, may have illustrated this concept in the rock art as a ritualistic expression of this desire. It is well known that other nearby Native American groups created sexually related images on rocks as part of fertility rituals (McGowan 1977), perhaps the Basketmakers did the same thing.

Pursuing this idea further suggests that symbolic concepts associated with the Twins might have been associated with other images in petroglyph panels by placing the symbols of the twins in proximity to them. For example, the twin uterine images might be placed next to a group of mountain sheep to insure their propagation, or because the twins (as described in the Navaho myths) were the producers and protectors of game (Wheelwright 1946:90). Similarly, twin uterine images—as a symbol of the power of the twins—might be placed to insure good hunting because, as Sun told the twins, "Now I have given ye

Figure 33. Large typical Basketmaker anthropomorph with lobed circle and smaller figure inside body.

with your birth the power to slay all game" (Cushing 1901:453).

Another hypothetical reason for the presence of twin uterine images in panels may be the association of the mythological Twins with the Sun as the Father. The sun's miraculous power of fertility in producing twins also may be expressed or embodied in the twin uterine images. The twin uterine images then would have been placed in a panel in a context where the concept of the sun's reproductive power would be desired. The relationship and importance of the sun to warmth, growing things, and fertility are well known to the Pueblo and Navaho people. The twin uterine images then could have become symbols that stood for the concepts associated with the twins.

Several specific ethnographic parallels exist between the Hopi and Navaho twin mythology, and the Basketmaker rock art in which twin uterine images occur. These parallels strengthen the premise of a continuity between the Basketmaker rock art and the mythology, or mythological events, surrounding the birth of Pueblo and Navaho twins. For example, the panels with lobed-circle (uterus) images shown in Figures 17 and 18 have spiders associated with them. Spiders are an unusual and rare element in San Juan Basketmaker rock art. The spider's association with the twin uterine images, in two separate panels is, therefore, significant. There are two closely related possibilities in Pueblo mythology to account for the association of a spider with the uterine images. The spider may either be a symbol representing Spider

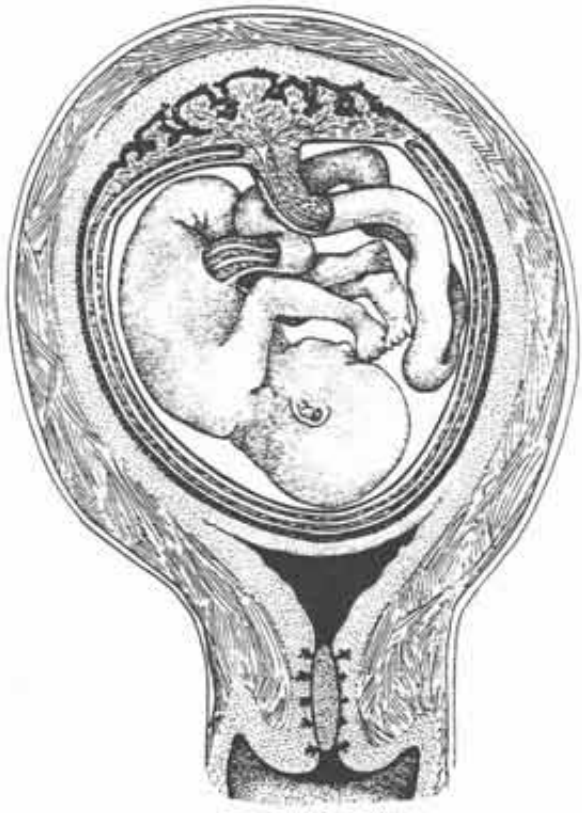


Figure 34. Drawing of a baby inside a uterus, after Torrey and Feduccia (1979). Note the lopsided form of the image.

Woman or Spider Grandmother; in some accounts the Pueblo Twin's grandmother is a spider (Tyler 1964:97). Spider Woman is one of the creators of human beings (Tyler 1964:96) and is, thus, the Mother of the Twins. One especially significant aspect of Spider Woman or Spider Grandmother is that she created human beings in pairs (Tyler 1964:95-96). A symbol representing her creative powers or abilities would be appropriate in context with two uterine images. A spider, therefore, in association with twin uterine images would be expected in Pueblo rock art. That this relationship exists in Basketmaker rock art strongly suggests a continuity with Pueblo and Navaho mythology; panels where the uterine images occur may be illustrations of Basketmaker myths from which the Pueblo/Navaho Twin myths originated.

In almost all instances the twins of Pueblo and Navaho creation mythology are male. The presence of a headdress (which is limited to male images) in the

Figure 35. Petroglyph of a proposed uterus with anthropomorphic image inside.

abdomen of the female image in the petroglyph panel illustrated in Figure 16, along with twin images of babies, seems to confirm the idea of the importance of male twins. This further strengthens the Basketmaker/Pueblo and Navaho mythology relationship.

An aspect of the birth of the Hopi and Navaho twins, as previously mentioned, is that they were born from a woman who is also supernatural and who plays particularly significant roles in mythology. In two panels discussed here (Figures 11 and 12 and Figures 1 and 4), the lobed-circle image is associated with a female figure or figures that possess exceptional ornamentation. These petroglyphic images do not appear to be the typical Basketmaker anthropomorphic type from Schaafsma's San Juan Anthropomorphic Style (1980). While the female images have the typical Basketmaker triangular apron (that identifies them as female), above the waist they also have either one or two upward curving rows of two necklaces (Figures 4 and 12). This elaborate decoration suggests that the images represent a female of unusually high significance. Spider Woman would be such a woman. This is not to suggest that these images represent Spider Woman and Spider Grandmother, rather it is to suggest that there was a continuity in mythological concepts between the Basketmaker and historic Pueblo and Navaho mythology—they may be distant relatives.

The abundant presence of images suggesting twins in Basketmaker petroglyphs and their context, implies that the strong interest in twins among the myths of the historic Pueblos and Navaho appears to have its roots at least as far back in time as the Basketmaker period. This is considerably earlier than has been presumed.

CULTURAL ASSOCIATION: DESCRIPTION OF PHYSICAL OBJECTS

Large Pendants

Physical objects in the shape of the lobed-circle image have been found in excavations in northeastern Arizona. Earl H. Morris discovered two pendants that are analogous in form to the lobed-circle image. These pendants were found while Morris was excavating in Canyon del Muerto (now included in Canyon de Chelly National Monument) (Morris 1925). The pendants were covered with turquoise mosaic (Figure 38). Near the end of the lobes are two holes, apparently made to hang the pendant around the neck of the wearer.

The context and circumstances under which the pendant was found are significant. The pendants were discovered as ornaments on the chests of two of three bodies buried one on top of another in a pit. The pendants were found on the body on top and the body at the bottom. It is significant that two lobed-circle pendants were found in this burial. This is further discussed below. Since the two bodies with the lobed-circle pendants were buried one upon the other, one cannot help wondering what association these two individuals had with twins (i.e., if they were twins, or ritualistic representatives of twins). It is unfortunate that the sex of the three individuals buried together is unknown. Having this information would add to the knowledge of the use and further meaning of the lobed circle. It would be informative to know if the pendants were on the chests of two females while a male was buried between.

A second occurrence of nearly identical lobed-circle objects was reported by Elizabeth Ann Morris (1980) (see Figure 39). These objects were excavated from broken Flute Cave in the Prayer Rock District of northeastern Arizona (Morris 1980:133, Figure 86c). These lobed-circle objects appear to have been nearly identical in form to those found by Earl Morris in Canyon del Muerto. They are however missing the turquoise or whatever mosaic covered them. During the excavation one whole lobed-circle object was found and one fragment. Morris classifies the objects

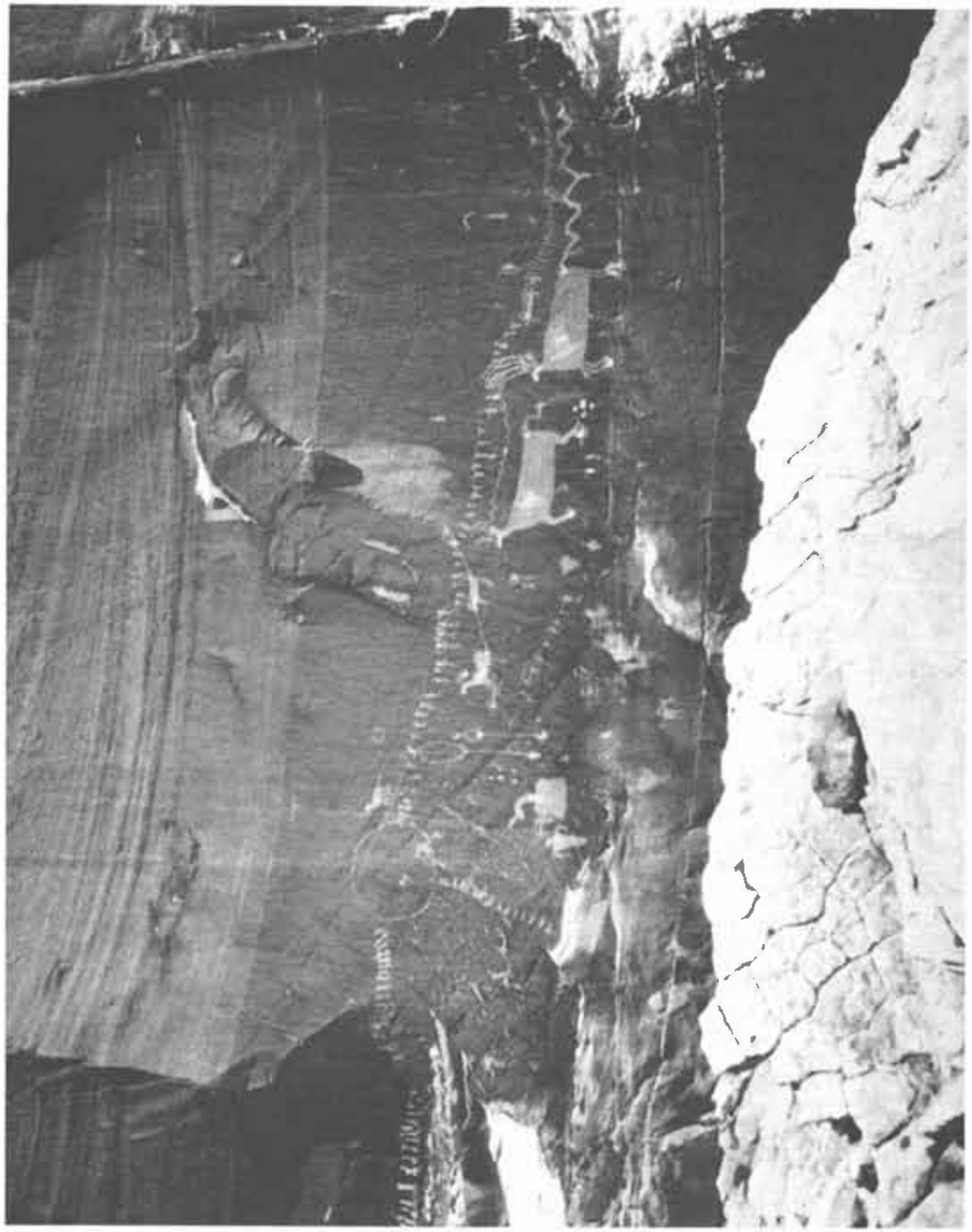


Figure 36. The procession panel.

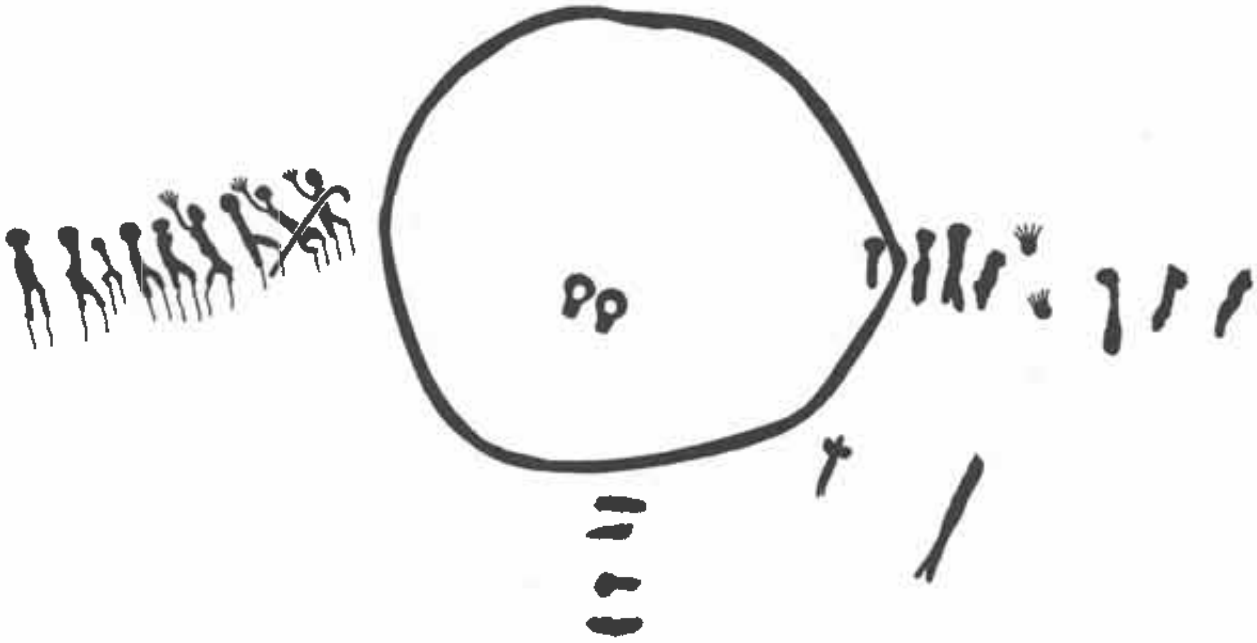


Figure 37. Detail of the Procession panel showing two lobed circles inside a large, roughly circular ring.

as, "Mosaic Pendant Backs." She describes the objects as, "circular rings of wood with a rectanguloid projection on one side." The lobed-circle objects were, "smoothed on all surfaces and edges by grinding." One side of each was, "smeared with pitch, which held the decorative material in place. One of the holes in the lobe through which the cordage passed that apparently held it in place had broken out" (Morris 1980:133). Morris surmises that the decorative materials must have been removed from the pieces when the suspension holes broke. No turquoise was found. Here again the presence of two of the lobed-circle objects is indicated. It is unknown, however, if they were in association.

The existence of a pair of lobed-circle pendants—one upon the chest of each of two bodies—and the presence of two lobed-circle pendants at another site, reinforces the importance and obvious emphasis that a pair of these objects had among the Basketmaker Culture. The form of the pendants and their context further strengthens the relationship between the lobed-circle images in rock art and these lobed-circle-shaped physical objects (they both occur predominantly in pairs). A relationship in form appears evident; a relationship in meaning is implied. The presence of two lobed-circle pendants in both of these locations reinforces the supposition that the lobed-circle rock art images and the physical objects are indicative of the same ideologies. The petroglyphs discussed here then, have the potential to provide additional information about the use of the physical pendants, and thus, their meanings and associated ideologies. This information could not be obtained from the objects themselves.

The presence, and suspected presence, of turquoise (and white shell) in association with the pair of pendants is not unexpected. In several versions of the creation/emergence myths, twins save the people from a flood by providing reeds for the people to use to climb out of the water. These reeds are then turned into "Turquoise and White Shell" (Haile 1949:130-131). The presence of these "precious jewels" as elements in a pair of Basketmaker mosaic uterine images again suggests considerable antiquity for the Hopi and Navaho emergence myths.

There appears to be an inconsistency in the use of the lobed-circle form between the pendants from Canyon del Muerto and the anthropomorphs with pendants shown in the panel in Figure 19. Three of the anthropomorphs in the panel have two images on their chests that appear to be lobed circles, while there is only one on the chest of each body in Canyon del

Figure 38. Turquoise mosaic pendant having the lobed-circle form after Morris (1925).

Figure 39. Mosaic pendant backs having the lobed-circle form after Morris (1980).

Muerto. This appears to suggest that the images on the chests of the anthropomorphs do not represent a Canyon del Muerto kind of mosaic pendant. While this may be true, (a supposition was made earlier that these images may represent female breasts) it must be realized that the meaning and use of the same object would be expected to vary slightly and even more likely to change over time and space. This variation then does not rule out the possibility that the same objects were being used in slightly different contexts in different areas or at different times. The images on the chests of the anthropomorphs in Figure 19 then could represent mosaic pendants. The conflict and difficulty in assigning a definitive meaning to the images on the chests of these anthropomorphs is a good example of the difficulty in specifically interpreting rock art images.

Small Pendants

Tanner (1976:155, Figure 5.8a) illustrates a small pendant that has the form of a lobed circle. Jernigan (1978) also illustrates several small shell pendants that resemble the lobed circle. The existence of these small pendants appears to substantiate the existence of lobed-circle-shaped physical objects that correspond to those hanging from the sides of the head (ears) of an anthropomorph (Figure 31). Hays (1990) notes the presence of lobed-circle images in Broken Flute Cave. She describes these as, "two tabbed circles pendant from a half circle, possibly a head or mask with earrings." Apparently these images are similar to one illustrated by Morris (1980:15, Figure 6b, Number 3). Hays notes that there are several occurrences of these figures in Broken Flute Cave. Hays's description appears to establish the existence of several panels (besides Figure 31) exhibiting ear pendants of the lobed-circle form. This small image then may represent the existence of a fetish, amulet or talisman.

Lobed-Circle Objects as Fetish

The context of the lobed circle or uterine image in some petroglyph panels and the existence of lobed-circle objects and their archaeological context, suggest that the likeness of a uterus may have been used as a fetish. There are two meanings for the word fetish. One is a material object, sometimes in the form

of a living thing that is believed among primitive people to have magical power. In most contexts a fetish is believed to confer upon its bearer supernatural power or protection. Branson (1976) noted, "a fetish is thought to bring good luck, and if treated properly and with veneration, will help or give power to its possessor. The most prevalent belief is that the power is supposed to reside in the spirit dwelling within the fetish, rather than the fetish itself."

The second definition for fetish is an object of unreasonably excessive attention or reverence. It would appear that the second definition is also correct for the lobed-circle images among the Basketmaker Culture.

Fetishes are common among prehistoric cultures, as they are among the historic Pueblo. This is especially true among the Zuni. Bunzel (1929:489) noted, "Practically all the techniques employed by primitive or civilized man to influence the supernatural are known at Zuni—fetishism, imitative magic, incantation, and formula, figure in ritual." Branson (1976) further observed, "Among the Zunis, there is a fetish for almost any unknown phenomenon, including those for use in hunting, war, initiation into cults or societies, propagation, diagnosing and curing diseases, gambling, and even the detection and protection against witchcraft." Leighton and Adair (1966:47) noted of the Zuni, "Care for sacred objects (fetishism) is most important, for the whole welfare of the people depends on the proper treatment of the ettowe." Since, as has been suggested here, some uterine images appear to represent a symbol of fertility and since the existence of a physical object whose image is represented in the petroglyphs is likely, then that object may similarly be a symbol of fertility. It would not be unusual then for lobed-circle objects to be fertility fetishes. Also, since many lobed-circle images appear also to have a context associated with the Pueblo and Navaho twins and their mythology, the objects may represent fetishes associated with the Twin mythology. It would also not be unusual for fertility to be combined with some fetish aspect of the Twins.

The turquoise objects worn around the necks of the bodies found by Morris could represent fetishes. The anthropomorph in Figure 31 appears to illustrate the presence of the lobed-circle object as ear pendants. These could represent a fetish. The uterine images being carried as illustrated in Figure 30 and those in the circle in Figure 37, are not quite so well defined. The image being carried may suggest the existence of an actual uterus because of their size compared with the person carrying them. Of course it is unknown whether the artist illustrated their relative size accurately, and it is also speculation whether the object being carried is an actual uterus or just a replica. If the uterine images in this panel are replicas, then they might well represent fetishes.

Critics of this view may suggest that the panel proves that the lobed-circle image represents an actual uterus and not a replica, because fetishes are objects worn by individuals and are not part of a communal ceremony. This is not correct, however, because among primitive societies a fetish, "may belong to an individual, a secret society, a clan or it may be the property of the entire tribe" (Branson 1976). Thus, the uterine images could represent fetishes and just be replicas.

CULTURAL ASSOCIATION: BROKEN FLUTE CAVE

Having discussed the lobed-circle image; the mosaic, lobed-circle objects; the images of crook-necked staffs; and the presence of a circular image—apparently representing a large structure—a site may now be discussed that ties these patterns together, both temporally and spatially. This is Broken Flute Cave, a Basketmaker III site in northeastern Arizona. Here in 1930, Earl Morris excavated 16 pithouses and 65 cists; work later reported by his daughter Elizabeth Morris (1980). Morris (1980) notes that most of the 211 whole and restorable vessels and the thousands of sherds date to the Basketmaker III period. Among the artifacts found were the two lobed-circle shaped, mosaic pendant backs described above. Also found were several long, crook-necked staffs (Morris 1980:Figure 90) such as those depicted in the procession panel.

Morris (1980) also reported the presence of what was referred to in the excavation notes as, "the Great Kiva Circle." This roughly circular structure near the back wall of Broken Flute Cave was formed by a single row of upright sandstone slabs, each being about two ft in diameter. The diameter of the structure was roughly 60 ft (Vivian and Reiter 1960:100). No floor surface nor floor associated features were found. Evidence suggests that the circular structure dates to the Basketmaker III period, although as Morris states, "the evidence is not conclusive." Morris also questions whether the

structure is a kiva. She notes that in size, shape, and lack of features it is similar to what have been identified as Basketmaker III great kivas in neighboring areas (Vivian and Reiter 1960).

Broken Flute Cave and the procession panel complement each other. The presence of this structure in a predominantly Basketmaker III cave—with lobed-circle pendants and long, crook-necked staffs—suggests they are all contemporaneous and related. The procession panel substantiates this relationship and further provides information about the function, meaning, and context of these artifacts (including the structure). This example typifies the importance rock art plays in interpreting material remains. The procession panel further strengthens the Basketmaker III date for the large circular structure; however, the structure's function as a kiva remains problematical. In like manner, the physical objects provide information on the image's forms and characteristics. The large circular structure substantiates the interpretation that the pecked circular image is a structure. Furthermore, the group of artifacts that match the group of rock art images, provides physical evidence for their existence.

KIVA AND PITHOUSE RELATION TO LOBED CIRCLE

Many of the pithouses, protokivas, kivas, and great kivas throughout the Southwest have an overall form nearly identical to the lobed-circle image and its various expressions. The long, narrow-to-semi-rectangular antechamber on the side of the pithouse would form the lobe of a lobed-circle shape, as does the large recess on the exterior of a kiva. The shape of some of the pithouses of the Basketmaker III period are egg shaped or oval (McGregor 1941:227), which would enhance the lobed-circle form even more. The lobed-circle form would have been very apparent when viewing the exterior of an appropriately shaped pithouse structure, as in contrast to just examining the excavated floor plan. This is because the above ground portion was built with sticks and covered with smoothed mud, which would promote the lobed-circle effect. These structures then, have a round-to-oval shape, from which there is a rounded-rectangular extension, and they are hollow in the middle. The parallel in form suggests that a relationship may exist between these structures and lobed-circle images.

These lobed-circle-shaped structures have a wide distribution in the Anasazi area. Hays and Lancaster (1975, Figures 3, 10, and 15) illustrate several pithouses and protokivas from the Mesa Verde area that have this form. Cassells (1893:117-125) describes Basketmaker III pithouses and Pueblo I kivas from areas south and west of Mesa Verde that have the lobed-circle form. Brew (1946) illustrates lobed-circle-shaped structures from Alkali Ridge, which is north of the San Juan River. Prudden (1903, 1914, 1918) describes many kivas (associated with room blocks) from the San Juan drainage that have the lobed-circle form. Early Basketmaker pithouses in the Mogollon area of New Mexico also have a lobed-circle shape (Wills 1992). Chaco Canyon contains many examples of distinctive lobed-circle-shaped kivas; these include Pueblo Bonito, Chetro Ketl, Una Vida, and others. The author has observed many kivas in the northern canyons of the San Juan River drainage that have this corresponding overall form.

Many great kivas also have the same lobed-circle shape. The lobed-circle portion of the image is formed by the antechamber. Cordell (1984:253) states, "Antechambers are commonly associated with great kivas." An excellent example is the great kiva at Salmon Ruin in Bloomfield, New Mexico (Cordell 1984:262), which is along the San Juan River. This great kiva forms a near perfect lobed-circle image. Other well-known examples occur at Aztec Ruins National Monument and Casa Rinconada in Chaco Canyon (both in New Mexico).

Large kivas dating from the Basketmaker III period have been found in the Southwest. Frank H. Roberts (1929) excavated a kiva at Shabik'eshchee Village in Chaco Canyon that was 12.2 m (40 ft) in diameter and 1.27 m (4 ft 2 in) deep. At Broken Flute Cave Earl Morris found a wall he believed had been part of a bench of a large kiva (Lister and Lister 1968:149).

There are several large circular depressions near the San Juan River and even more in its northern drainages. Large circular depressions are found as far north as Canyonlands National Park. One large depression, located near the San Juan River and believed to be a great kiva, was recently tested (Glass 1990). The outside wall was located and a test pit dug inside the depression next to the wall. The great kiva turned out to be only about one m deep. This structure would be another excellent candidate for the ring represented in the panel illustrated in Figure 37.

Since the kivas and some earlier Basketmaker pithouses functioned ceremonially, their form might also have had ritual significance. Evidence suggests

that the form of some of these structures was patterned after a uterus. Access to some of the Basketmaker pithouses was through the antechamber on the side of the pithouse. People coming out or emerging from the antechamber would be symbolic of birth, or emergence, which would correlate with the Pueblo myths.[2] This concept also was mentioned by Williamson (1981). In recording the origin myth of Acoma Pueblo, the following statement was made: "When they began to build the first Kiva, Iatiku told Oak man that it must be done in a certain way. Then she told him just how it was to be done. The whole Kiva was to represent Shipapu, the place of emergence . . . (Williamson 1981:72)." If the whole kiva was to represent the place of emergence, the form of the kiva may have been patterned after a uterus—the "real" place of emergence.

Many kivas in the Southwest were constructed with an underground tunnel that led from an outside structure into the kiva. Presumably this was for emergence ceremonies, during which entrants would emerge from the kiva floor. This further substantiates the relationship of the emergence concept with the kiva.

Additional evidence for emergence context associated with Pueblo structures is the sipapu that is sometimes found in the floor of kivas. The sipapu is generally a small tube-like pit (Wormington 1947:18). "Similarly placed holes in present day ceremonial structures of the Pueblo Indians represent the mythical place of emergence from the underworld from which the first people came to the earth" (Wormington 1947:18, 52).

Pithouses, protokivas, kivas, and great kivas having the lobed-circle form and having associations with emergence, suggest that the kiva may have been purposefully shaped like a uterus to suggest ritual birth. It appears that this concept may have originated during the Basketmaker II period and carried over into the late Pueblo periods.

ALTERNATIVE INTERPRETATIONS

There is also a possibility that some of the lobed-circle images in Basketmaker rock art represent something other than a uterus. There are several objects occurring in nature that have the same overall form as a uterus, a gourd for example. There are also several manufactured objects that would have a lobed-circle shape, for example, a ceramic vessel or a water bladder made from animal skins. Some of the Basketmaker, widemouthed, straight-necked, plain-gray jars (Morris 1980:Figure 25) when turned upside down bear a resemblance to some of the lobed-circle images.

The context of the lobed-circle images in most of the panels—especially where they occur in pairs and in contexts suggesting human sexuality—rules out these interpretations. There is also one other subtle aspect that confirms the uterine hypothesis; it is the peculiar shape (discussed above) of some of the lobed-circle images themselves. The asymmetrical shape of the baby in the uterus matches many of the lobed-circle images. This subtle characteristic would not so often exist if any other image was being portrayed.

CONCLUSIONS

The presence of the lobed-circle image along the San Juan River and in its northern tributaries, in combination with the presence of lobed-circle objects (pendants) in two locations in the southern tributaries of the San Juan River, suggests that the ideologies responsible for the creation of these images and objects center on the lower San Juan River and its tributaries. This areal distribution corresponds roughly with that of the Basketmaker culture and suggests that the image is associated with that culture and period.

More precise information on cultural affiliation and dating of the lobed circle may be obtained from contextual clues. The lobed-circle image has not been found in rock art of Turner's Glen Canyon Style 5 style, which is apparently the oldest defined style in the San Juan Area. Turner (1971) proposed that the style dates to 2,000–6,000 B.C. This suggests that the lobed circle came into existence following this period.

The lobed-circle image often occurs in panels of Schaafsma's San Juan Anthropomorphic Style (1980:109-119). If Schaafsma's proposed dating is correct, then the lobed circle's existence in this style suggests that the image was used extensively in the Basketmaker II period and, thus, came into existence nearly simultaneously with the Basketmaker.

Dates associated with objects that have the form of the lobed circle suggest that the lobed circle as objects appeared during the Basketmaker III period. Tree ring dates from Broken Flute Cave, Pit House 8A, where the lobed-circle pendants apparently were found, range from A.D. 469–494 (Morris 1980:50). These dates place the lobed-circle objects in the early Basketmaker III period.

The association of the lobed circle with bird-headed images are further evidence of a Basketmaker III correlation, that is if the assumptions of Grant (1978:171-175) and Schaafsma's Chinle Representational Style (1980:122-128) are temporally correct. Evidence suggests that these dates appear to be reasonably accurate. Hays (1990) has reported that Chinle Representational Style rock art in Broken Flute Cave, "is often found on surfaces which formed the back walls of cists dating to the Pueblo I period (on the basis of ceramic and sandal styles)." She also stated that, "sometimes the mud outlines of these cists are superimposed over the rock art." Hays also notes the presence of lobed-circle images in Broken Flute Cave. Assuming the above information is correct, it appears that the lobed-circle images date from Basketmaker II through at least the Pueblo I period.

Determining the beginning date and period of use of the lobed-circle images would establish whether the ideologies responsible for these images are associated with the same material-based, cultural divisions that have been established by archaeologists. It appears, from the above information, that the ideologies responsible for the lobed-circle image developed along with other material evidences.

The information presented in this paper suggests that the ideologies responsible for the creation of the lobed-circle images evolved to incorporate the image in many different forms of rituals and aspects of culture. This would be expected if the image came into existence in the Basketmaker II period. This was a period in which major changes took place in the Southwest. There was a great increase in cultural complexity with a general expansion of the population.

The incorporation of a uterus into other aspects of culture appears to be evidenced by the shape of many pithouses, protokivas, kivas, and great kivas, since they have the form of a lobed circle. This form, along with early historic creation (emergence) myths, suggests that the ritualistic ideologies and concepts of birth extended to these structures. There are two possibilities that explain this relationship. One, the ideologies and concepts of emergence evolved from the coincidental shape of the pithouse to a uterus. Two, the ideologies were responsible for the uterine shape of the structures. If this second perception is correct, it demonstrates the importance that ideologies, superstitions, and myths have in ordering prehistoric societies and in forming their material remains.

A direct relationship between the mosaic pendants and the lobed-circle image has been established here. Petroglyphs then have the potential to provide additional information about the use of physical objects, their contexts, and thus, their meanings, which could not be obtained from the objects themselves.

Two lobed-circle images frequently occur together. When they do occur together, they are of the same size and are placed next to each other. They also often appear in a context suggesting that they are specifically related to human sexuality and fertility and likely related to the birth of twins. The contexts of many panels, coupled with the presumed cultural association discussed above, further suggest that myths concerning Pueblo and Navaho Twins may have begun as far back as the Basketmaker period.

Do these panels represent Pueblo creation myths from the Basketmaker period? Evidence suggests that some of the panels illustrated in this paper (and others not discussed) could represent (actual or variant) Pueblo myths. Harris (1982; 1983) has suggested that several panels explicitly depict Pueblo and Navaho creation myths involving twins. Harris's conclusions are easy both to arrive at and to justify. There are so many variations in the creation myths involving twins that one can match up a story—or even easier—parts of a story, with a panel. For example, in one emergence myth the Twins save the people from a flood. Figure 18 contains two large, wavy lines that could represent water and, thus, the flood. The row of people above the wavy lines could represent the people; the spider could be a representation of Spider Woman, the Mother of the Twins. The duck could represent some aspect of floating on water. Therefore this panel could be interpreted to represent a version of the emergence myth. The difficulty, of course, comes in trying to prove such an explanation. There are many panels that could be easily interpreted to give accounts of the Twins mythology, especially where portions of several different myths are combined to explain one panel. Specific interpretations then, should be accepted with skepticism.

One other factor complicates an unambiguous interpretation that panels incorporating the lobed-circle images are symbolic of the Twins mythology. There appear to be no twin uterine nor lobed-circle images in rock art assigned to the Pueblo II and III periods (Schaafsma 1971; 1980 reports none), and they appear

absent even in the Pueblo IV period. There appears then to be no continuity in the Twins mythology expressed in the rock art between the Basketmaker period and the ethnographic recording of Pueblo Twin myths. What would account for this absence? One possibility would be that the definition of what constitutes Basketmaker rock art is incorrect. For example, were all the large anthropomorphs of Schaafsma's San Juan Anthropomorphic Style, and Chinle Representational Style really limited just to the Basketmaker II and III periods respectively, or did these styles continue through the Pueblo periods? Does style classification adequately address (or permit) designations of specific images, image complexes, and mythologies beyond strict cultural affiliations? These questions remain unanswered.

Another possibility that might explain the apparent absence of the lobed-circle image in later Pueblo rock art is the general change that took place in rock art during the Pueblo period. There is a marked decrease in complexity of images and intricacy of panels through time. A change in ideologies that influenced graphic arts was proposed to account for this difference (Manning 1990b). This change may have modified the way ideologies were expressed or utilized. Perhaps the utilization of rock art in mythology, or the legends told about twins via petroglyphs, changed into oral legends that became part of the kiva ceremonies. Should this have happened, the depiction of these apparent uterine images on the cliffs would have ceased, yet the mythologies would have lived on.

Still another possibility is that there was a revival in twin mythology just before the historic period. If this is the situation, then the petroglyphs do not represent direct Basketmaker versions of Pueblo myths. This appears unlikely, however, because there are too many parallels in the details of the elements of rock art that correspond to the Pueblo and Navaho myths. Several possibilities exist to account for the apparent discontinuity between the twins mythology in the Basketmaker period and the abundance of twin mythologies in ethnographic accounts. Which of these is correct, or if even there is a discontinuity, is unknown. Regardless, the evidence points strongly to a direct relationship between the Pueblo twin mythology and Basketmaker rock art.

The objective of this paper was not to determine whether the panels are a depiction of the Pueblo and Navaho Twin myths, but to propose a hypothesis for the meaning of the lobed-circle image and to discuss its distribution, cultural affiliation, context, and cultural modes. I believe this has been accomplished.

NOTE

1. Joe Pachak has indicated that he believes there is a painted lobed circle in Grand Gulch. I have not yet had the opportunity to verify his observation.

2. I remember reading an early ethnographer's statement that a Native American informant said that the form of coming out of the kiva was the same as that of the emergence, and the kiva was made that way so the people would always remember their emergence. I have been unable to relocate the reference.

REFERENCES CITED

Benedict, Ruth
1935 *Zuni Mythology.* Columbia University Contributions to Anthropology, Vol. 21, Parts 1 and 2. Columbia University Press, New York.

Branson, Oscar T.
1976 *Fetishes and Carvings of the Southwest.* Treasure Chest Publications, Santa Fe.

Brew, John Otis
1946 *The Archeology of Alkali Ridge, Southeast Utah.* Papers of the Peabody Museum of American Archaeology and Ethnology No. 21. Harvard University, Cambridge.

Bunzel, Ruth L.
1929 Introduction to Zuni Ceremonialism. *Bureau of American Ethnology 47th Annual Report 1929–30*, pp. 467–544. Smithsonian Institution, Washington, D.C.

Cassells, Steve E.
1983 *The Archeology of Colorado.* Johnson Books, Boulder.

Cole Sally J.
1989 Iconography and Symbolism in Basketmaker Rock Art. In *Rock Art of the Western Canyons*, edited by Jane S. Day, Paul D. Friedman, and Marcia J. Tate, pp. 59–85. Colorado Archaeological Society Memoir No. 3. Denver Museum of Natural History and Colorado Archaeological Society.
1990 *Legacy on Stone: Rock Art of the Colorado Plateau and Four Corners Region.* Johnson Books, Boulder, Colorado.

Cordell, Linda S.
1984 *Prehistory of the Southwest.* Academic Press, Orlando.

Cushing, Frank H.
1901 *Zuni Folk Tales.* G. P. Putnam's Sons, New York.

1923 Origin Myth from Oraibi. *Journal of American Folklore* 36:163–169.

Glass, Steven
1990 Test Excavations at a Circular Depression, San Juan County, Utah. Paper presented at the 1990 Pecos Conference, Blanding, Utah. Also Ms. on file with the Bureau of Land Management, San Juan Resource Area, Monticello, Utah.

Grant, Campbell
1978 *Canyon de Chelly: The People and Rock Art.* University of Arizona Press, Tucson.

Haile, Berard (compiler)
1949 *Emergence Myth According to the Hanelthnayhe or Upward-Reaching Rite.* Navaho Religion Series vol. III. The Museum of Navajo Ceremonial Art, Santa Fe.

Harris, James R.
1982 *The War Twins Petroglyph as a Tentative Interpretation.* American Indian Rock Art Vol. 8. American Rock Art Research Association, El Toro, California.
1983 *A Comparative Study of Specific Signs from Six Anasazi Sites with Mythological Ties to the Pueblo War Twins.* Utah Rock Art Vol. 3., Salt Lake City.

Hays, Kelley A.
1990 Prayer Rock District Rock Art. Poster Session at the 1990 Pecos Conference, Blanding, Utah.

Hays, Alden C., and James A. Lancaster
1975 *Badger House Community, Mesa Verde National Park, Colorado.* U.S. Department of the Interior, National Park Service, Washington, D.C.

Hurst, Winston B., and Joe Pachak
1989 *Spirit Windows: Native American Rock Art of Southwestern Utah.* Spirit Windows Project, Edge of the Cedars Museum, Blanding.

Jernigan, E. Wesley
1978 *Jewelry of the Prehistoric Southwest.* University of New Mexico Press, Albuquerque.

Leighton, Dorothea C., and John Adair
1966 *People of the Middle Place, A Study of the Zuni Indians.* Behavior Science Monographs. Human Relations Area Files Press, New Haven, Connecticut.

Lister, Florence C., and Robert H. Lister
1968 *Earl Morris & Southwestern Archeology.* University of New Mexico Press, Albuquerque.

Mails, Thomas E.
1983 *The Pueblo Children of the Earth Mother.* Doubleday & Company, Inc., Garden City, New York.

Manning, Steven J.
1990a Comprehensive Rock Art Literature Search Through the Files of the Division of State History. *Utah Archaeology 1990* 3(1):145–148.
1990b Barrier Canyon Pictographs of the Colorado Plateau. *Utah Archaeology 1990* 3(1):42–84.
1991 Parallels Between Rock Art Images of the Central San Juan River and the Uintah Basin areas of Utah. Paper presented at the 11th Annual Rock Art Research Symposium, Green River, Utah.
1992 *A Modal Based Classification System for Rock Art Research, Overcoming Stylistic Methodological Problems.* Utah Rock Art Vol. 11. Utah Rock Art Research Association, Salt Lake City.

McClure, Richard H., Jr.
1979 *Paired Anthropomorphs of Central Washington. American Indian Rock Art.* American Indian Rock Art Vol. 4. American Rock Art Research Association, El Toro, California.

McGowan, Charlotte
1977 *Female Fertility and Rock Art.* American Indian Rock Art Vol. 4. American Rock Art Research Association, El Toro, California.

McGregor, John C.
1941 *Southwestern Archaeology.* John Wiley & Sons, New York.

Morris, Earl H.
1925 Exploring the Canyon of Death. *National Geographic* 48(3):263–300.

Morris, Elizabeth Ann
1980 *Basketmaker Caves in the Prayer Rock District, Northeastern Arizona.* Anthropological Papers No. 35. University of Arizona, Tucson.

Parsons, Elsie C.
1923 The Origin Myth of Zuni. *Journal of American Folklore* 36:135–161.
1939 *Pueblo Indian Religion.* University of Chicago Press, Chicago.
1974 *The Pueblo of Isleta.* University of Albuquerque, Calvin Horn Publishers, Albuquerque.

Plog, Fred
1979 Prehistory: Western Anasazi. In *Southwest*, edited by Alfonso Ortiz, pp. 108–130. Handbook of North American Indians, vol. 9, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Prudden, T. Mitchell
1903 The Prehistoric Ruins of the San Juan Watershed of Utah, Arizona, Colorado, and New

Mexico. *The American Anthropologist*, New Series 5(2):24–288.

1914 The Circular Kivas of Small Ruins in the San Juan Watershed. *The American Anthropologist*, New Series 16:33–58.

1918 *A Further Study of Prehistoric Small House Ruins in the San Juan Watershed*. Memoirs No. 5. American Anthropological Association, Lancaster, Pennsylvania.

Roberts, Frank H. Jr.

1929 *Shabik'eshchee Village, A Late Basketmaker Site in Chaco Canyon, New Mexico*. Bulletin No. 92. Bureau of American Ethnology, Smithsonian Institution Washington, D.C.

Rouse, Irving

1939 *Prehistory in Haiti: A Study in Method*. Publications in Anthropology No. 21. Yale University, New Haven.

1960 The Classification of Artifacts in Archeology. *American Antiquity* 25(3):313–323.

Schaafsma, Polly

1971 The Rock Art of Utah. Peabody Museum of American Archaeology and Ethnology Vol. 65. Harvard University, Cambridge.

1980 *Indian Rock Art of the Southwest*. School of American Research, Santa Fe.

Shearin, Nancy L.

1990 A Crookneck Wooden Staff from San Juan County, Utah. *Utah Archaeology 1990* 3(1):111–122.

Stevenson, Matilda Coxe

1894 The Pueblo of Sia. *Bureau of American Ethnology 11th Annual Report 1889–1890*. United States Government Printing Office, Washington, D.C.

1898 Zuni Ancestral Gods and Masks. *The American Anthropologist* 11(2):33–40.

Tanner Clara Lee

1976 *Prehistoric Southwestern Craft Arts*. University of Arizona Press.

Torrey, Theodore W., and Alan Feduccia

1979 *Morphogenesis of the Vertebrates*. 4th ed. John Wiley & Sons, New York.

Turner, Christy G., II

1963 *Petrographs of the Glen Canyon Region*. Bulletin No. 38 (Glen Canyon Series No. 4). Museum of Northern Arizona, Flagstaff.

1971 Revised Dating for Early Rock Art in the Glen Canyon Region. *American Antiquity* 36:469–471.

Tyler, Hamilton A.

1964 *Pueblo Gods and Myths*. University of Oklahoma Press, Norman.

1979 *Pueblo Birds and Myths*. University of Oklahoma Press, Norman.

Vivian, Gordon, and Paul Reiter

1960 *The Great Kivas of Chaco Canyon and Their Relationships*. School of American Research, Santa Fe.

Wheelwright, Mary C.

1946 *Hail Chant and Water Chant*. Navaho Religion Series Vol. 2. Museum of Navajo Ceremonial Art, Santa Fe.

Williamson, Ray A.

1981 North America: A Multiplicity of Astronomies. In *Archaeoastronomy in the Americas*, edited by Ray Williamson, pp. 61–80. Anthropological Papers Number 22. Ballena Press, Los Altos, California.

Wills, W. H.

1992 Plant Cultivation and the Evolution of Risk-Prone Economies in the Prehistoric American Southwest. In *Transitions to Agriculture in Prehistory*, edited by Anne B. Gebauer and Douglas T. Price, pp. 153–176. Monographs in World Archaeology No. 4. Prehistory Press, Madison, Wisconsin.

White, Leslie A.

1932 The Acoma Indians, People of the Sky City. *Bureau of American Ethnology 47th Annual Report 1929–30*. Smithsonian Institution, Washington, D.C.

Whiteford, A. H.

1947 Description for Artifact Analysis. *American Antiquity* 12(4):226–237.

Wormington, H. M.

1947 *Prehistoric Indians of the Southwest*. The Denver Museum of Natural History, Denver.

Wright, Barton

1988 *The Mythic World of the Zuni*. University of New Mexico Press, Albuquerque.

FINDING A DATE: SOME THOUGHTS ON RADIOCARBON DATING AND THE BAKER FREMONT SITE IN EASTERN NEVADA

James D. Wilde, Office of Public Archaeology, Brigham Young University, 105 Allen Hall, Provo, Utah 84602

ABSTRACT

Conventional radiocarbon dating is a standard procedure in archaeology. It is a straightforward technique of counting radioactive particle emissions from the nucleus of unstable carbon isotopes and using the average number of emissions to calculate time elapsed since an organism died. Its use in archaeological contexts requires much care and thought because many factors of contamination, old wood, fractionation, and context can skew the results. In addition, its statistical nature keeps it less precise than most archaeologists would like. I explore the nature of conventional radiocarbon age assessment and ways of making it more precise by analyzing ten ^{14}C age assays from a Fremont structural site near Baker, Nevada. The suite of ages suggests that the site was occupied in the late twelfth and early thirteenth centuries. High quality corn ages, however, suggest that its major occupation occurred during the thirteenth century, and that it was probably used into the fourteenth century.

INTRODUCTION

The Baker Archaeological Site (26Wp63) is a Fremont period multiple-habitation location in east-central Nevada, about four miles west of the Utah border (Figure 1). It has been the focus of investigation by archaeologists and students from Brigham Young University for the past three years. The site has grown in importance since it was first tested in 1990, as excavations in 1991 and 1992 revealed a unique Fremont culture structural site (Figure 2). The project will continue for the next one or two years, and this article is intended as a preliminary discussion of the radiocarbon dating we have completed so far. Radiocarbon assay continues to provide valuable insights into the timing of past human behavior. Recent refinements in interpretation promise increases in precision as we try to determine what happened when, in the past.

RADIOCARBON AGE ASSESSMENT

Radiocarbon dating has grown exponentially over the last twenty years, as more labs came on line and as contract archaeology produced sometimes large numbers of samples for assay. No other dating technique is as widely used in American archaeology, and in many regions, including the Fremont area, radiocarbon assay is the primary technique for building chronologies and developing culture histories. The processes of using radioactive carbon to date past events are well described in recent works (see Taylor 1987; Thomas 1991) but will be related briefly here.

Radiocarbon Production

Radiocarbon, ^{14}C, is produced in the earth's upper atmosphere when neutrons in cosmic radiation react with nitrogen to produce a heavy carbon isotope. Carbon-14 contains 14 neutrons in its nucleus, rather than the normal 12, making it unstable and subject to radioactive decay. The atmosphere contains an abundance of carbon, which is oxidized to form CO_2, a component of air, and a major molecule for plant photosynthesis and the production of energy and oxygen. A small proportion of atmospheric carbon comprises ^{14}C, which is also oxidized to form $^{14}CO_2$, and which is also used in photosynthesis. Animal and plant metabolic processes, therefore, maintain an equilibrium of ^{14}C between living organisms and the atmosphere. However, when an organism dies, it no longer takes on atmospheric carbon or radiocarbon, and the amount of ^{14}C in the organism begins to decay back into nitrogen. The decay rate is measured by the half-life of ^{14}C, 5,730 years, meaning that after this time only half of the original radiocarbon remains in a sample. A sample 5,730 years old contains only half of the ^{14}C found in a living organism.

UTAH ARCHAEOLOGY 1992
pp. 39–53

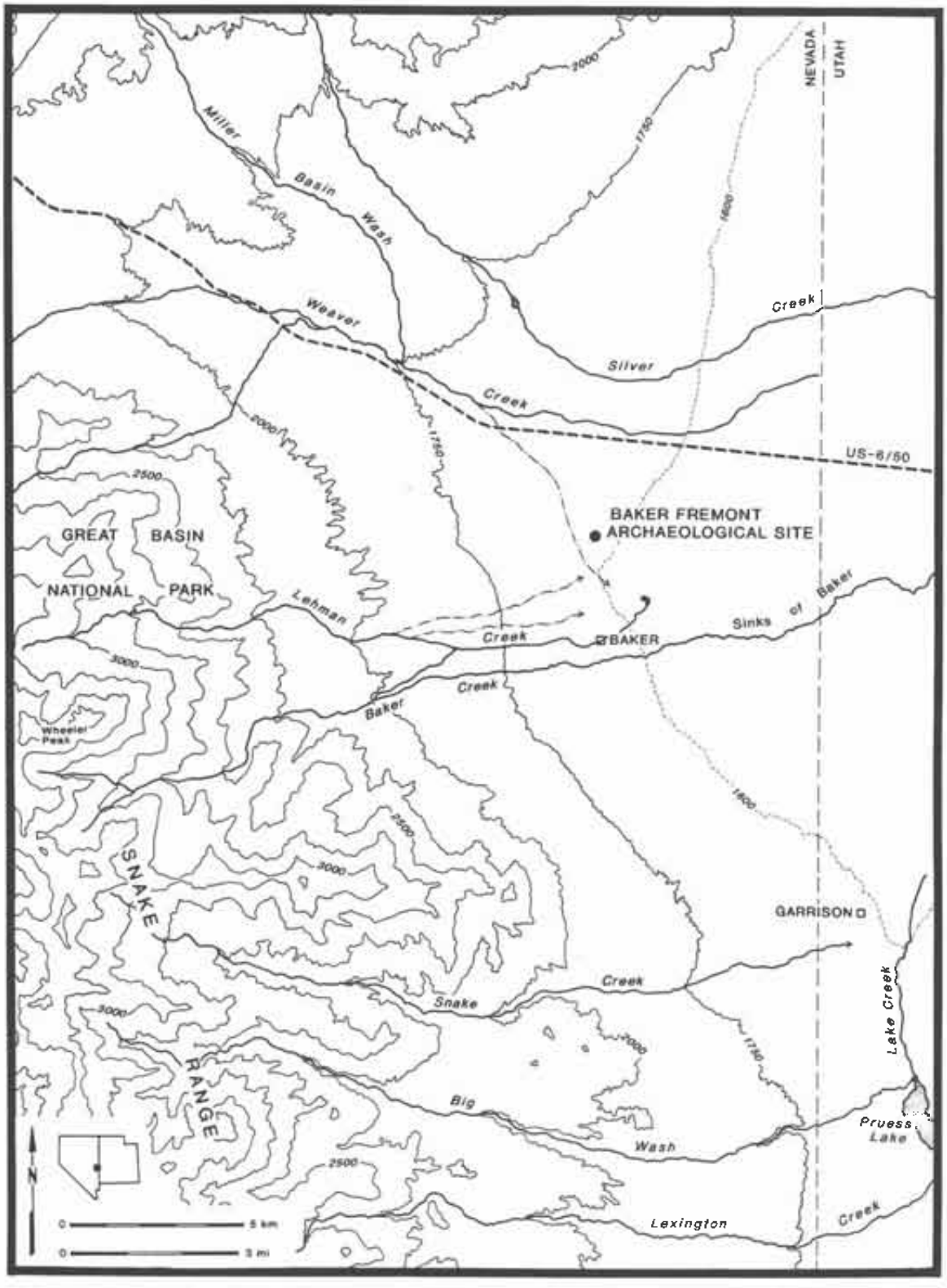


Figure 1. Location of the Baker Fremont Site in Snake Valley, Eastern Nevada.

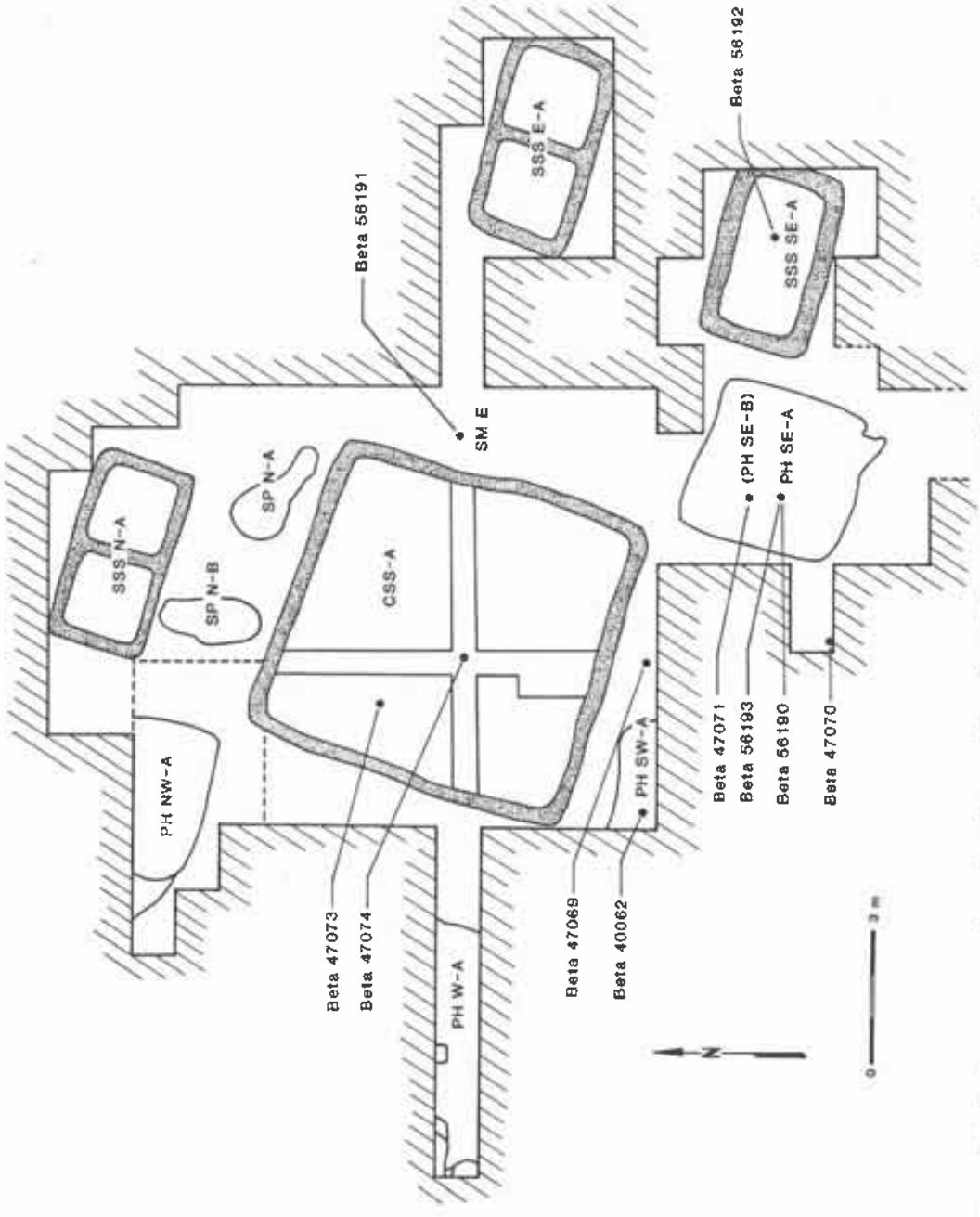


Figure 2. Plan of the Baker Site showing orientation and location of the structures and locations of radiocarbon samples. Pithouse (PH SE–B) is located directly above pithouse PH SE–A; it was built into the depression created by the collapse or dismantling of the original pithouse. **Codes:** *PH*, Pithouse; *CSS*, Central Surface Structure; *SSS*, Surface Storage Structure; *SP*, Storage Pit.

Direct and Indirect Age Assessment

Two methods are currently employed to determine the amount of ^{14}C remaining in a sample. The most common, partly because it is relatively inexpensive, is an indirect method called decay counting. It is the subject of most of the remainder of this article. A more accurate and precise method is called direct counting, and most of us would use it more often if it were not so expensive. Direct counting is also called Accelerator Mass Spectrometry (AMS), which has several advantages over decay counting methods. It directly measures the number of ^{14}C atoms in a sample, it uses much smaller samples, it uses much shorter counting periods, and it extends the maximum ^{14}C age range beyond that of decay counting. Its use will increase, and its costs will decrease, as more laboratories become equipped to perform AMS dating. In the meantime, most archaeologists will continue to rely on conventional, decay counting methods of radiocarbon age assessment.

DECAY COUNTING

Radioactive decay is the loss of particles and the release of energy in the nucleus of an unstable atom, hence the name nuclear reaction. Carbon-14 decays by losing its extra neutrons, and as each neutron leaves the nucleus, it emits a charged beta particle. The amount of ^{14}C in a sample can be measured by counting the number of beta emissions per gram of carbon over a specific amount of time. The number of emissions per gram per unit of time indicates the amount of ^{14}C remaining in a dead organism and provides the basis for calculating the elapsed time since death, based on the known half-life of radiocarbon[1].

The Archaeologists's Responsibility

The straightforward act of counting beta emissions from a sample of carbon provides the basis for determining the age of death of an organism. The process of obtaining a ^{14}C date involves several steps before the counting begins. One of the most important is the archaeologist's responsibility to obtain samples of organic material from contexts that will tell us something relevant about the past. This means that we must be very careful to obtain samples from controlled contexts. Samples should not be mixed, nor disturbed since burial, nor be subject to contamination, at least to any extent that is controllable or identifiable by the field workers. Specific questions should be (1) What are we trying to date? and, (2) How does the material sampled relate to whatever is to be dated? The most useful and accurate dates will be obtained from uncontaminated samples that are directly related to, or are themselves the subject of the dating inquiry.

The Old Wood Problem

It is also important to consider the type of material to be dated. Different kinds of organisms process and store carbon in slightly different ways, so it is useful to know the type of material in a sample. Charcoal is the usual sampled material, but it is becoming increasingly important to know what kinds of plants produced the charcoal one is about to date. For example, wood charcoal contains abundant carbon, and has been the material or choice since the 1950s. However, the nature of wood growth suggests caution must be used to insure accurate age assessments of cultural features associated with the sample. Trees grow by increments, adding growth rings to their outermost wood. Inner wood rings are essentially dead material, with already decaying ^{14}C locked into their cells. Only the outermost rings will contain amounts of ^{14}C equal to the atmospheric pool at the time the tree died. Samples of charcoal that incorporate inner rings will give ^{14}C ages older than the actual date of death, causing the radiocarbon age to be inaccurate. For this and other reasons, the best material for dating is from plants that live for only one or two years. Corn and other vegetables, grasses, marsh plants, shrubs, seeds, twigs, and other such plants and plant parts are the best dating materials. Often these are not as abundant in archaeological sites as we would like, so wood charcoal remains the most commonly dated material. Care in choosing charcoal can alleviate some of the problems associated with built-in age in old wood (see examples in Smiley 1985:96-138).

Fractionation

Various factors also must be considered during and after the counting procedures in the laboratory. One of these is called fractionation. The measures of elapsed time are based on changes in the ratio of ^{14}C to ^{12}C in the organic sample. A complicating factor is that carbon has three atomic configurations instead of just the two mentioned. The ratio of carbon isotopes in modern organics is around 99% ^{12}C, 1% ^{13}C, and

10^{-10}% ^{14}C, or for every ^{14}C atom there are about 10 billion ^{13}C atoms, and 1 trillion ^{12}C atoms (Taylor 1987:34). Fractionation effects are caused by changes in the ratios of carbon isotopes due to their respective atomic weights and are not functions of time or other factors. Carbon-14 is about 15% heavier than either of the other isotopes and some biochemical processes, such as photosynthesis, can naturally select greater amounts of the lighter isotopes over the heavier ^{14}C. Laboratories can measure the ratios of ^{14}C to ^{13}C and of ^{13}C to ^{12}C to gauge the effects of fractionation on any given sample. In addition, different kinds of plants and animals are known to incorporate ^{13}C at different rates, allowing construction of tables of standard (or mean) ^{13}C values for material types ranging from marine shells to terrestrial organics, such as grains, bone collagen, wood, leaves, and peat (Burleigh et al. 1984; Polach 1976; Stuiver and Polach 1977; Stuiver and Reimer 1992; Taylor 1987). These tables are not yet as complete as they need be, because many desert plants that metabolize carbon differently than plants from wetter environments have not been tested. In any case, values of ^{13}C obtained in laboratory tests or from standard value tables can be used to adjust the ^{14}C age to incorporate the effects of fractionation, and provide more accurate radiocarbon ages.

Tree-Ring Calibration

Another consideration is the amount of ^{14}C in the atmosphere through time. We know that ^{14}C fluctuates in relation to the amount of ^{12}C in the atmosphere, and that this fluctuation affects the age assessments of long-dead organic material. The amount and frequency of fluctuation has been determined and refined through the years from studies of tree rings and global carbon reservoirs (see Taylor 1987; Thomas 1989 for overviews; Damon and Linick 1986; Damon et al. 1978; de Vries 1959; Grey and Damon 1970; Klein et al. 1980; Libby 1973; Pearson et al. 1993; Polach 1976; Stuiver 1970; 1982; Stuiver and Braziunas 1993; Stuiver et al. 1991; Stuiver and Polach 1977; Stuiver and Suess 1966; Suess 1965, 1980 for details). In essence, long-lived trees, such as bristlecone pine (*Pinus longaeva*, *Pinus aristata*), have provided tree-ring records that span the last 8,200 years. Oak trees (*Quercus* sp.) in Germany have extended the record to more than 11,000 years ago (Becker 1993; Becker et al. 1991; Kromer and Becker 1993). Comparing the known age of tree rings, which can be determined to the exact calendar year with radiocarbon dates on those rings, reveals the frequency and magnitude of $^{12}C/^{14}C$ fluctuations since the terminal Pleistocene, about 12,000 years ago. Various curves have been generated from these data with which to calibrate conventional radiocarbon ages with the tree-ring record (Clark 1975; Damon et al. 1974; Klein et al. 1982; Kromer and Becker 1993; Ralph et al. 1973; Stuiver and Becker 1993; Stuiver and Pearson 1993; Stuiver and Reimer 1986, 1993; Suess 1970, 1979). The effect of calibration is to add accuracy to the conventional radiocarbon age, allowing it to be converted to calendrical years. That is, from assessments of radiocarbon years before present (B.P.), ^{14}C ages are calibrated to actual years, counted in terms of the Christian (B.C. and A.D.) calendar.

It should be noted that not all experts agree that calibration is a useful step in the process of ^{14}C interpretation, especially when the target date range is less than 3,000 years ago (Berry 1982; see also Smiley 1985:94–96). Others, however, argue that converting radiocarbon ages into calendrical date ranges cannot be done except through calibration, and that calibration refines information about the past because it more accurately reflects changes in the atmospheric carbon pool (Polach 1976; Stuiver 1970; Stuiver and Becker 1993; Stuiver and Polach 1977). Stuiver and others also argue that calibration should only be done on ^{14}C ages that have been ^{13}C adjusted, suggesting that this procedure be routine during laboratory analyses (Stuiver 1992; Stuiver and Reimer 1992; 1993).

Laboratory Procedures

With all these factors in mind, the archaeologist collects a radiocarbon sample and sends it into a laboratory for age assessment. Laboratory personnel examine the sample and remove any visible contaminating materials, such as rootlets. They then subject the sample to several baths to remove any remaining contaminants, with the goal of obtaining a sample with no carbon-containing compounds that might exhibit ^{14}C activities different from those of the intended sample material (see Taylor 1987 for details). The sample is converted to either a carbon gas, such as CO_2, methane, acetylene, or ethane, and then counted, or is further processed into a carbon liquid, such as benzene, and then counted. The latter method, called liquid scintillation, is commonly used today.

Very precise instruments are used to count beta emissions from the purified sample.

The laboratory determines the length of time a sample is counted based on its carbon weight and the wishes (and riches) of the investigator. Counting time for standard samples, between 250 and 5,000 mg is from 24 to 72 hours. High precision and extended-range samples, with between 10,000 and 20,000 mg of carbon, are counted from 72 to 168 hours. Very small samples with less than 5 mg of carbon are often counted for up to 2,760 hours (Taylor 1987:Table 4.1).

Statistics

Beta emission is random in the sense that we do not know which ^{14}C nucleus will decay at any moment, but we do know that a given number will decay in a specific period of time. For instance, fewer than 14 nuclei will decay and make beta particles available for detection in a one-minute period (Taylor 1987:90). They may decay all at once, but they usually decay in spurts, with periods of high activity and periods of low activity. This is the reason beta counts are made over periods of hours. In addition, the total counting period is divided into smaller time units, such as the 50 minute sub-periods used at Beta Analytic, Inc. This radiocarbon laboratory records all decay events during the 50 minute sub-period and then resets the counting instruments to zero to count all the events in the next sub-period. This gives a number of samples of counts within the overall counting period and allows for the examination of instrument error. It also helps assess the effects of background radiation and saves the sample and data in case of power failures during counting (Jerry Stipp, personal communication 1992).

All beta emissions from each sub-period are counted and analyzed. The results can be graphed in a normal bell-shaped curve that shows the highest and lowest number of emissions during the entire counting procedure. The difference between the highest and lowest number of emissions is the **range**. The majority of emissions will fall near the middle of the range. All the counts are summed, and the average, or **mean**, is calculated along with the **standard deviation**. The latter designates the amount of spread in the count values, that is, the variability of differences between the count values and the mean. The more the values differ from the mean, the higher the standard deviation. Conversely, if all values are equal, each is equal to the mean and the standard deviation is zero. The standard deviation tells us how much variability is in the beta emission counts. The standard deviation, or **sigma**, also provides a method of determining how much area, or what proportion of the total number of values, is incorporated under parts of the bell-shaped curve. One sigma on either side of the mean, or two times sigma, accounts for about 68% of the total. Two sigmas on either side of the mean, or four times sigma, accounts for 95% of the total. Three sigmas on either side of the mean, or six times sigma, accounts for over 99% of the total.

The laboratory uses the mean and sigma values to calculate the **range** of the number of years passed since the sampled organism died. It uses the mean of the beta counts to provide a **mean** radiocarbon age of the sample. It reports back to the archaeologist information about the sample, its laboratory number, its mean age, and the range of variability within **one** standard deviation of the mean. If the sample was ^{13}C adjusted, a mean ^{13}C age is also reported, along with its one standard deviation range. This information constitutes the radiocarbon age assessment from the laboratory.

An Example

An assessment from the Baker site is useful at this point. Beta 56193 is a Beta Analytic, Inc. assay that is ^{14}C dated to 910 ± 90 B.P. It is an age from charcoal, and was ^{13}C adjusted to 880 ± 80 B.P.. The reported age assessment suggests that the hearth from which the sample was drawn is around 880 years old, with a one standard deviation, or **one-sigma** range of between 800 and 960 years ago. But how accurate is this interpretation? As it turns out, we do not really have a way to know exactly, but statistically, the probability of the actual age being within this one sigma range is only 68%. In other words, it has a two of three chance of being correct. Most scientific work will not accept this low level of probability. Accuracy at a higher level can be gained by being less precise: the probability of the actual date falling within two sigmas of the mean is around 95%. This means that most likely, the correct age for Beta 56193 falls between 720 and 1,040 years ago, a range of 320 years. Extending the age range to three sigmas increases the accuracy to a level above 99%, but almost all precision is lost. Thus, the actual date for Beta 56193 falls somewhere between 640 and 1,120 years ago, with a range of 480 years. This spans more than half of the Fremont period.

Calibrating the reported age helps gain some precision. Calibration to the tree-ring record is facilitated by software that enables us to perform the procedure on personal computers. Since 1987, we at BYU have been using CALIB, a program written at the Quaternary Isotope Lab at the University of Washington, Seattle (Stuiver and Reimer 1986). I recently received a pre-release version of CALIB Rev3, the third revision of the program (Stuiver and Reimer 1992, 1993), and have used it in preparing this article. Calibration of Beta 56193 on CALIB Rev3 produces a report that tells me that the ^{14}C age has two calibrated ages: A.D. 1161 and A.D. 1185. These are not averages of counts, but are points where the average count age, 880 B.P., crossed the tree-ring/^{14}C curve. These dates seem quite precise but are not really any more precise than the ^{14}C age, because they are also subject to the standard deviation of the beta count. The calibration report also tells me that the two-sigma range for Beta 56193 is from A.D. 900 to A.D. 1259, a range of 359 years, somewhat larger than the two-sigma range reported with the ^{14}C age. More precision can be gained, however, because the CALIB program also calculates the highest probability area for the reported ^{14}C age under the tree-ring/^{14}C curve. In this case the report tells me that the more restricted range of A.D. 1017 to 1264 has a probability of 97%. In other words, the CALIB program suggests that the smaller range of 247 years between A.D. 1017 and 1264 has a 97% chance of containing the actual date. This increase in precision helps us to compare different dates and to formulate more accurate culture histories.

Additional methods of increasing precision in radiocarbon dating are also available. By using suites of ages, at least three from the same or similar contexts, we can gain more understanding about the material collected, the context of the sample, and the accuracy of the ^{14}C ages. Multiple ages from the same context will sometimes show problems with a sample, because its age assessment will be widely different from the others. In other cases, however, several ages from the same contexts will cluster together, indicating that they are fairly close to contemporaneous (for example, see Wilde and Newman 1989). We can test the hypothesis that several ages are temporally equivalent with a variety of statistics (Berry 1982, Long and Rippeteau 1974; Ward and Wilson 1978). Acceptable levels of probability that two or more ages can be considered contemporaneous are at or above 95%, as calculated by the various statistics. Once the probability of contemporaneity is determined to be 95% or higher, ages from similar contexts can be averaged. The process of averaging favors those ages with smaller sigmas, providing a weighted average of the ages. It also acts as if the beta counting process was extended and provides a smaller weighted average sigma for the resultant average age. Because of its smaller sigma, this new age can be calibrated to a range of time that is narrower than any of the individual age calibration ranges. With the proper care for appropriate contexts, tests of contemporaneity and weighted averaging provide additional precision in interpreting just when something is likely to have happened in the past.

Discussion and Caveat

Problems I have discussed with material, collection, sampling, adjustment, calibration, and standard deviations mean that the archaeologist must focus on the material to be dated, the context of the material, the laboratory procedures, and the exact questions the date assay is to answer. However, no problem or suite of problems can be taken to mean that radiocarbon dating is generally inaccurate, flawed, or misguided, as some pseudo-scientists have claimed. As with most powerful tools, the usefulness of the ^{14}C technique is related to the thoughtfulness of its practitioners, not to flaws in the technique itself. The constant refinement of ^{14}C dating and calibration brings the technique ever closer to the precision desired by archaeologists (see Stuiver 1992). But, as shown in the example, ^{14}C dating is not yet as precise as most of us would like. It may not ever be, just because of the nature of conventional radiocarbon dating, especially when compared to very precise tree-ring dating techniques. I want to further explore the nature of radiocarbon dating and some of the methods I've mentioned for improving its precision, using ^{14}C ages recently obtained from the Baker Archaeological Site.

WHEN DID FREMONT PEOPLE LIVE AT BAKER?

This is one of the primary research questions guiding work at the Baker site (Wilde et al. 1991; Wilde 1992). A review of all available radiocarbon ages from Fremont area permanent habitation structures was recently reported (Talbot and Wilde 1989). One of the conclusions we made was that

Table 1. Radiocarbon Ages from the Baker Site, Eastern Nevada

Season	Beta Lab Number	Material	^{14}C Age B.P. ± 1s	$^{13}C/^{12}C$	^{13}C Adjusted Age
1990	40062	Corn	760 ± 60	-11.5 0/00	980 ± 60 B.P.
1991	47069	Charcoal	890 ± 70	-26.5 0/00*	866 ± 72 B.P.
1991	47070	Charcoal	970 ± 70	-26.5 0/00*	946 ± 72 B.P.
1991	47071	Charcoal	820 ± 50	-26.5 0/00*	796 ± 52 B.P.
1991	47073**	Charcoal	890 ± 60	-26.5 0/00*	866 ± 62 B.P.
1991	47074	Charcoal	840 ± 70	-26.5 0/00*	816 ± 72 B.P.
1992	56190	Corn	570 ± 70	-14.2 0/00	740 ± 70 B.P.
1992	56191	Corn	480 ± 60	-11.8 0/00	690 ± 60 B.P.
1992	56192	Corn	570 ± 100	-15.2 0/00	730 ± 100 B.P.
1992	56193	Charcoal	910 ± 80	-26.5 0/00	880 ± 80 B.P.

* Not ^{13}C adjusted by lab; Beta 56193 charcoal ^{13}C adjustment used as standard for calculating ^{13}C adjustment for these 1991 charcoal assays; adjusted by CALIB Rev3 (Stuiver and Becker 1993; Stuiver and Reimer 1993).

** Beta 47072 too small to assay with conventional methods.

Fremont peoples appeared to have spread out at various times from a cultural core area along the Great Basin/Colorado Plateau Transition Zone. This area is essentially the Wasatch Range and its western, and some eastern, slopes from the Idaho border to the Parowan Valley. The period of maximum geographical expansion of Fremont pithouses seems to have been between A.D. 1040 and 1190, the time proposed for the Garrison, Utah/Nevada Fremont occupation. Because the Garrison site is only about seven miles south of Baker, we believed that the Baker site should have been occupied during the same period. Can we show that it was?

Radiocarbon Ages from Baker

Ten radiocarbon ages were returned from samples collected from the Baker Site (Table 1). The 1990 age at the top of the table was obtained from corn remains found near the bottom of a meter-deep test pit dug during the site-testing phase of the project. We later found that this test pit penetrated an ancient pit with corn and other trash that was dug into the fill inside a pithouse (Structure PH SW-A). No more than the northeastern corner of this pithouse has been explored, so we have no further information about its relation to the corn sample. The Beta-40062 ^{14}C age has been adjusted for fractionation using the ratio of ^{13}C to ^{12}C in the corn samples. This produced an adjusted age of 980 ± 60 B.P.. The table shows this to be the oldest age from the site, with a calibrated age of A.D. 1023, and a two-sigma range of A.D. 901–1207, as shown on Table 2 (all calibrations from CALIB Rev3 [Stuiver and Reimer 1993], using the A10 curve). This single date seems to support the hypothesis of Fremont occupation during the eleventh and twelfth centuries. It also suggests an earlier occupation, since the corn sample was from a pit excavated into the fill of an older pithouse. What of the other ages obtained in 1991 and 1992?

Table 1 shows the suite of ages on charcoal obtained in 1991. These ages were not ^{13}C adjusted by Beta Analytic, Inc., but are shown with this adjustment having been calculated by CALIB Rev3 using the $^{13}C/^{12}C$ ratio value (-26.5 parts per mil, 0/00) obtained from the 1992 charcoal sample Beta-56193. This procedure may more accurately reflect the true age of the charcoal samples taken from the site in 1991 (Jerry Stipp, personal communication 1992).

Table 2. Calibrated Ages of Baker Village ^{14}C Assays*

Beta Lab Number Material	^{13}C Adjusted Age	Calibrated Age(s)	2 Sigma Range	Highest Probable Range(s)	Relative Probability
40062 corn	980 ± 60	A.D. 1023	A.D. 901–1207	A.D. 976–1194	95% (2sigma)
47070 charcoal	946 ± 72	A.D. 1034, 1143, 1148	A.D. 900–1259	A.D. 976–1259 A.D. 1016–1161	98% (2sigma) 92% (1sigma)
56193 charcoal	880 ± 80	A.D. 1161, 1185	A.D. 992–1279	A.D. 1017–1264	97% (2sigma)
47073 charcoal	866 ± 62	A.D. 1164, 1170, 1190	A.D. 1000–1279	A.D. 1023–1264	99% (2sigma)
47069 charcoal	866 ± 72	A.D. 1164, 1170, 1190	A.D. 996–1281	A.D. 1020–1277	100% (2sigma)
47074 charcoal	816 ± 72	A.D. 1221	A.D. 1022–1296	A.D. 1023–1285	99% (1sigma)
47071 charcoal	796 ± 52	A.D. 1233, 1237, 1256	A.D. 1040–1284	A.D. 1189–1278 A.D. 1149–1285	93% (1sigma) 84% (2sigma)
56190 corn	740 ± 70	A.D. 1277	A.D. 1159–1390	A.D. 1209–1303 A.D. 1154–1332	93% (1sigma) 86% (2sigma)
56192 corn	730 ± 100	A.D. 1278	A.D. 1039–1413	A.D. 1150–1410 A.D. 1190–1330	90% (2sigma) 83% (1sigma)
56191 corn	690 ± 60	A.D. 1281	A.D. 1220–1398	A.D. 1260–13237 A.D. 1220–1333	75% (1sigma) 68% (2sigma)

*(Calibrated with CALIB Rev3 using decadal curve A10 [Stuiver and Becker 1993; Stuiver and Reimer 1993].)

The suite of ages obtained in 1992 comprises three corn samples and one charcoal sample, as shown in the table (please refer to Figure 2 for sample locations). The corn remains consisted of cobs and cob parts found on the floor of a deep square pithouse (Structure PH SE-A; Date Beta-56190), the floor of an adjacent surface storage structure (SSS SE-A; Beta-56192), and in a thin sheet midden and use surface on the eastern side of the site, north of, and adjacent to the pithouse and storage structure (SM-E; Beta-56191). Stratigraphically and structurally these surfaces appear to be contemporary features. Table 1 shows their ^{13}C adjusted ages to be very close to one another, and Table 2 shows that their calibrated ages fall between A.D. 1277 and 1281 with ranges primarily in the thirteenth century. These data suggest the hypothesis of eleventh and twelfth century Fremont expansion cannot be supported.

The ^{13}C adjusted charcoal ages from 1991 and 1992 shown on Tables 1 and 2, all appear to be earlier than the three 1992 corn dates. Beta-56193, on charcoal in the hearth of the deep PH SE-A pithouse, dates to around 880 B.P., with two calibrated ages of A.D. 1161 and A.D. 1185. These are both significantly earlier than the calibrated corn age of around A.D. 1277 from the floor of the same structure. Beta-47071, from hearth charcoal in the later oval-shaped PH SE-B pithouse built into the depression created by the collapse of the deep square PH SE-A structure, yielded an adjusted age around 790 B.P., with a calibrated age of A.D. 1257. This inverts the stratigraphy, as it is slightly older than the corn from the floor of the deeper PH SE-A pithouse, located directly below the more recent PH SE-B sample. However, the PH SE-B pithouse age is in the correct stratigraphic relation to the charcoal age (Beta-56193) from the earlier PH SE-A structure. Which ages do we believe?

Beta-47070 produced an adjusted age of around 946 B.P., on charcoal from a small hearth just below the modern surface west of the deep PH SE-A pithouse. The calibrated ages on this sample are A.D. 1034, A.D. 1143, and A.D. 1148 with a range spanning three

centuries. The stratigraphic position of this hearth suggests it is related in time to the PH SE-B pithouse, although its calibrated ages seem to be much earlier. Beta-47073 is from a small hearth on the most recent use surface within the large mud-walled surface structure called CSS-A. It produced a charcoal age adjusted to around 866 B.P., with calibrated ages of A.D. 1164, 1170, and 1190. This age range is identical to that of Beta-47069, on charcoal from a small hearth adjacent to the exterior of the south wall of CSS-A. Stratigraphically, the hearths producing Beta-47070, Beta-47073, and Beta-47069 appear to be very close to the same age. The stratigraphic location of the Beta-47071 hearth sample, in the shallow PH SE-B pithouse, suggests it should fit well within this group representing the latest uses of the site.

Beta-47074 produced an adjusted age on charcoal of around 816 B.P., with a calibrated age of A.D. 1221. This sample is from a hearth on the primary, therefore deepest, floor in the large surface structure CSS-A. The stratigraphy is again inverted, as this age is somewhat more recent than the stratigraphically higher age of 866 B.P., calibrated to A.D. 1164 and 1190 (Beta-47073), from a floor about 50 cm above the primary floor of the structure. One of these ages must be incorrect. Which do we choose?

Finding a Date

The discussion of ages describes three instances of stratigraphic inversion: First, the hearth in the upper, later pithouse PH SE-B is dated somewhat earlier than the corn from the floor of the PH SE-A pithouse directly below. Second, the age of the most recent floor in CSS-A is somewhat earlier than the age of the primary floor about 50 cm deeper in the same structure. Third, a small exterior hearth near the modern surface of the site is stratigraphically related to the PH SE-B pithouse but is dated much earlier than even the PH SE-A pithouse below PH SE-B. What is going on here? In addition, the suite of charcoal ages is earlier than the three corn dates from use surfaces at the site. In one case, that of the floor of PH SE-A, the charcoal age is considerably earlier than the corn age from the same structure. And, the corn age from the 1990 testing is much earlier than the other ages from the site. How do we make sense of these results?

One way is to look at the layout of the site itself. The mud-walled architecture, the generally similar alignment, and the tight clustering of the known structures suggest that they were all built and used at the same time. Most or all of the primary structures (this excludes PH SE-B and the upper floor of CSS-A) may have been built at the same time. The stratigraphy also suggests that some time passed between the collapse or dismantling of the lower PH SE-A, and the construction of the less formal upper PH SE-B that was built into the earlier pithouse depression. The CSS-A structure was also re-used, at least four times, but we have ages on only the lowermost and uppermost floors. It would make sense that the use of the uppermost floor in CSS-A corresponded to the use of the upper PH SE-B pithouse. So, I think we can say that the site was used for a relatively long time, although this may not have been the result of continuous occupation. The puzzle of the radiocarbon ages can be boiled down to three questions: When did the occupations begin? When did they end? Do we have enough information to answer these questions?

The earlier radiocarbon discussion suggested that better ^{14}C age determinations can be obtained from organic materials with short lives. Smiley (1985:71) places corn remains into the highest quality category (category 1) for dating materials. Charcoal collections from hearths, even those collected with a goal of retrieving only small twig-like pieces as at the Baker site, are in his category 5 (of seven categories) for quality in providing accurate age determinations. The corn ages from the site are, therefore, likely to be much more accurate than the charcoal ages. From the four corn ages, we could argue that the site was first occupied before A.D. 1023 and last occupied sometime after A.D. 1277. This is most likely a highly accurate interpretation. But, we would like to have more precise information.

Tests of Contemporaneity and Weighted Averages

Existing data can tell us little more about the 1990 test pit age, as we have yet to excavate the PH SW-A pithouse and its fill into which the corn sample seems to have been intruded. For now, I will assume that the Beta-40062 corn age is accurate and dates an early occupation. The three 1992 corn ages, however, may have more to tell us. These ages are statistically equivalent (synchronous) at a level above 95% probability ($X^2 = 5.99 > 0.32$ (0.05) [CALIB Rev3 chi-squared test of significance based on Ward and Wilson 1978]). The averages of these three and other compared ages is shown on Table 3. The corn age average is 714 ± 41 B.P., which calibrates to A.D.

Table 3. Calibrated Pooled Mean Ages

Description	Pooled Mean Age	Calibrated Age(s)	2 Sigma Range	Highest Probable Range(s)	Relative Probability
All 1991/1992 dates	811 ± 23	A.D. 1223	A.D. 1161–1276	A.D. 1213–1258	100% (1sigma)
All 1992 corn dates	714 ± 41	A.D. 1279	A.D. 1224–1385	A.D. 1257–1301 A.D. 1218–1322	91% (1sigma) 88% (2sigma)
All charcoal dates	853 ± 27	A.D. 1194, 1199, 1207	A.D. 1045–1258	A.D. 1157–1224	100% (1sigma)

1279, with a high probability range of A.D. 1257–1301 at one sigma. The two-sigma high probability range is A.D. 1218–1322. This latter age range suggests that the last use of the pithouse PH SE-A, the SSS SE-A storage structure, and the SM-E sheet midden use surface occurred between A.D. 1218 and A.D. 1322. The one-sigma range, which may not be as accurate, suggests that perhaps we can refine the time of occupation to the latter half of the thirteenth century.

A test of the autonomy of all ten ages from the site shows that they are statistically different at a 95% level ($X^2 = 16.90 < 18.37$ [0.05]). Removing the 1990 corn age, however, indicates that this early age contributed to the statistical difference. All nine remaining ages from 1991 and 1992, are statistically equivalent at the 95% level ($X^2 = 15.50 > 11.47$ [0.05]). The average of these ages is shown on Table 3: 811 ± 23 B.P., with a calibrated age of A.D. 1223, and a high probability range of A.D. 1213–1276, during the thirteenth century.

All six charcoal ages are also equivalent above a 95% level ($X^2 = 11.10 > 3.32$ [0.05]). These ages average to 853 ± 27 B.P., with calibrated ages of A.D. 1194, 1199, and 1207, and a high probability range between A.D. 1157–1258. These data suggest the occupation occurred during the last half of the twelfth and first half of the thirteenth centuries.

In sum, an early corn age suggests an occupation during the eleventh and twelfth centuries. No other data bear on this question. The suite of another nine ages from the site, three on corn, and six on charcoal from hearths, suggests the major occupation occurred during the first three-fourths of the thirteenth century. The suite of six charcoal ages suggest the occupation occurred earlier, during the last half of the twelfth and the first half of the thirteenth centuries. The three corn ages from primary surfaces suggest the occupation was during the last half of the thirteenth century. The ranges overlap, but appear to be significantly different in regard to the Fremont expansion and contraction model proposed by Talbot and Wilde (1989).

The Age of the Site

In terms of the Talbot and Wilde (1989) model, what are the dates of the permanent habitation structures at the site? The pooled age of all 1991 and 1992 excavation ages suggests occupation during Period 5 (A.D. 1190–1250), when we proposed a major Fremont retraction to the southern core area (Talbot and Wilde 1989:12, Figure 7). These data from Baker would suggest that the upper Snake Valley was also part of what could be considered a core area where permanent habitation structures persisted through whatever forces contributed to the apparent abandonment of the wider Fremont area. On the other hand, assuming that the 1992 corn ages are the most accurate, and that all, or most of the charcoal ages are too early because of old wood, the major occupation appears to have occurred during the last half of the thirteenth century. This is Period 6 (A.D. 1250–1350), when we saw an apparent renewed expansion of Fremont permanent habitation structures primarily in the eastern Great Basin and the western half of the Great Basin/Colorado Plateau Transition Zone (Talbot and Wilde 1989:12, Figure 8). The suite of corn ages from the pithouse, the surface structure, and the exterior use surface fits well within this part of the model.

What if we assumed the charcoal ages were all correct, and that the corn dates were not? The suite of charcoal ages suggests occupation during both Period 4 (A.D. 1040–1190) and Period 5 (A.D. 1190–1250), although we probably could argue that most of the occupation occurred in the latter part of Period 4, based on the model. Period 4 is the time of the widest apparent expansion of Fremont permanent habitation structures (Talbot and Wilde 1989:9–10, Figure 6). It is also the period into which more radiocarbon ages fall than in any other segment of time in Fremont prehistory. The charcoal ages from Baker fit fairly well into this pattern.

Which ages, or suites of ages, do we choose? In terms of the last of the three questions previously posed, do we have enough evidence to decide when occupation began and ended at the Baker site? I think we do have sufficient evidence to make educated suggestions. The 1990 corn age may indicate that Baker was occupied as early as A.D. 1000. However, what this sample is actually dating is unclear and determining its context and its relation to occupation at the site will require more work.

The major occupation consists of the contiguous and substantial semi-subterranean and surface structures shown on Figure 2. All radiocarbon ages, except perhaps the 1990 corn age, relate to occupations and uses of these structures. The evidence we have now suggests that the terminal uses of these major features occurred during the last half of the thirteenth century. I think this is strong evidence because it comes from the high-quality, pooled-corn sample age. When these structures were built is more problematic. I propose the early A.D. 1200s, the distant part of the nine-age, high-probability calibrated range, for the construction of these features.

Why? I think most of the charcoal age samples contained old wood, but the average of all nine ages is likely to compensate for this in that the corn ages bring the average into more recent times. The hearth samples probably mixed old wood with occupation-contemporaneous wood, a very common problem (Smiley 1985). However, the resultant individual hearth-sample ages are likely to be averages near the mid points of the ages of wood mixed in the hearths. The average of the nine-age, pooled sample brings the charcoal ages much closer to the recent ends of their calibrated ranges, possibly compensating for the mix of old and new wood. This puts my proposed range of major occupation mostly within the thirteenth century.

Some other considerations: The proposed terminal age is what I believe now to be the end of the occupation that created and used the original contiguous structures. This is not the terminal age for occupation of the site, since the CSS-A large surface structure was re-used, and the PH SE-B upper pithouse was built in the depression over the original PH SE-A pithouse. If the major, primary use of the site ended near the end of the thirteenth century, when did the later CSS-A and PH SE-B occupations occur? The answer is not clear, but the charcoal from these features provided ages that are not statistically different from charcoal samples of the earlier features. Some time elapsed after the PH SE-A occupation to allow for accumulation of wind-blown and water-born sediments in the depression over the collapsed pithouse. PH SE-B was built over these sediments. The length of the intervening period is not discernable yet by radiocarbon aging, but I suspect that the actual date is in the first half of the fourteenth century. The upper, more recent pithouse contained relatively few Fremont sherds but did contain two fingernail impressed sherds on its use surface. These may be very late Fremont ceramics, or they may be related to early Late Prehistoric ceramics. Obviously more work is needed to answer such questions.

CONCLUSIONS

After all this discussion, how do we go about finding accurate and precise dates with radiocarbon assay? Some suggestions: First, I think we should no longer use hearth charcoal as our material of choice for dating features and sites in **excavated** contexts. Charcoal in **testing** contexts remains viable, since we are usually looking for indications of age ranges, rather than precision for comparison. Second, very much care in selection of materials should allow us to find something other than hearth charcoal in most contexts that will give a good and relevant age determination. Short-lived plants are one answer. We may find that some charcoal pieces or other remains in hearths or other contexts are identifiable, and collectable, as short-lived plant samples for dating. Sufficient material for conventional radiocarbon ages may not be attainable. In these cases, it might be useful to consider buying a few Accelerator Mass Spectrometer (AMS) age assays rather than several conventional ^{14}C assays. AMS dating should also allow us to obtain age assessments on relevant artifacts in primary contexts, and with careful use, should also

provide more precision in radiocarbon dating and calibration. Finally, using suites of carefully selected ages from relevant stratigraphic and other site contexts should allow more thoughtful use of radiocarbon age assessments than we may be used to. At least the use of suites of carefully selected ages will give us much to think about, as have the ten ^{14}C ages from the Baker Fremont Site.

In conclusion, radiocarbon age assays are useful, if often vague, indications of past human behavior. Carbon-13 adjustments, calibration, and the appropriate averaging of suites of ages may give us more precision than we have obtained from radiocarbon assay in the past. The ten assays from the Baker site, four on corn, and six on hearth charcoal, suggest several conclusions:

1. The earliest use of the site might have occurred in the eleventh or twelfth century.
2. The construction and use of the major structures at the site may have occurred during the early thirteenth century, with the last use of one deep pithouse, associated storage structure, and nearby use surface, and by extension, all the major structures at the site, having occurred between A.D. 1250 and 1300.
3. Later re-use of the site seems to have occurred an unknown number of years after these structures were abandoned, possibly well into the fourteenth century.
4. Radiocarbon age assessment is not as precise as we would like, but I think we can use it more carefully to increase its precision. The selection of short-lived plant materials over pooled charcoal hearth samples is one step toward greater precision. The use of carefully selected samples for AMS assessments might be another. Careful selection and interpretation of suites of conventional and AMS ages will provide more precision.
5. Finally, even with the use of carefully selected suites of radiocarbon age assessments, results are often confusing and thought provoking. But, I think the almost yearly refinements in calibration and precision will eventually help to dispel the confusion and provoke more accurate thoughts.

I have attempted to reveal some of the thoughts provoked by the Baker Fremont Site ages, and how I interpret them at this moment. Future work at the site is designed to more fully address some of the hypotheses and questions raised by the ages and by the discussions and proposals herein.

NOTE

1. By convention, the half-life used for radiocarbon age assessment in most laboratories is 5,568 years, the decay-rate estimated by Willard Libby in 1949, and not the more recently established accurate half-life of 5,730 years. The difference is accounted for in calculating elapsed time, so the convention has little effect on the accuracy of ^{14}C age determinations.

ACKNOWLEDGMENTS

I thank Bob Kohl and Joel Janetski for suggesting I write this article on radiocarbon age determinations. Joel's support and wisdom have helped me in countless situations over the past eleven years. Paula Reimer at the Quaternary Isotope Lab in Seattle provided me with suggestions, information, and a pre-release copy of CALIB Rev 3. Jerry Stipp, of Beta Analytic, Inc., offered advice as he patiently listened to some of my ideas. David Madsen, Bob Kohl, and Joel Janetski provided comments on earlier drafts. Tuula Rose drafted the figures. I also thank the many fine people in the Ely District of the Bureau of Land Management who support the Baker Project under Assistance Agreement No. F040A20003. Special thanks to Mark Henderson, Hal Bybee, Michele Myette, Jerry Smith, Brian Amme, Terry Walker, Sean Pitts, Reed Soper, and Steve Robertson. The continuing support of the Department of Anthropology and the College of Family, Home, and Social Sciences at BYU is also gratefully acknowledged. Best wishes to all the students and volunteers who participated in the 1991 and 1992 field schools at Baker, Nevada.

REFERENCES CITED

Becker, Bernd
1993 An 11,000 Year Long German Oak and Pine Dendrochronology for Radiocarbon Calibration. *Radiocarbon*, in press.

Becker, Bernd, B. Kromer, P. Trimborn
1991 A Stable Isotope Tree-Ring Timescale of the Late Glacial/ Holocene Boundary. *Nature* 353:647–649.

Berry, Michael S.
1982 *Time, Space, and Transition in Anasazi Prehistory*. University of Utah Press, Salt Lake City.

Burleigh, Richard, D. Mathews, and M. M. Leese
1984 Consensus ^{13}C Values. *Radiocarbon* 26:46–53.

Clark, R. M.
1975 A Calibration Curve for Radiocarbon Dates. *Antiquity* 49:251–266.

Damon, Paul E., C. W. Fergusson, Austin Long, and E. I. Wallick
1974 Dendrochronological Calibration of the Radiocarbon Time Scale. *American Antiquity* 39:350–366.

Damon, Paul E., and T. W. Linick
1986 Geomagnetic-Geliomagnetic Modulation of Atmospheric Radiocarbon Production. *Radiocarbon* 28:266–278.

Damon, Paul E., J. C. Lerman, and Austin Long
1978 Temporal Fluctuations of Atmospheric ^{14}C: Causal Factors and Implications. *Annual Review of Earth and Planetary Science* 6:457–494.

de Vries, Hessel
1959 Measurement and Use of Natural Radiocarbon. In *Researches in Geochemistry*, edited by P. H. Abelson, pp. 169–189. John Wiley and Sons, New York.

Grey, D. C., and Paul E. Damon
1970 Sunspots and Radiocarbon Dating in the Middle Ages. In *Scientific Methods in Medieval Archaeology*, edited by Rainer Berger, pp. 167–182. University of California Press, Berkeley.

Klein, J., J. C. Lerman, Paul E. Damon, and T. Lincik
1980 Radiocarbon Concentration in the Atmosphere: 8000 Year Record of Variation in Tree-Rings. *Radiocarbon* 22:950–961.

Klein, J., J. C. Lerman, Paul E. Damon, and Elizabeth K. Ralph
1982 Calibration of Radiocarbon Dates: Tables Based on the Consensus Data of the Workshop on Calibrating the Radiocarbon Time Scale. *Radiocarbon* 24:103–150.

Kromer, B., and Bernd Becker
1993 German Oak and Pine ^{14}C Calibration, 7200 B.C.–9400 B.C. *Radiocarbon*, in press.

Libby, Willard F.
1973 Radiocarbon Dating, Memories and Hopes. In *Proceedings of the 8th International Radiocarbon Conference*, compiled by T. A. Rafter and T. Grant-Taylor, pp. xxvii–xliii. Royal Society of New Zealand, Wellington.

Long, Austin, and Bruce Rippeteau
1974 Testing Contemporaneity and Averaging Radiocarbon Dates. *American Antiquity* 39:205–215.

Pearson, Gordon W., Bernd Becker, and F. Qua
1993 High-Precision ^{14}C Measurement of German Oaks to Show the Natural ^{14}C Variations from 7890 to 5000 B.C.. *Radiocarbon*, in press.

Polach, Henry A.
1976 Radiocarbon Dating as a Research Tool in Archaeology: Hopes and Limitations. In *Ancient Chinese Bronzes and Southeast Asian Metal and Other Archaeological Artifacts*, edited by N. Barnard, pp. 255–298. National Gallery of Victoria, Victoria, B.C.

Ralph, Elizabeth K., Henry N. Michael, and Mark C. Han
1973 Radiocarbon Dates and Reality. MASCA Newsletter 9:1–20.

Smiley, Francis E., IV.
1985 *The Chronometrics of Early Agricultural Sites in Northeastern Arizona: Approaches to the Interpretation of Radiocarbon.* Ph.D. dissertation. University of Michigan. University Microfilms, Ann Arbor.

Stuiver, Minze
1970 Long-Term C14 Variations. In *Radiocarbon Variations and Absolute Chronology*, edited by I. U. Olsson, pp. 197–213. Almqvist and Wiksell, Stockholm.
1982 A High-Precision Calibration of the A.D. Radiocarbon Time Scale. *Radiocarbon* 24:1–26.
1992 High-Precision Radiocarbon Age Calibration. Paper Presented at the 12th Biennial Meeting, American Quaternary Association, University of California, Davis, August 1992.

Stuiver, Minze, and Bernd Becker
1993 High-Precision Decadal Calibration of the Radiocarbon Time Scale A.D. 1950–6000 B.C. *Radiocarbon*, in press.

Stuiver, Minze, and T. F. Braziunas
1993 Modeling Atmospheric ^{14}C Influences and Radiocarbon Ages of Marine Samples back to 10,000 B.C. *Radiocarbon*, in press.

Stuiver, Minze, T. F. Braziunas, Bernd Becker, and B. Kromer
1991 Climatic, Solar, Oceanic, and Geomagnetic Influences of Late-Glacial and Holocene Atmospheric $^{14}C/^{12}C$ Change. *Quaternary Research* 35:1–14.

Stuiver, Minze, and Gordon W. Pearson
1993 High-Precision Bi-Decadal Calibration of the Radiocarbon Time Scale, A.D. 1950–500 B.C., and 2500–6000 B.C. *Radiocarbon*, in press.

Stuiver, Minze, and Henry A. Polach
1977 Discussion: Reporting of ^{14}C Data. *Radiocarbon* 19:355–363.

Stuiver, Minze, and Paula J. Reimer
1986 A Computer Program for Radiocarbon Age Calibration. *Radiocarbon* 28:1022–1030.
1992 CALIB User's Guide: Rev 3.0 (Draft). Quaternary Isotope Lab, University of Washington, Seattle.

1993 Extended ^{14}C Database and Revised CALIB Radiocarbon Calibration Program. *Radiocarbon*, in press.

Stuiver, Minze, and H. E. Suess

1966 On the Relationship Between Radiocarbon Dates and True Sample Ages. *Radiocarbon* 8:534–540.

Suess, H. E.

1965 Secular Variations of the Cosmic-Ray Produced Carbon 14 in the Atmosphere and Their Interpretations. *Journal of Geophysical Research* 70:5937–5951.

1970 Bristlecone-Pine Calibration of Radiocarbon Time 5200 B.C. to Present. In *Radiocarbon Variations and Absolute Chronology*, edited by I. U. Olsson, pp. 303–312. Almqvist and Wiksell, Stockholm.

1979 A Calibration Table for Conventional Radiocarbon Dates. In *Radiocarbon Dating*, edited by R. Berger and H. E. Suess, pp. 777–784. University of California Press, Berkeley.

1980 Radiocarbon Geophysics. *Endeavor* 4:113–117.

Talbot, Richard K., and James D. Wilde

1989 Giving Form to the Formative: Shifting Settlement Patterns in the Eastern Great Basin and Northern Colorado Plateau. *Utah Archaeology 1989* 2(1):3–18

Taylor, Richard E.

1987 *Radiocarbon Dating: An Archaeological Perspective*. Academic Press, Orlando.

Thomas, David H.

1989 *Archaeology*. 2nd Edition. Holt, Rinehart and Winston, Fort Worth.

1991 *Archaeology: Down to Earth*. Harcourt, Brace, Jovanovich College Publishers, Orlando.

Ward, G. K., and S. R. Wilson

1978 Procedures for Comparing and Combining Radiocarbon Age Determinations: A Critique. *Archaeometry* 20:19–31.

Wilde, James D.

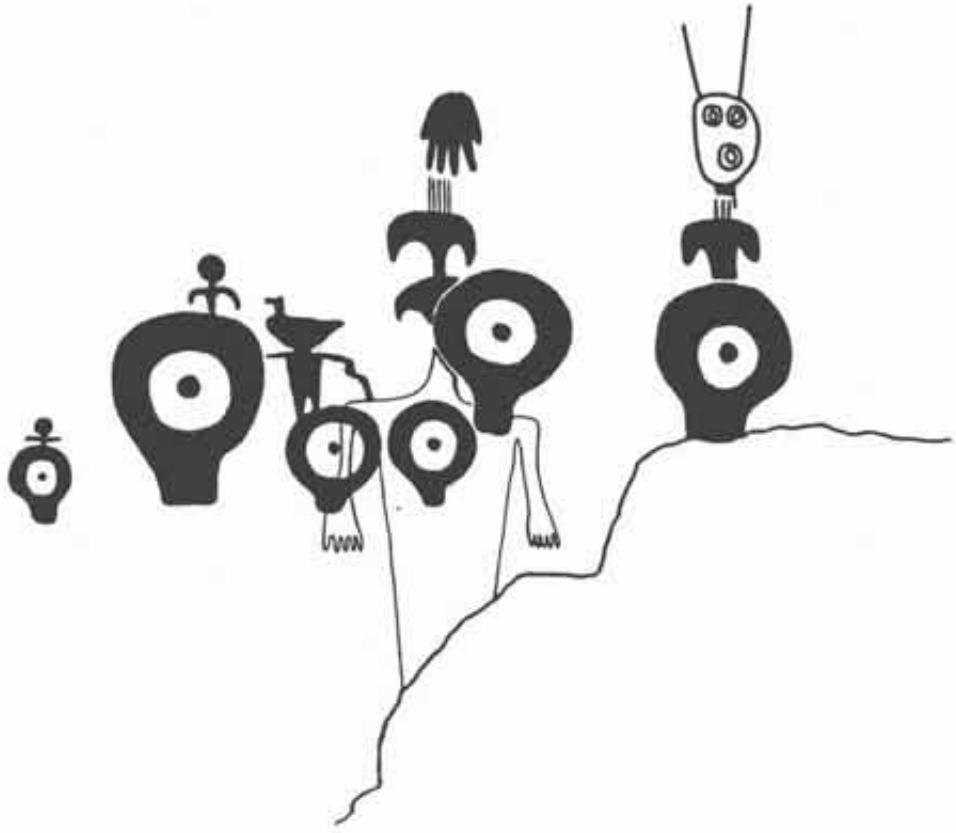
1992 *Snake Valley Archaeological Project, Baker Field School 1992 Technical Application*. Submitted to the Bureau of Land Management, Ely District Office, Ely, Nevada.

Wilde, James D., and Deborah E. Newman

1989 Late Archaic Corn in the Eastern Great Basin. *American Anthropologist* 91:712–720.

Wilde, James D., Lane D. Richens, Scott E. Billat, and Richard K. Talbot

1991 *Snake Valley Archaeological Project, 1991 Baker Field School Research Design*. Museum of Peoples and Cultures Technical Series No. 91-9. Brigham Young University, Provo.



THE FREMONT: A VIEW FROM SOUTHWEST WYOMING

Craig S. Smith, Mariah Associates, Inc., 605 Skyline Drive, Laramie, Wyoming 82070

ABSTRACT

Examining the archaeological record at the boundary between traditional archaeological cultures, especially those of different subsistence adaptations, can provide new insights concerning cultural behavior. Archaeological excavations at 48Ut199 and 48Sw97 have provided an opportunity to examine the relationship between the partly horticultural Fremont of the northern Colorado Plateau and eastern Great Basin, and the hunters and gatherers of southwest Wyoming during the Late Prehistoric period (1,500–650 B.P.). Investigations at these and other sites in southwest Wyoming have yielded apparent Fremont pottery together with the remains of typical southwest Wyoming hunter and gatherer campsites. These sites may represent camps of hunters and gatherers coming into the southwest Wyoming area from the south and west to obtain food, especially bison. The information from southwest Wyoming provides additional evidence concerning the diversity of the Fremont and suggests that fairly mobile hunting and gathering was included among the wide range of adaptive strategies followed by the Fremont.

INTRODUCTION

An important avenue of research in archaeology is the exploration of the relations among coexisting societies, especially ones of different subsistence adaptations (Trigger 1989). This research could provide clues about how cultures change and insights concerning human behavior. To obtain some understanding of how past societies interacted, the archaeological record at the boundary between two traditional archaeological cultures can be examined. One such boundary occurs between the partly horticultural Fremont of the northern Colorado Plateau and eastern Great Basin, and the hunters and gatherers of southwest Wyoming dating between approximately 1,500 and 650 B.P.

The Fremont lived in an area of considerable environmental variety, and thus, a tremendous amount of diversity in cultural remains and modes of subsistence is evident across the area (Madsen 1989). Because of this diversity, numerous attempts have been made to classify the Fremont (Anderson 1983). In the 60 years since Morss (1931) first defined the Fremont, the area has been subdivided into two to five variants depending on the attributes used (e.g., Steward 1933; Wormington 1955; Ambler 1966; Marwitt 1970; Madsen and Lindsay 1977). One of the more popular classification schemes is the one proposed by Marwitt (1970) which divides the area into five variants. The variants adjacent to southwest Wyoming are the Uinta and Great Salt Lake (Figure 1). Some of the more well-known sites for these two variants are shown in Figure 1. Recent research has moved away from classification attempts and toward understanding Fremont diversity and variation (Madsen 1989; Simms 1990). Through the delineation of the variations of Fremont settlement and subsistence, a clearer picture will develop of the behavior of the prehistoric peoples of the area.

One of the major artifact categories used to identify archaeological sites as Fremont is gray pottery (Madsen 1989). Though rare, apparent Fremont gray ware has been found at archaeological sites of the hunters and gatherers in southwest Wyoming, an area of large, high, sagebrush-covered intermountain basins. Other remains, usually considered Fremont traits in Utah, that are occasionally found in southwest Wyoming include Rosegate and Uinta Side-notched projectile points, Utah metates and elaborate two-handed manos, bone gaming pieces and bone disk beads, and a few granaries (Metcalf 1988). However, most of these traits are not exclusively Fremont. Only sites with pottery identified as similar to Fremont types are discussed in this paper. No systematic study of the small sample of pottery sherds from these sites has been conducted and much variation appears to exist in the sample.

Archaeological sites with Fremont pottery in southwest Wyoming were first recorded by Day and Dibble (1963) during cultural resource inventories for the Flaming Gorge Reservoir Area in the early 1960s. Fremont pottery sherds were also recovered from the upper layers of the Pine Spring site in the 1960s (Sharrock 1966). Since that time, apparent Fremont pottery sherds have been found on a few sites during

UTAH ARCHAEOLOGY 1992
pp. 55–75

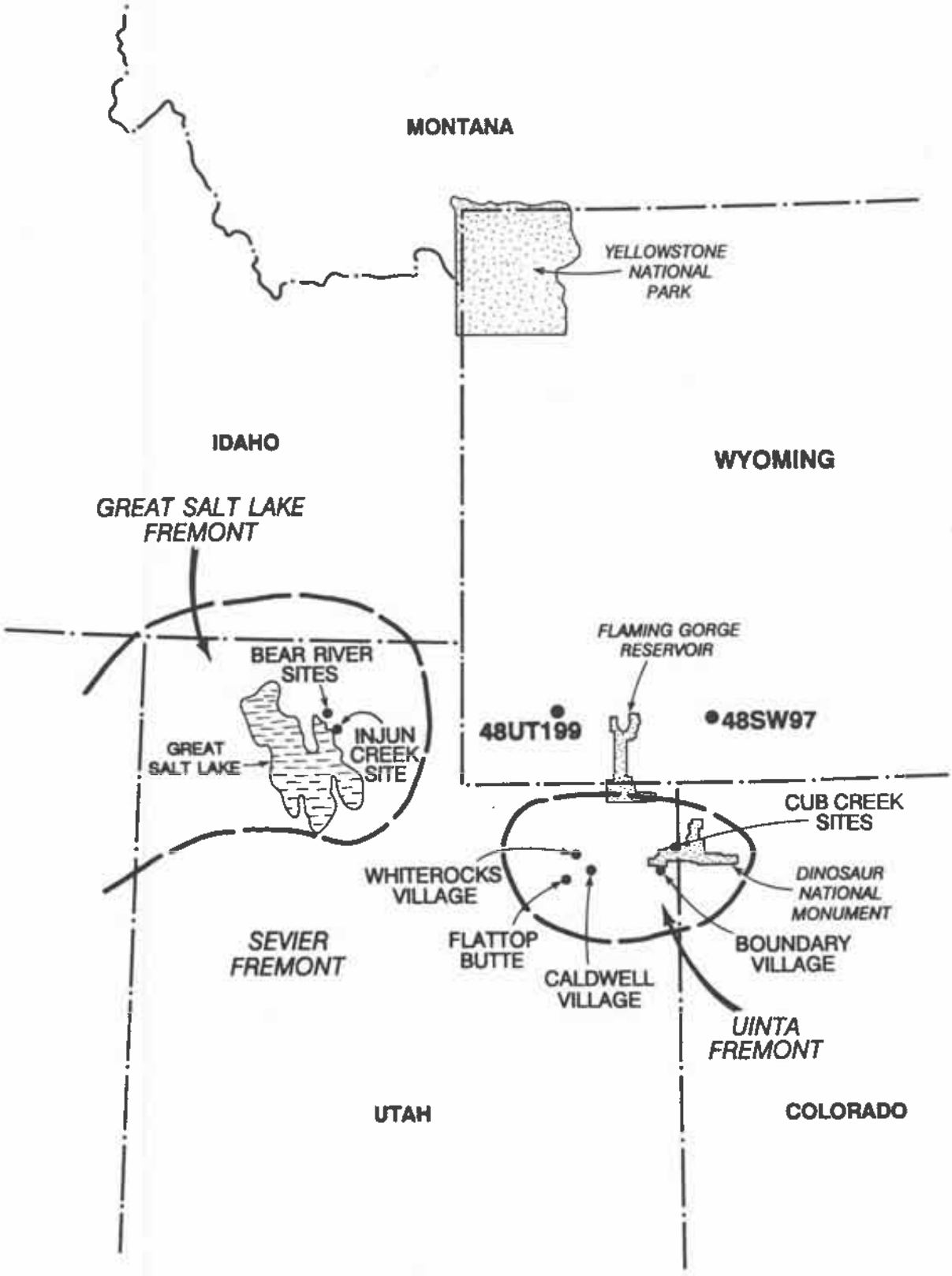


Figure 1. Location of the Great Salt Lake and Uinta Fremont variants (after Marwitt 1970) and sites 48Ut199 and 48Sw97 in southwest Wyoming.

inventories, some of which have been excavated or tested. The recovery of Fremont sherds at these sites indicates some sort of relationship between the hunters and gatherers of southwest Wyoming and the Fremont groups to the south and west in Utah and Colorado, although the nature of this relationship is unknown.

The excavation by Mariah Associates, Inc., over the past several years of two Late Prehistoric period hunter and gatherer sites, 48Ut199 and 48Sw97, in southwest Wyoming containing possible Fremont pottery sherds provided an opportunity to examine the relationships between the hunters and gatherers of southwest Wyoming and the Fremont. This paper first summarizes the results of excavations at 48Ut199 and 48Sw97, discusses other sites in southwest Wyoming, and finally, makes comparisons with Fremont sites in northern Utah. These comparisons allow for preliminary suggestions concerning the relationship of the hunters and gatherers of the area and the partly horticultural Fremont, and, thereby, also facilitates a better understanding of the diversity of Fremont adaptations. This paper builds on Metcalf's (1988) discussion of Fremont influences in southwest Wyoming, summarizes much of the available information, and provides suggestions to stimulate additional research and discussion.

SITE 48UT199

Site 48Ut199 is situated along several kilometers of an upland, sagebrush-covered terrace about 2.5 km east of the Blacks Fork River (Batterman and Smith 1989). It is about 0.5 km west of Church Butte, the dominant topographic feature in the area. Several areas of this large site have been excavated over the past 10 years, yielding occupation layers dating to several periods in the prehistory of the area (Schroedl 1985).

The excavations discussed here consisted of a 4 m x 5 m block located within an AT&T fiber optic cable right-of-way. The excavations yielded the remains of a single, relatively intact occupation layer with a radiocarbon age of 930 ± 70 years B.P. (TX-6314). The sediment in the excavation block consisted of shallow aeolian deposits overlying a weathered sandstone/mudstone colluvium.

Two cultural features were encountered during the excavations (Figure 2). Both were large, shallow, irregular-shaped pits containing fire-cracked rock, debitage, and bone. Feature 1 was approximately 1.86 m x 1.65 m, and Feature 2 was about 1 m in diameter.

Six flaked-stone tools, one core, and 437 pieces of debitage were recovered from the block. The one projectile point is a small corner-notched arrow point (Figure 3*A*). Other recovered flaked-stone artifacts include a base/midsection of a preform with subrectangular and slightly convex base (Figure 3*B*), two blank fragments which fit together (Figure 3*C*), a secondary flake with use-wear on two lateral margins (Figure 3*D*), a large tertiary flake displaying retouch on two margins (Figure 3*E*), and two pieces of utilized desert pavement gravels (Figure 3*F*). Most of the debitage is tertiary flakes of locally available Bridger formation cherts. A small percentage of quartzite is also present in the debitage collection. A hammerstone and a groundstone abrader were also recovered from the block. The sandstone abrader contains a shallow, lengthwise groove and was probably used as an arrow shaft straightener (Figure 3*G*).

Four pottery sherds were found during the block excavations. Two additional sherds were found on the surface. All are plain grayware body sherds possibly derived from at least two separate jars that appear to be Fremont ware. Thin sections from the sherds examined by Pat Dean showed that the temper is composed of angular fragments of marble.

A total of 1,069 pieces of bone or tooth was collected during the excavations. Bison is the only identifiable taxon with 34 specimens identified. The fragmentary nature of the remainder of the collection allowed for identification only as large mammal and medium/large mammal. All specimens in these two categories could be from bison, and given the lack of evidence for non-bison species, the entire collection may represent bison. Evidence of cultural modification of the bone includes burning, cut marks, polishing, and extensive intentional breakage.

Five fill samples from different parts of the large Feature 1 were floated and examined for plant macrofossils. Only one charred globemallow seed and a fragment of what is possibly a goosefoot seed were recovered from these samples. No charred seeds were recovered from a fill sample from the smaller Feature 2.

The horizontal distribution of features, artifacts, pottery sherds, debitage, and bone is shown in Figure 2. Feature 2 is situated east and downwind of Feature 1, and together they appear to represent a concentrated domestic work area and hearth. Most of the recovered remains, including debitage, bone, and fire-cracked

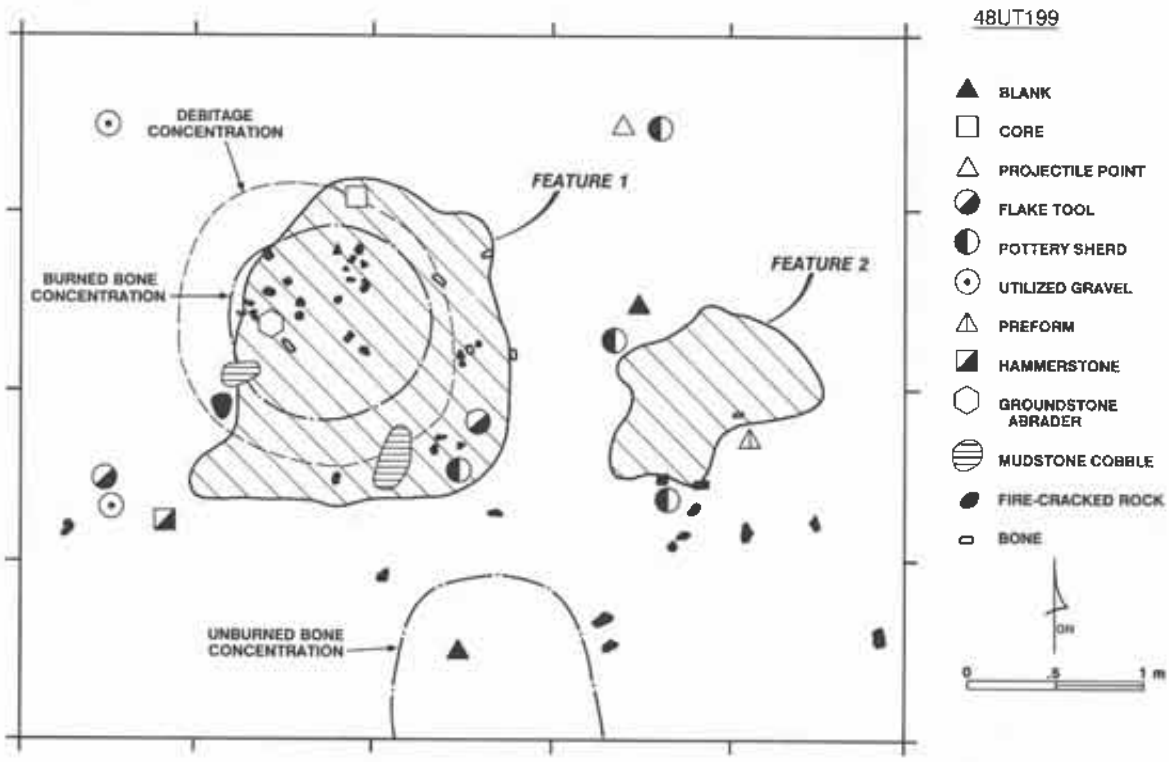


Figure 2. Spatial distribution of features, fire-cracked rock, artifacts, pottery sherds, and bone at 48Ut199.

rock, are present within the large Feature 1. The area around Feature 1 appears to have been the central work area where several activities including lithic reduction, cooking, and animal processing took place. The sharp contrast between artifact density within the boundaries of the feature and the density outside the feature, along with its large overall size, suggest that this area was sheltered. The shallow depth of the feature and the absence of postholes suggest that the structure was a windbreak constructed of sagebrush.

The major activity at the site appears to have been bone grease processing and juice production, as evidenced by the highly fragmentary nature of the faunal remains (Vehik 1977; Binford 1978). Most of the processing probably occurred within the Feature 1 area, where fire-cracked rock and burned-bone fragments are concentrated. The two large mudstone cobbles found in Feature 1, although lacking modification, may have been used as anvils for bone crushing. Some of the bone fragments may have become burned as a result of other activities conducted in the general work area. The unburned bone concentration located to the south of the feature may represent a bone dump following processing.

Another activity represented at the site appears to be the reduction of preblanks and blanks brought to the site. The presence of small tertiary flakes suggests the maintenance and resharpening of tools were also activities. However, the presence of only 437 pieces of debitage indicates that tool production was only a minor activity.

SITE 48SW97

Site 48Sw97 is situated on a ridge between the confluence of two small tributaries of Bitter Creek (McNees et al. 1992). The site is just east of Black Buttes; the dominant topographic feature in the area. Vegetation in the site area consists of juniper and sagebrush.

A 118 m^2 block was excavated at the site as part of data recovery excavations within the Black Butte Coal Mine permit area. The excavation yielded four archaeological components representing multiple occupations dating between 2,600 and 610 years ago. The component (Component 4) discussed in this paper is the uppermost one with radiocarbon ages of 880 ±

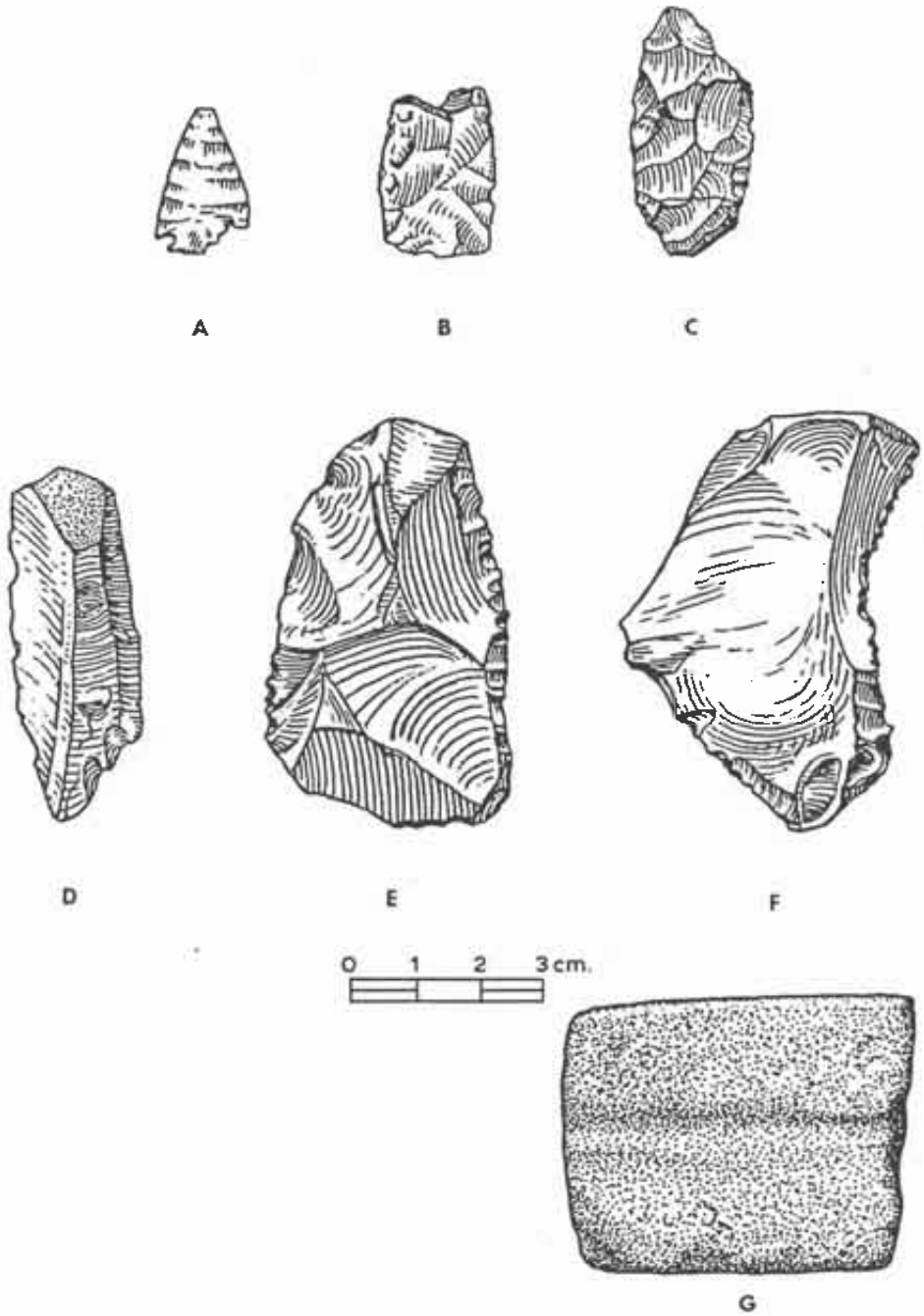


Figure 3. Selected artifacts from 48Ut199.

80 years B.P. (Beta-41865) and 610 ± 60 years B.P. (Beta-41862). The archaeological remains occurred in sandy deposits averaging about 40 cm to 60 cm in depth over bedrock. In some areas within the excavation block, bedrock was just below the surface.

Three cultural features were encountered in Component 4 during the excavations (Figure 4). Two small, stained basins (Features 4 and 8) with charcoal and fire-cracked rock were located in the west central portion of the excavation block. Feature 4 measured

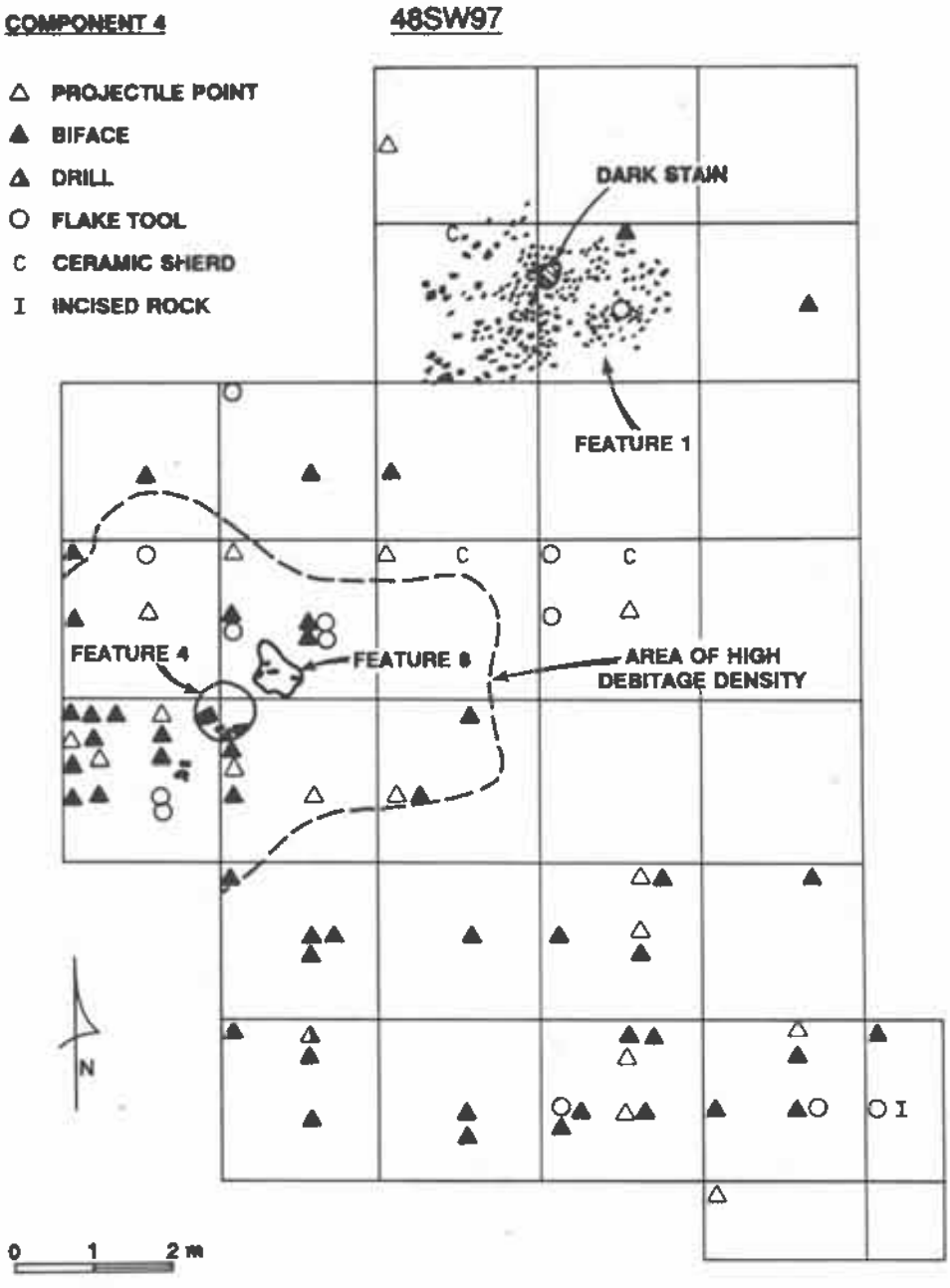


Figure 4. Spatial distribution of features, fire-cracked rock, artifacts, and pottery sherds at 48Sw97.

60 cm in diameter and Feature 8 was 62 cm x 50 cm. Both basins probably functioned as hearths. The third feature was a large, dense, fire-cracked rock concentration that measured 1.75 m x 1.25 m with some scattered charcoal stained sediment.

A total of 86 flaked-stone tools or fragments, two cores, and 6,844 pieces of debitage were recovered from Component 4. Six of the 19 projectile points or fragments are tri-notched (Figure 5*A–F*). These points have high side notches and fairly large basal notches.

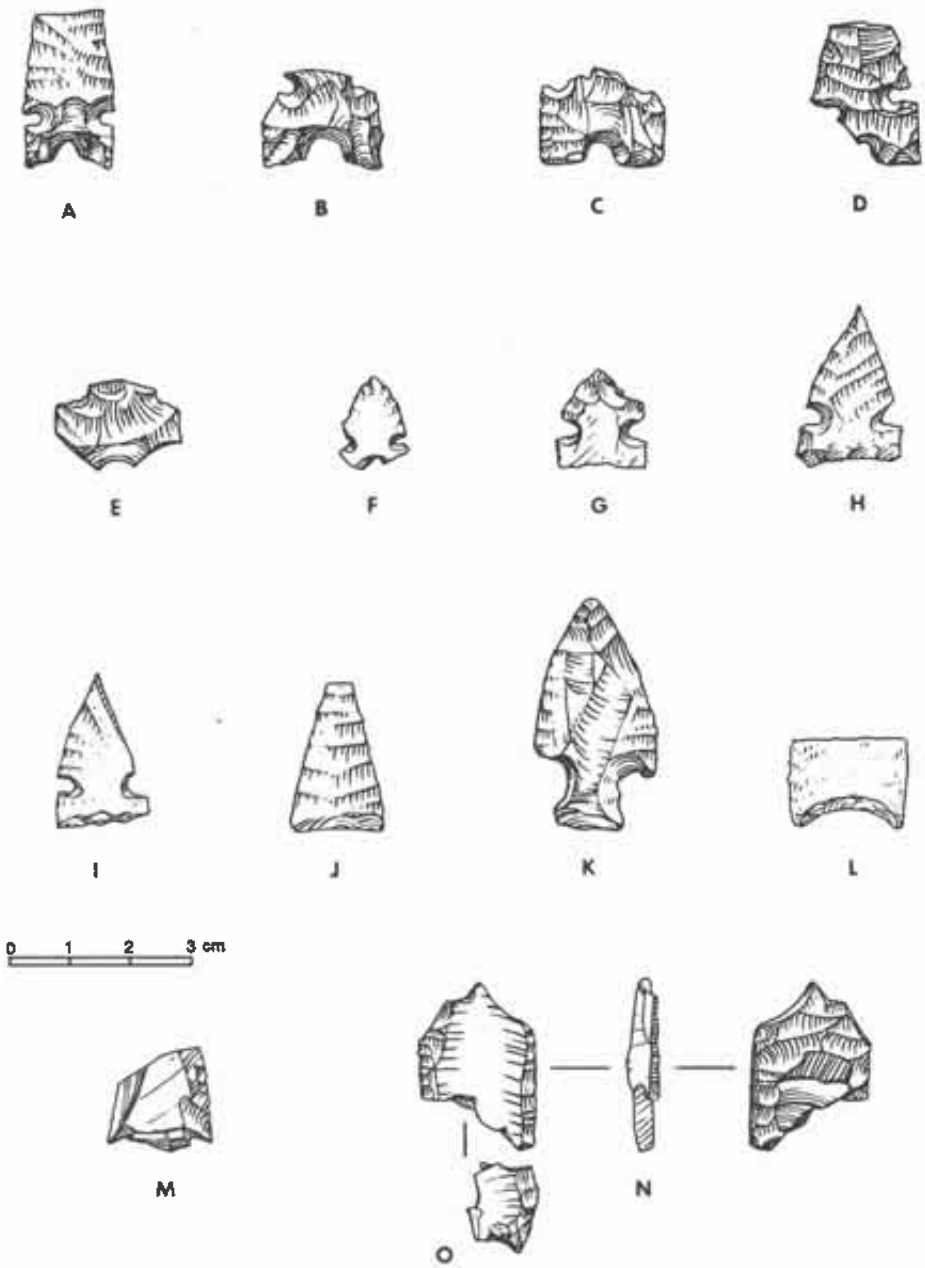


Figure 5. Selected projectile points from 48Sw97.

This point style is similar to the Desert Side-notched type (Holmer and Weder 1980). Though these points are often associated with Shoshoni pottery, they are also found on Fremont sites in the northern area. These points are somewhat different than the Desert Side-notched points usually found associated with Late Prehistoric period sites in southwest Wyoming. Three additional points have side notches with fairly straight or slightly concave bases which appear to be the Uinta Side-notched type common on northern Fremont sites (Figure 5*G–I*). One unnotched projectile point with a concave base may be a Cottonwood Triangular (Figure 5*J*). A stemmed dart point that may have functioned as a hafted knife (Figure 5*K*), a proximal portion of a

lanceolate point with a concave base (Figure 5*L*), and a medial fragment of a corner-notched arrow point (Figure 5*M*) are also part of the collection. Additionally, three fragments of a Folsom point were recovered (Figure 5*N–O*).

The other 39 recovered bifaces include a bi-bevelled knife tip (Figure 6*A*), 2 drill fragments (Figure 6*B*), 8 preforms including one with a square base and straight sides (Figure 6*C*), 10 blanks including a large specimen with fine retouch/use-wear on both lateral margins (Figure 6*D*), 4 preblanks, 8 final biface fragments, and 7 unclassifiable biface fragments. Many of the bifaces are small fragments that appear to have been broken during manufacture. Twenty-eight flake and cobble tools including hafted end scrapers (Figure 6*E–F*), large laterally retouched flakes (Figure 6*G*), and large flaked cobbles (Figure 6*H*) are part of the artifact assemblage. About 52% of the debitage is tertiary flakes and 43% is microflakes (tertiary flakes less than 1.0 cm). The most common material type is Black Buttes quartzite, a common local material, and opaque chert, another local material, is the second most common type. One incised piece of sandstone that appears to represent an anthropomorphic figure was found during the excavations (Figure 7). The component lacked groundstone.

Four pottery sherds were found at the site; one was on the surface, and three were recovered during the excavations. Three are fingernail impressed body sherds that appear to be from the same vessel. These sherds may be Fremont, but the sample is too small for definite identification. These sherds may actually be of an unknown type. Thin sections from the sherds examined by Pat Dean show quartzite temper. The fourth piece of pottery is a half cylinder, which appears to be a portion of a bead.

A total of 1,924 pieces of bone or tooth was collected during the excavations of Component 4. The only identifiable taxa are bison and mountain sheep. The mountain sheep is represented by a single third phalange. Bone elements identified as bison include a humerus, a radius, a second phalange, and a cuboid-navicular. Probably two bison are represented as indicated by a large second phalange probably from a male and a cuboid-navicular from a smaller animal. The collection was highly fragmentary and 1,545 of the recovered fragments could only be identified as large mammal. The rest of the fragments were identified as medium or small/medium mammal. Overall, the collection appears to represent mostly bison. Many of the bone fragments had been burned.

A fill sample from each of the features was floated and examined for plant macrofossils. Only one charred juniper seed was recovered from Feature 4, one of the small, stained basin hearths. The charred seed was probably introduced into the feature from the juniper growing on the site.

The horizontal distribution of the features, artifacts, pottery sherds, and debitage is shown in Figure 4. The two hearth features are associated with the highest debitage frequencies of the component and many of the flaked-stone artifacts. Most of the bone was recovered from this area as well. Though disturbed from post occupation processes, the area around these two hearths was probably a domestic work area where several activities took place. As with 48Ut199, one of the major site activities in the vicinity of the two hearths appears to be the processing for bone grease and juice (Vehik 1977; Binford 1978). Fire-cracked rock used to heat the water during the processing may have been dumped in the area of Feature 1. The scatter of flaked-stone artifacts in the southern portion of the block may have resulted from other activities or occupations that have become disturbed. The high percentage of tertiary and microflakes from Component 4 indicates that the maintenance and resharpening of tools were also important site activities.

OTHER SOUTHWEST WYOMING SITES WITH FREMONT POTTERY

A few additional sites in southwest Wyoming have yielded apparent Fremont pottery sherds during block excavations, test excavations, and inventories (Figure 8). These sites contained what has been identified by the original site investigators as Fremont or Fremont-like pottery (Table 1). No attempt was made to reanalyze the recovered pottery sherds for this paper. Apparent Fremont pottery has been recovered from four excavated sites (Table 1).

The Archery site (48Sw5222), which is located on a juniper-covered hill south of Rock Springs, yielded 37 plain pottery sherds, as well as bone gaming pieces and beads (Hakiel et al. 1987). Radiocarbon ages for the occupations associated with the pottery are 1,230 and 850 years ago. Large amounts of bison and cottontail bone were recovered. Recovered projectile points included corner- and side-notched arrow points

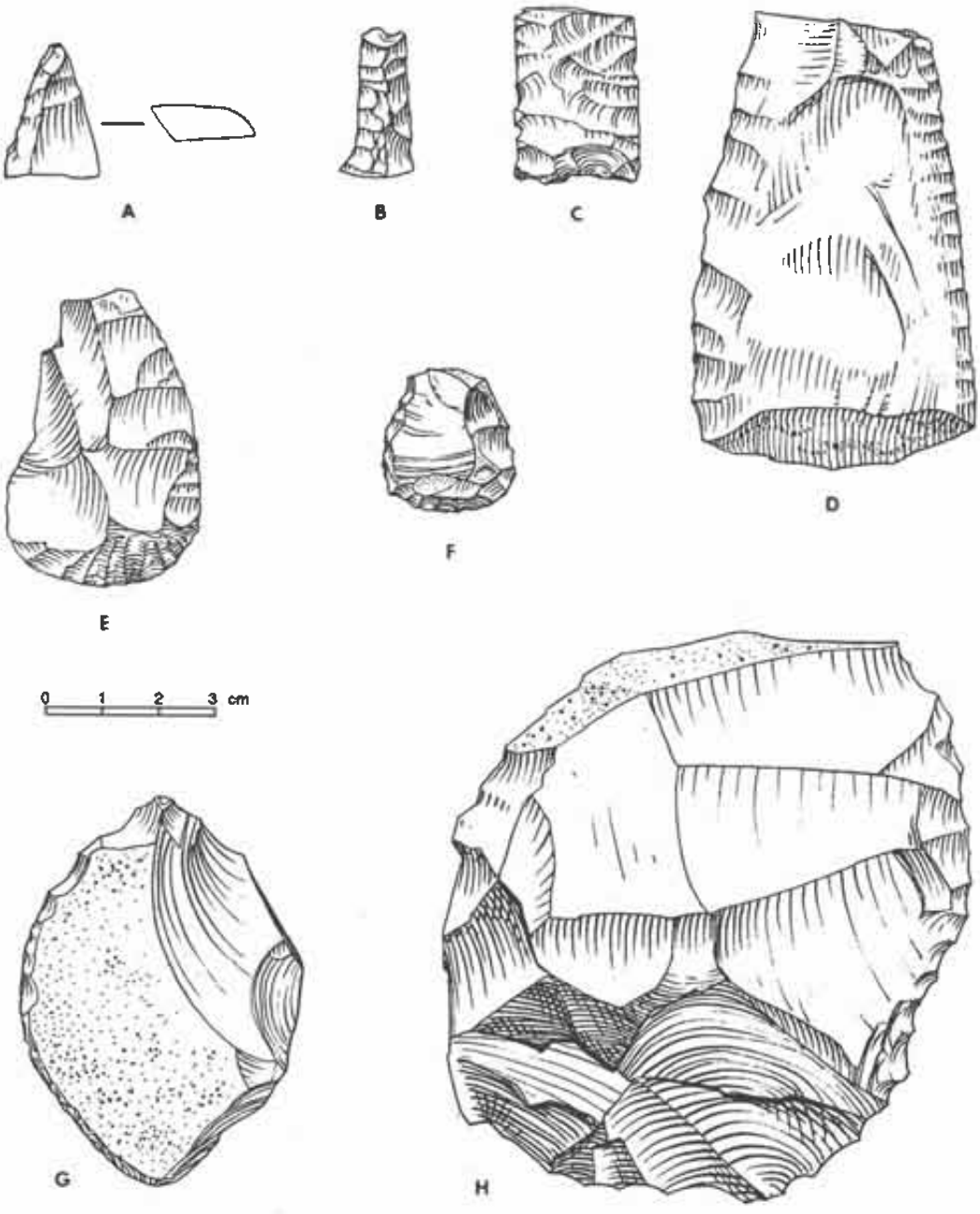


Figure 6. Selected flaked-stone tools from 48Sw97.

unlike the Rosegate type. As with 48Ut199 and 48Sw97, the Archery site appears to be a hunting or animal processing site.

The Pine Spring site (48Sw101) is located at a spring area on a high ridge west of the Green River at Flaming Gorge Reservoir (Sharrock 1966). Four sherds some of which were identified as corrugated ware were recovered from the upper component of a three-component site. The upper component also yielded projectile points similar to the Rosegate and Desert Side-notched types and other small corner- and side-notched varieties, groundstone including a Utah

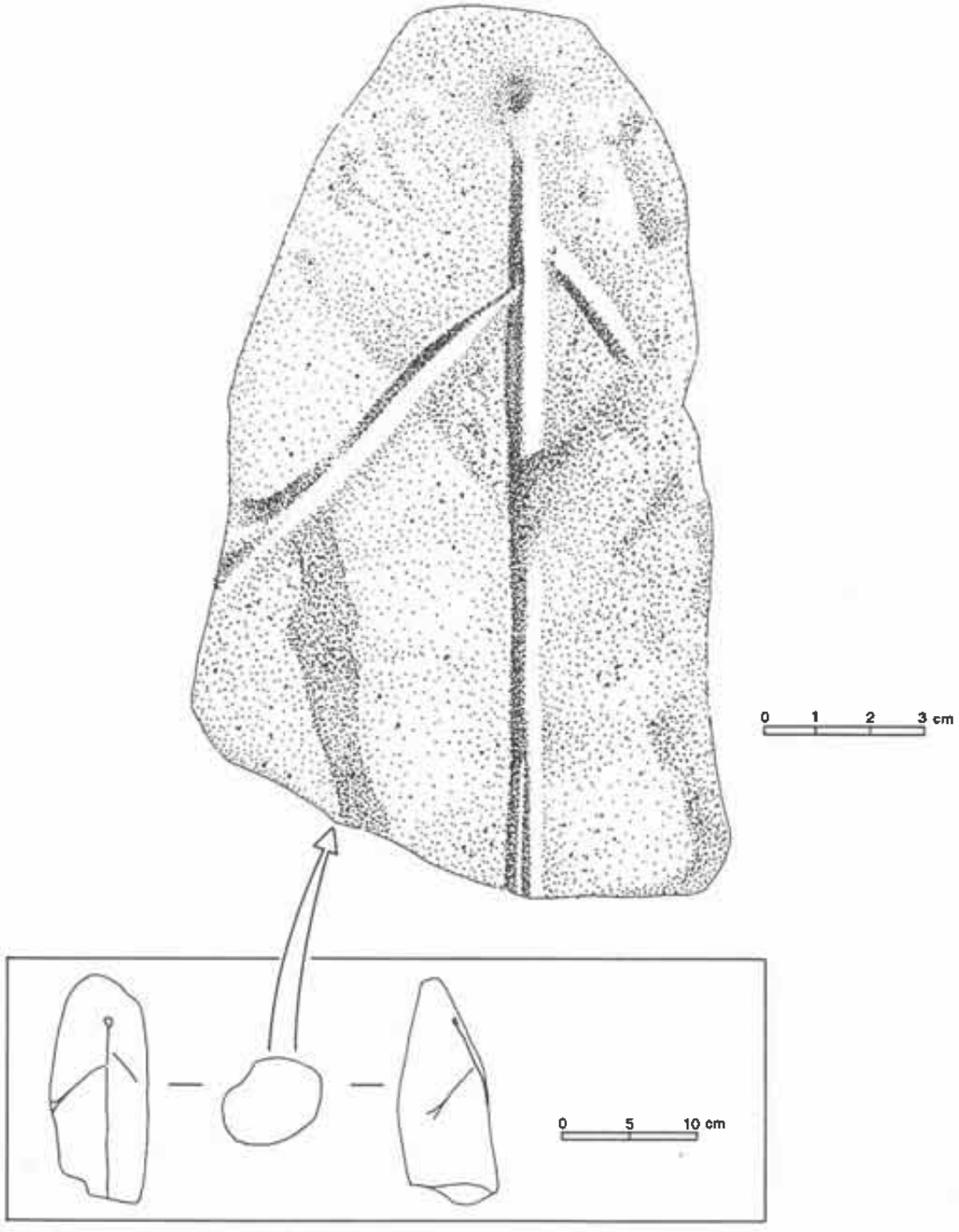


Figure 7. Incised anthropomorphic figure from 48Sw97.

metate, and bones of mountain sheep and bison. Sharrock (1966) considered the Fremont component as primarily a quarry-workshop activity area. However, the recovery of mountain sheep and bison indicates that animals were processed at the site as well.

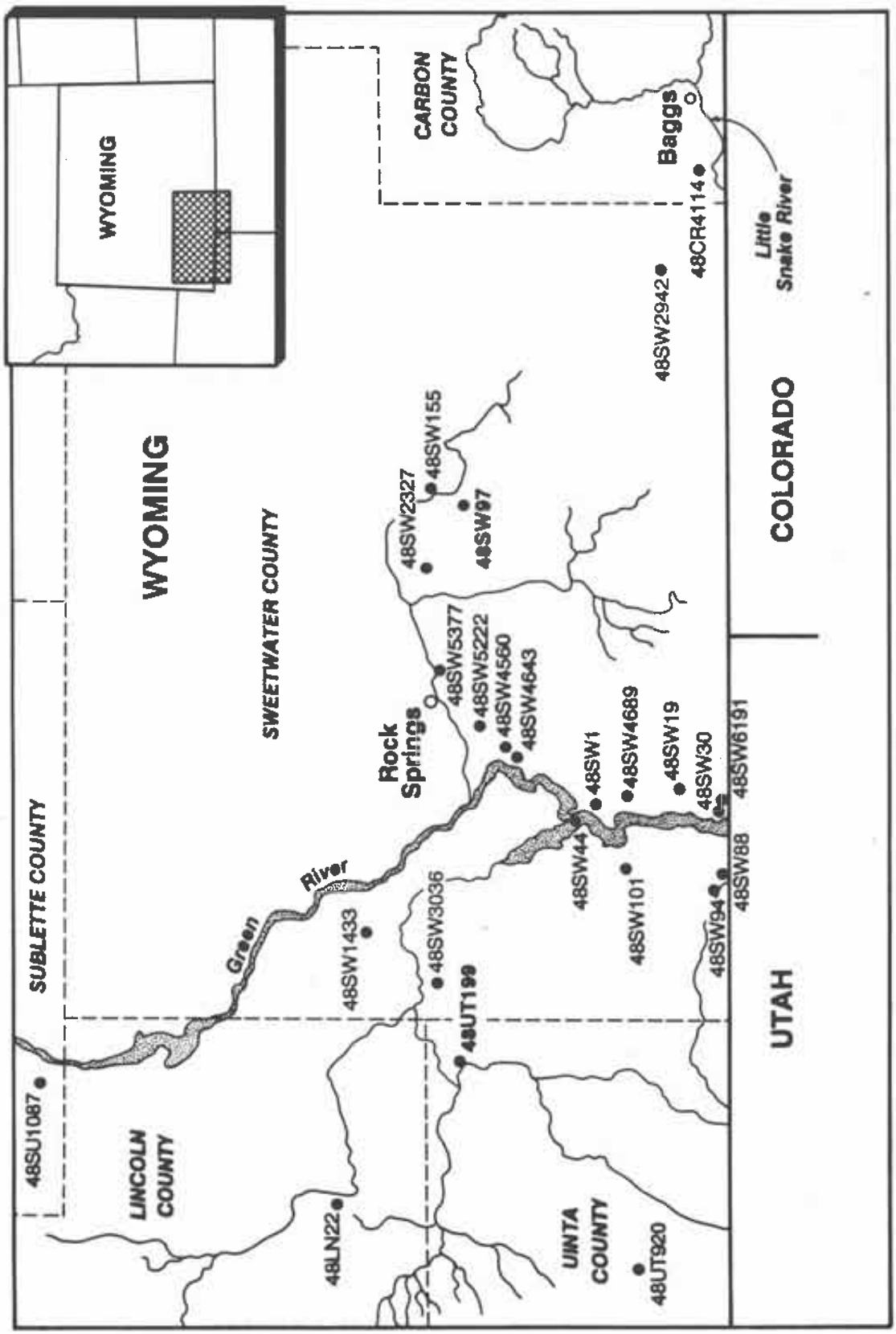


Figure 8. Location of selected sites with Fremont pottery in southwest Wyoming.

Table 1. Selected Sites with Apparent Fremont Pottery in Southwest Wyoming

Site Number (Name)	^{14}C Age (years B.P.)	Pottery (Number of Sherds)	Arrow Points	Other Artifacts	Bone Remains (Taxa)	Topographic Location	Type of Investigation	Reference
48Ut199	930 ± 70	4 (excavation) 2 (surface)	1 corner-notched	1 abrader	Bison	Sagebrush-covered terrace	Excavation	This paper
48Sw97	880 ± 80 610 ± 60	3 (excavation) 1 (surface)	Side- and basally-notched	1 incised stone	Bison, mountain sheep	Juniper-covered ridge	Excavation	This paper
48Sw5222 (Archery site)	1230 ± 70 850 ± 70	37 (excavation)	Corner- and side-notched	Bone disc beads, bone gaming pieces, bone awls	Bison, cottontail	Juniper-covered hill	Excavation	Hakiel et al. (1987)
48Sw101 (Pine Spring site)	—	4 (surface and excavation)	Side-notched	6 grinding slabs, 1 abrader, 1 bone awl, 2 bone punches	Mountain sheep, bison	Spring area on high ridge	Excavation	Sharrock (1966)
48Cr4114 (Sheehan site)	1190 ± 60 1140 ± 90	5 (excavation)	Corner-notched	3 bone tubular beads, 1 ring bead, 7 groundstone	Pronghorn, deer, mountain sheep, elk, jackrabbit	Sagebrush-covered ridge	Excavation	Bower et al. (1986)
48Ut920	1650 ± 60	122 (excavation)	2 corner-notched	1 stone bead, 12 groundstone	Pronghorn, jackrabbit, cottontail, prairie dog	Base of slope	Excavation	Latady et al. (1989)
48Sw1433 (Pottery site)	1650 ± 60	14 (test)	—	Groundstone	Bison	Dune near playa	Test	Heffington et al. (1982)

Table 1. Continued

Site Number (Name)	^{14}C Age (years B.P.)	Pottery (Number of Sherds)	Arrow Points	Other Artifacts	Bone Remains (Taxa)	Topographic Location	Type of Investigation	Reference
48Sw155	1020 ± 100	2 (test)	4 side- and basally-notched	—	Bison	Sagebrush-covered ridge	Test	Metcalf (1975)
48Sw6191	1290 ± 70	8 (surface) 1 (test)	—	Possible juniper lodge	—	Juniper-covered ridge	Test	Truesdale and Eckerle (1986)
48Sw1087	1470 ± 50	1 (test)	—	—	—	Sagebrush-covered hills	Test	Mackey et al. (1989)
48Sw3036	—	117 (test)	—	2 bone bead fragments	Unident-ifiable bone fragments	Edge of dune	Test	Rodriquez et al. (1982)
48Sw1	—	1 (surface)	—	—	—	Flat-topped butte	Inventory	Day and Dibble (1963)
48Sw30	—	1 (surface)	—	—	—	Ridge	Inventory	Day and Dibble (1963)
48Sw44	—	1 (surface)	—	—	—	Overhang on crest of terrace	Inventory	Day and Dibble (1963)
48Sw88	—	25 (surface)	—	Petroglyph panel	—	Second terrace	Inventory	Day and Dibble (1963)
48Sw94	—	6 (surface)	—	—	—	Juniper-covered ridge	Inventory	Sharrock (1966)

Table 1. Continued

Site Number (Name)	^{14}C Age (years B.P.)	Pottery (Number of Sherds)	Arrow Points	Other Artifacts	Bone Remains (Taxa)	Topographic Location	Type of Investigation	Reference
48Sw2327	—	78 (surface)	2 side-notched	—	—	Juniper-covered ridge	Inventory	Burchett (1981)
48Sw2942	—	10 (surface)	—	Groundstone	—	Dune	Inventory	Vlcek and Merewether (1980)
48Sw4560	—	1 (surface)	—	—	—	Juniper-covered saddle	Inventory	Metcalf et al. (1983)
48Sw4643	—	1 (surface)	—	—	—	Dunes in juniper area	Inventory	Metcalf et al. (1983)
48Sw4689	—	18 (surface)	—	—	—	Juniper-covered slope	Inventory	Metcalf et al. (1983)
48Ln22	—	9 (surface)	—	—	—	Flat terrain	Inventory	Bennett (1975)

The Sheehan site (48Cr4114) also contained apparent Fremont pottery. It is located in southwest Wyoming in the Washakie Basin quite a distance east of the other known sites with Fremont pottery (Bower et al. 1986). The upper component of this site contained five plain sherds, three bone tubular beads, a ring bead, and Rosegate Corner-notched arrow points. Radiocarbon ages for the component are 1,190 and 1,440 years ago. A large stained area containing fire-cracked rock, debitage, flaked-stone tools, and bone similar to the large feature at 48Ut199 was also present. As at 48Ut199, a hearth was found just to the east of the large stained area. Features at both sites may have had similar functions. Unlike 48Ut199 and 48Sw97, this site yielded bone of a wide range of animal taxa including pronghorn, deer, mountain sheep, elk, and jackrabbit. The site appears to have been a short-term animal processing and flaked-stone tool reduction activity area.

Site 48Ut920 located in extreme southwest Wyoming near the Bear River Divide also contained Fremont pottery found during excavation of a 59 m^2 block area (Latady et al. 1989; Truesdale and Latady 1991). It yielded 122 pottery sherds probably representing a single jar, two Rosegate Corner-notched arrow points, 74 other flaked-stone tools including utilized flakes and bifaces, 2,651 pieces of debitage, and 12 pieces of groundstone. These remains were found within a layer of fire-cracked rock and charcoal-stained sediment. Charcoal from the rock-lined hearth, located about 6 m from the pottery sherds, produced a radiocarbon age of 1,650 years ago. Though most of the recovered bone consisted of small fragments, some bone was identified as pronghorn, jackrabbit, cottontail, and prairie dog. Apparent site activities included cooking and consumption of small and large animals, and tool manufacture and maintenance.

Five other sites in southwest Wyoming have yielded apparent Fremont pottery during test excavations (Table 1). Site 48Sw1433 located in a dune area adjacent to a playa contained 14 pieces of plain ware and some bison bone (Heffington et al. 1982). Test excavations at 48Sw155 produced two plain pottery sherds and four side- and basally-notched arrow points from a sagebrush-covered ridge (Metcalf 1975). A radiocarbon age of 1,020 years ago was obtained for the site (Metcalf 1987). Eight plain sherds were found on the surface associated with a possible juniper lodge at 48Sw6191, located on a juniper-covered ridge (Truesdale and Eckerle 1986). Test excavations yielded one additional sherd and a radiocarbon age of 1,290 years ago. One plain sherd was recovered during test excavations at 48Su1087 (Mackey et al. 1989). The associated component was radiocarbon dated at 1,470 years ago. A total of 117 sherds was found during test excavations at 48Sw3036 (Rodriquez et al. 1982). These sherds were probably from a single vessel and were associated with three bone bead fragments, a biface knife, one piece of debitage, hematite, two small mussel shell fragments, and a few fragments of unidentifiable bone.

Approximately another dozen sites with Fremont pottery have been recorded during inventories (Table 1). These sites include four that were found during the inventory for Flaming Gorge Reservoir (Day and Dibble 1963). Some of these sites also contained petroglyph panels with figures in the Fremont style. Other known sites occur on juniper-covered ridges near the Green River or adjacent to Black Buttes (Burchett 1981; Metcalf et al. 1983).

DISCUSSION OF SOUTHWEST WYOMING SITES

Most of the sites dating to the Late Prehistoric period that lack Fremont pottery appear to be residential camps of foragers where a wide range of plant and animal resources were exploited (Smith and Creasman 1988; McNees et al. 1989). Binford's (1980) forager-collector model should not be viewed as one dimensional but multidimensional where various components of the adaptive system such as mobility (type, frequency, stability), predation (prey spectrum, scheduling), and technology (time budgeting, storage) are considered as separate dimensions (Chatters 1987). The foragers of southwest Wyoming probably used a residential mobility strategy (Kelly 1983) that was fairly stable where some site localities were revisited on a regular basis. During much of the year, the residential camps were occupied for only a short time, while some camps were used for a longer period, especially during the fall for intensive animal and seed processing. The use of stored foods was an important component of their adaptive strategy.

A large population increase during the Late Prehistoric period in southwest Wyoming and adjacent areas is evidenced by a tremendous increase of sites and radiocarbon ages belonging to this period compared to earlier periods (Metcalf 1987). These sites generally have Rosegate projectile points and

other small corner- and side-notched points, basin-shaped and rock-filled pits representing hearths and roasting pits, the remains of a wide variety of large and small animals, and the charred seeds of several taxa (Smith and Creasman 1988). Many of these sites appear to represent the remains of single occupation, short-term residential camps (McNees et al. 1989).

Other sites dating to the Late Prehistoric period contained evidence of repeated longer-term occupations. Excavations at a few sites have yielded large, saucer-shaped stains and stone circles that appear to be the remains of small sagebrush windbreaks and structures (Harrell 1989; McNees et al. 1992; McKibbin et al. 1989; Smith and Creasman 1988). Other Late Prehistoric period sites in the Green River Basin including the Austin Wash and Oyster Ridge sites contained evidence of extensive processing of pronghorn (Schroedl 1985; Zier 1982). These apparent pronghorn processing sites also had the remains of several other animal species, charred seeds, groundstone, flaked-stone tools, and debitage indicating that a wide range of domestic activities occurred at these sites as well. Though the processing of pronghorn was a primary focus, evidence for a wide range of domestic activities suggests that these sites also functioned as residential camps of mobile foragers who were acquiring winter stores. Other excavated residential camps in southwest Wyoming appear to have been occupied repeatedly in the late summer or fall for the extensive processing of seeds from weedy species (Harrell 1989; Smith and Creasman 1988). Some of these sites may have been areas where seeds of wild, weedy species, such as goosefoot, were broadcast and encouraged (Smith 1988).

Sites with what has been identified as Fremont pottery are quite rare in southwest Wyoming. Over 9,000 sites have been recorded in Sweetwater County (the county that covers much of southwest Wyoming) and only a handful of these contain apparent Fremont pottery. The limited number of radiocarbon ages from sites in southwest Wyoming indicates that sites with apparent Fremont pottery were occupied between about 1,500 and 680 years ago (and possibly as early as 1,650 years ago), or most of the Late Prehistoric period in southwest Wyoming. The sample is too small to determine whether certain periods within this time frame were more important than others or whether differences exist in the pottery through time.

The few sites containing apparent Fremont pottery sherds in southwest Wyoming are generally similar to those lacking pottery. The sites with Fremont pottery also appear to be short-term campsites of hunters and gatherers, though it is unclear whether a logistical or residential mobility strategy was followed. In contrast to the overall pattern during the Late Prehistoric period in southwest Wyoming, there appears to be an emphasis on the hunting of large game, such as bison, at sites with Fremont pottery; however, a few of the excavated sites with Fremont pottery also yielded the remains of a wide range of animal species. The sites with Fremont pottery usually lack charred seeds and appear to have been occupied at times of the year other than the late summer and fall, though information concerning the season of occupation is usually lacking at excavated sites. Additionally, many of the sites with Fremont pottery are limited to juniper-covered ridges or hills providing excellent views in several directions and to areas adjacent to the Green River or its tributaries.

Sites with apparent Fremont pottery usually have only a few sherds often from the same vessel. As evident by the general rarity of pottery on sites in southwest Wyoming dating to this period, it appears that a local ceramic manufacturing industry was not important. Most likely, the pottery was traded or brought into the area. However, Fremont hunters and gatherers may have produced a few ceramic vessels during their visits to the Wyoming Basin. The local inhabitants also may have imitated Fremont pottery using locally available materials in some cases.

The pottery that is found on the few sites appears to have a wide variety of temper types and possible construction techniques. For example, the thin section analysis indicates that the sherds from 48Ut199 have a marble temper and the ones from 48Sw97 have a quartzite temper. Sherds identified as Fremont from other sites in southwest Wyoming probably have just as much variability. Other sites in the area, such as the Wardell site in the Green River Basin, have pottery quite different than Fremont pottery, but date to the same time period as the sites with Fremont pottery (Frison 1973). Other contemporary wares with relatively fine temper of unknown type also are present at some sites (Metcalf 1988). The relationship between Fremont pottery and types found at the Wardell site and other sites in southwest Wyoming is unknown. However, Creasman et al. (1990) have lumped pottery from southwest Wyoming dating prior to 650 years ago, including those identified as Fremont and those from the Wardell site, as a single type

defined as Black Buttes Gray. The lumping of pottery into this type was based mostly on temporal considerations and the association of certain projectile point types. Additional analyses, including thin sections of pottery sherds from a wide range of sites in the area, may resolve some of this complexity or perhaps increase it. Adding even more to the complexity of the problem is the small sample size of sherds from southwest Wyoming.

COMPARISONS WITH THE UTAH FREMONT

Comparison of the sherds recovered from sites in southwest Wyoming with Fremont types from northern Utah is difficult. Pottery from the Uinta Basin of Utah known as Uinta Gray is usually considered to have calcite temper, and pottery from the Great Salt Lake area known as Great Salt Lake Gray is usually defined as being tempered with sand and quartz (Madsen 1977; Madsen 1986). Recent thin section analysis of sherds from the Great Salt Lake area has shown considerable variety in temper materials (Dean and Heath 1990). Analysis of thin sections of Uinta Gray sherds from Dinosaur National Monument has shown the temper to be limestone (Truesdale and Hill 1991). Additional thin sections need to be examined, and the pottery from Utah more completely defined before the relationship of the pottery sherds from southwest Wyoming and Utah can be completely worked out. Many of the sherds from southwest Wyoming, especially those with quartzite temper, appear to be most similar to the types in the Great Salt Lake area.

Fremont subsistence strategies at sites in northern Utah apparently relied heavily on hunting and gathering during certain time periods, or at least during certain times of the year. Several Fremont sites excavated along the eastern side of the Great Salt Lake including Bear River No. 1 (Aikens 1966), Injun Creek site (Aikens 1966), Bear River No. 2 (Aikens 1967), and Levee and Knoll sites (Fry and Dalley 1979), were seasonal camps used primarily for hunting and gathering activities. Some of these sites were camps where animals such as bison, elk, and birds were processed. Nearby marsh resources were exploited as well. Some of the sites lack structures, and others contain evidence of fairly temporary structures. These sites date from approximately 1,450 years ago to as recent as 400–500 years ago. Sites such as Hogup Cave west of the Great Salt Lake also appear to have been seasonal camps used by the Fremont (Aikens 1970). It has been noted that these investigated sites may represent only a portion of the Great Salt Lake Fremont settlement system and may be logistical camps used by people from larger village sites now destroyed by present day urbanization (Simms 1990).

The Fremont of the Uinta Basin are generally thought to be more hunter and gatherer orientated than the Fremont further south (Marwitt 1986). Most of the known village sites consist of five or fewer shallow, circular pithouses occupied at any one time. They are generally located on high ridge tops or knolls above marshes and creek floodplains. Many of the sites appear to represent short or seasonal occupations. Among the investigated village sites are Caldwell Village (Ambler 1966), the Goodrich, Flattop Butte, Felter Hill, Gilbert, and Whiterocks Village sites (Shields 1967), Boundary Village (Leach 1966), and the Cub Creek sites (Breternitz 1970). Caldwell Village and Boundary Village contained flaked-stone artifacts of tiger chert (chert from the Bridger formation on the north side of the Uinta Mountains) indicating some use of southwest Wyoming by the Fremont of the Uinta Basin. Most of the archaeological work in the Uinta Basin has focused on the village sites, and the settlement diversity of the area is poorly understood.

Conceivably, the Fremont from the Great Salt Lake area or Uinta Basin who were at least partially and possibly at times full-time hunters and gatherers, used southwest Wyoming as part of their range to obtain bison and other resources. This possibility of sites in southwest Wyoming functioning as hunting locations was hypothesized for the Woodruff Bison Kill, located in the Wyoming Basin near the Utah/Wyoming state line (Shields 1978). Though no diagnostic Fremont artifacts were found at the site, bison limb bones which were the least numerous at the Woodruff Bison Kill, were the most common bone type at the Bear River sites. Though the Fremont of the Uinta Basin or Great Salt Lake area could have at times exploited resources in the Wyoming Basin, this use of the area was probably only on an occasional basis as evidenced by the general rarity of Fremont remains; however, other sites lacking Fremont pottery may also have been used by people from the south. The Fremont probably shared the area with fairly extensive local hunter and gatherer groups or other peoples from other areas. These local groups may have been quite similar

to some of the Fremont in terms of settlement and subsistence.

It is unclear what type of settlement strategy was used by the hunters and gatherers with apparent Fremont pottery who occupied the sites in southwest Wyoming. As noted above, most sites lacking pottery in southwest Wyoming during the Late Prehistoric period were camps of mobile foragers with high residential mobility. The sites with Fremont pottery could represent a different settlement strategy, but additional research is required to completely delineate the adaptive strategies. These adaptive strategies also could have changed through time. Adding to the problem is the lack of understanding of the complete diversity of the settlement and subsistence systems used by the Fremont in Utah. The partly horticultural peoples of Utah may actually have been hunters and gatherers during certain times of the year or during certain years of crop shortfall, or may have lived side by side with groups following a hunting and gathering strategy (Simms 1986). Some possible adaptive strategies represented by the sites with apparent Fremont pottery in Wyoming include:

1. These sites could represent residential camps of foragers who included southwest Wyoming as part of their seasonal round. These foragers at certain times of the year may have been collectors who occupied semisedentary camps especially near marsh resources along the eastern edge of the Great Salt Lake.
2. These sites could represent logistical camps of collectors who sent small hunting parties into southwest Wyoming from the Uinta Basin or the Great Salt Lake area.
3. These sites could represent forger camps of part time horticulturalists who became mobile during certain times of the year or during years of horticultural shortfall.
4. These sites could represent logistical camps of horticulturalists who relied partly on animals and wild plant foods.
5. These sites could represent residential camps of local foragers who occasionally obtained by trade or raid a Fremont pot, or copied Fremont technology using local materials.

These are only some of the possible adaptive strategies that may be represented by sites with apparent Fremont pottery in southwest Wyoming. At this time the data do not allow any definite delineation of the relationships between the sites in southwest Wyoming and the Fremont. A systematic study including thin sections of the small sample of pottery sherds from southwest Wyoming needs to be completed to facilitate an understanding of the pottery of the area. The information derived from these analyses should then be compared with detailed analyses including thin sections of sherds from Fremont sites in northern Utah. These comparisons may provide clues concerning the origin of the pottery in southwest Wyoming, and the kinds of adaptive strategies represented. Determining the types of vessels represented and other morphological and compositional analyses may provide additional information concerning adaptive strategies (Simms 1986). However, the small sample size of sherds from many of the sites in southwest Wyoming may limit the possible types of analyses.

CONCLUSIONS

It is becoming increasing clearer that what has been grouped as the Fremont based on certain artifact traits consists of a wide range of settlement and subsistence strategies, including fairly mobile hunting and gathering. Much of this information is coming from areas where horticulture is only marginally possible. One of these areas is the Sevier Desert of western Utah where a temporary habitation Fremont site, known as the Topaz Slough site, was excavated and interpreted as representing short-term hunting and gathering activities (Simms 1986). Additionally, areas such as the western deserts of Utah contain thousands of lithic/sherd scatters that probably represent hunting and gathering activities. The sites in southwest Wyoming containing apparent Fremont pottery reveal additional evidence that some hunters and gatherers used pottery similar to that produced by the partly horticultural Fremont. As noted by Simms (1986), determining whether these hunters and gatherer sites including those in southwest Wyoming are true Fremont is irrelevant, and the important issue to understanding cultural behavior is delineating the variability in Fremont settlement and subsistence.

The Fremont in Utah and the hunters and gatherers of southwest Wyoming were part of the general phenomenon, which included an increase in population, and a more intensive use of a wide variety of resources that is apparent in the region during the Late Prehistoric period compared to earlier periods. Part of this intensification of the use of the region

occurred as horticulture in some places in Utah where it was environmentally feasible. Even in southwest Wyoming where horticulture was generally not possible, the hunters and gatherers may have broadcast seeds and encouraged the growth of weedy species such as goosefoot (Smith 1988). This intensification of use of the region was probably pursued by peoples of many different ethnic and linguistic identities (Simms 1990).

ACKNOWLEDGMENTS

Excavations at 48Ut199 were the result of an AT&T fiber optic cable project in Wyoming, and investigations at 48Sw97 were completed for Black Butte Coal Company. We thank them for funding the excavations and their full cooperation and interest. Thomas P. Reust served as project director for the excavations at 48Ut199, and much of the report was written by William E. Batterman. Lance M. McNees directed the excavations for Black Butte Coal Company. Patricia Dean conducted the thin section analysis of the pottery sherds from the two sites. Michael D. Metcalf, James A. Truesdale, David Vlcek, and H. Blaine Phillips provided useful reports and documents.

REFERENCES CITED

Aikens, C. Melvin
1966 *Fremont-Promontory Relationships in Northern Utah.* Anthropological Papers No. 82. University of Utah, Salt Lake City.
1967 *Excavations at Snake Rock Village and the Bear River No. 2 Site.* Anthropological Papers No. 87. University of Utah, Salt Lake City.
1970 *Hogup Cave.* Anthropological Papers No. 93. University of Utah, Salt Lake City.

Ambler, J. Richard
1966 *Caldwell Village.* Anthropological Papers No. 84. University of Utah, Salt Lake City.

Anderson, Duane C.
1983 Models of Fremont Cultural History: An Evaluation. *Journal of Intermountain Archaeology* 2:1-27.

Batterman, William E., and Craig S. Smith
1989 *Archaeological Investigations Along the AT&T Fiber Optic Cable Right-of-Way, Wyoming: Excavations of a Fremont-Influenced Occupation at Site 48UT199, Uinta County, Wyoming.* Prepared for AT&T, Pleasanton, California. Mariah Associates, Inc., Laramie, Wyoming.

Bennett, M. Ann
1975 *Report of Archaeological Survey, Kemmerer Coal Company Project: Phase II, June 1975.* World-Wide Survey, LTD., Salt Lake City.

Binford, Lewis R.
1978 *Nunamiut Ethnoarchaeology.* Academic Press, New York.
1980 Willow Smoke and Dog's Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation. *American Antiquity* 47:485-503.

Bower, Patrick, J. W. Miller, Michael W. Bergstrom, Lynn L. Harrell, and A. Dudley Gardner
1986 *The Sheehan Site.* Cultural Resource Management Report No. 20. Western Wyoming College, Rock Springs.

Breternitz, David A.
1970 *Archaeological Excavations in Dinosaur National Monument, Colorado-Utah, 1964-1965.* University of Colorado Studies, Series in Anthropology No. 17. Boulder.

Burchett, Tim
1981 *Bartlett Prospect Federal 24-26 Addendum.* Prepared for Houston Oil and Minerals. Powers Elevation, Denver.

Chatters, James C.
1987 Hunter-Gatherer Adaptations and Assemblage Structure. *Journal of Anthropological Archaeology* 6:336-375.

Creasman, Steven D., Kevin W. Thompson, and Beth Sennett
1990 Prehistoric Pottery of Southwest Wyoming: A Preliminary Assessment. Paper presented at the 48th Plains Anthropological Conference, Oklahoma City, Oklahoma.

Day, Kent C., and David S. Dibble
1963 *Archaeological Survey of the Flaming Gorge Reservoir Area, Wyoming-Utah.* Anthropological Papers No. 65. University of Utah, Salt Lake City.

Dean, Patricia, and Kathleen M. Heath
1990 Form and Function: Understanding Gray Pottery in the Northeastern Great Basin. In *Hunter-Gatherer Pottery from the Far West*, edited by Joanne M. Mack, pp. 19-28. Anthropological Papers Number 23. Nevada State Museum, Carson City, Nevada.

Frison, George C.
1973 *The Wardell Buffalo Trap, 48SU301: Communal Procurement in the Green River Basin, Wyoming.* Anthropological Papers No. 48. Museum of Anthropology, University of Michigan, Ann Arbor.

Fry, Gary F. and Gardiner F. Dalley
1979 *The Levee Site and Knoll Site.* Anthropological Papers No. 100. University of Utah, Salt Lake City.

Hakiel, Bridget, Nicholas Hakiel, James C. Mackey, Thomas Reust, and Ricky Laurent
1987 The Archery Site (48SW5222): A Uinta Fremont Campsite in Southwest Wyoming. *Southwestern Lore* 53(2):1-22.

Harrell, Lynn L.
1989 *The Buffalo Hump Site: Late Prehistoric Occupation in the Great Divide Basin, Wyoming.* Cultural Resource Series No. 7. Wyoming Bureau of Land Management, Cheyenne.

Heffington, J. Douglas, Tim Church, Michele Church, Judith Jacobson, A. Dudley Gardner, J. C. Mackey, George Burns, and David Gaylord
1982 *The Playa Project: Archaeological Investigations at the Texasgulf Tailings Pond #4, Sweetwater County, Wyoming.* Cultural Resource Management Report No. 4. Archaeological Services of Western Wyoming College, Rock Springs.

Holmer, Richard N., and Dennis Weder
1980 Common Post-Archaic Projectile Points of the Fremont Area. In *Fremont Perspectives*, edited by D. B. Madsen, pp. 55-68. Antiquities Section Selected Papers 16. Utah State Historical Society, Salt Lake City.

Kelly, Robert L.
1983 Hunter-Gatherer Mobility Strategies. *Journal of Anthropological Research* 39(3):277–306.

Latady, William R., James A. Truesdale, and Michael McFaul
1989 48UT920. In *Archaeological Investigations Wyoming Project SCPF-011-1(3) Kemmerer-Lazeart Junction Haystack Mine Section*, edited by William R. Latady, pp. 69–105. Prepared for Wyoming Highway Department. Office of the Wyoming State Archaeologist, Laramie.

Leach, Larry L.
1966 *The Archaeology of Boundary Village.* Miscellaneous Paper No. 13, Anthropological Papers No. 83. University of Utah, Salt Lake City.

Mackey, J. C., Thomas Reust, and Bridget Mackey
1989 *Archaeological Test Excavations of Site 48SU1087, Section 27, T27N, R113W, Sublette County, Wyoming.* Prepared for Enron Oil and Gas Company. Western Research Archaeology, Pinedale, Wyoming.

Madsen, David B.
1986 Prehistoric Ceramics. In *Great Basin*, edited by Warren L. d'Azevedo, pp. 206–214. Handbook of North American Indians, vol. 11, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.
1989 *Exploring the Fremont.* University of Utah Occasional Publication No. 8. Utah Museum of Natural History, Salt Lake City.

Madsen, David B. and La Mar W. Lindsay
1977 *Backhoe Village.* Antiquities Section Selected Papers No. 12. Division of State History, Salt Lake City.

Madsen, Rex E.
1977 *Prehistoric Ceramics of the Fremont.* Ceramic Series No. 6. Museum of Northern Arizona, Flagstaff.

Marwitt, John P.
1970 *Median Village and Fremont Culture Regional Variation.* Anthropological Papers No. 95. University of Utah, Salt Lake City.
1986 Fremont Cultures. In *Great Basin*, edited by Warren L. d'Azevedo, pp. 161–172. Handbook of North American Indians, vol. 11, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

McKibbin, Anne, Ronald J. Rood, and Michael D. Metcalf
1989 *Archaeological Excavations at Six Sites in the Leucite Hills, Sweetwater County, Wyoming.* Prepared for Black Butte Coal Company. Metcalf Archaeological Consultants, Inc., Eagle, Colorado.

McNees, Lance M., Thomas P. Reust, and Craig S. Smith
1989 *Prehistoric Foragers of Southwest Wyoming: Phase II Archaeological Investigations for the Black Butte Coal Mine Pit 10 Project.* Prepared for Black Butte Coal Company. Mariah Associates, Inc., Laramie, Wyoming.

McNees, Lance M., Thomas P. Reust, Rick Weathermon, Craig S. Smith, Richard Anduze, Bruce McCelland, Karl Kibler, Fred Oglesby, and Cynthia Webb
1992 *Data Recovery Investigations at the Black Butte and Leucite Hills Mine Permit Areas, Sweetwater County, Wyoming.* Prepared for Black Butte Coal Company. Mariah Associates, Inc., Laramie, Wyoming.

Metcalf, Michael D.
1975 *Archaeological Investigations at the Proposed Black Butte Mine, Sweetwater County, Wyoming.* Prepared for Black Butte Coal Mine. Western Wyoming College, Rock Springs.
1987 Contributions to the Prehistoric Chronology of the Wyoming Basin. In *Perspectives on Archaeological Resource Management in the Great Plains*, edited by A. J. Osborn and R. C. Hasler, pp. 233–261. I & O Publishing Company, Omaha.

1988 Fremont Influences in the Late Prehistoric Period of Southwestern Wyoming. Paper presented at the 21st Great Basin Anthropological Conference, Park City, Utah.

Metcalf, Michael D., T. C. Pebbles, and G. Hummer
1983 *A Class II Cultural Resource Survey of the Green River Study Area, Sweetwater County, Wyoming.* Metcalf-Zier Archaeologists, Eagle, Colorado.

Morss, Noel M.
1931 *The Ancient Culture of the Fremont River in Utah: Report on the Explorations under the Clafin-Emerson Fund, 1928–29.* Papers of the Peabody Museum of American Archaeology and Ethnology Vol. 12, No. 3. Harvard University, Cambridge.

Rodriquez, Herbert, Ronald E. Kainer, James C. Miller, R. Thomas Euler, and Russel L. Tanner
1982 *Final Report on Archaeological Investigations Along the Overthrust Pipeline Route, Southwestern Wyoming.* Cultural Resource Management Report No. 1. Archaeological Services of Western Wyoming College, Rock Springs.

Schroedl, Alan R. (compiler)
1985 *Archaic and Late Prehistoric Adaptation in Southwestern Wyoming: The Frontier Pipeline Excavations.* Cultural Resource Series No. 3. Wyoming Bureau of Land Management, Cheyenne.

Sharrock, Floyd W.
1966 *Prehistoric Occupations Patterns in Southwest Wyoming and Cultural Relationships with the Great Basin and Plains Cultural Areas.* Anthropological Papers No. 77. University of Utah, Salt Lake City.

Shields, Wayne F.
1967 *1966 Excavations: Uinta Basin.* Miscellaneous Paper No. 15, Anthropological Papers No. 89. University of Utah, Salt Lake City.
1978 *The Woodruff Bison Kill.* Miscellaneous Paper No. 21, Anthropological Papers No. 99. University of Utah, Salt Lake City.

Simms, Steven T.
1986 New Evidence for Fremont Adaptive Diversity. *Journal of California and Great Basin Anthropology* 8:204-216.
1990 Fremont Transitions. *Utah Archaeology 1990* 3(1):1–18.

Smith, Craig S.
1988 Seeds, Weeds, and Prehistoric Hunters and Gatherers: The Plant Macrofossil Evidence from Southwest Wyoming. *Plains Anthropologist* 33(120):141-158.

Smith, Craig S., and Steven D. Creasman
1988 *The Taliaferro Site: 5000 Years of Prehistory in Southwest Wyoming.* Cultural Resource Series No. 6. Wyoming Bureau of Land Management, Cheyenne.

Steward, Julian H.
1933 *Archaeological Problems of the Northern Periphery of the Southwest.* Bulletin No. 5. Museum of Northern Arizona, Flagstaff.

Trigger, Bruce G.
1989 *A History of Archaeological Thought.* Cambridge University Press, Cambridge.

Truesdale, James A., and William P. Eckerle
1986 *Continued Archaeological Investigation at 48SW6191; Test Excavations, Recommendations, and Data Recovery Program for Area B, Highway Project SSP-TO-017-1(12).* Prepared for Wyoming Highway Department. Office of the State Archaeologist.

Truesdale, James A., and David V. Hill
1991 A Re-evaluation of the Fremont "Uinta" Gray Pottery form Dinosaur National Monument, Utah/Colorado. Paper presented at the 49th Plains Anthropological Conference, Lawrence, Kansas.

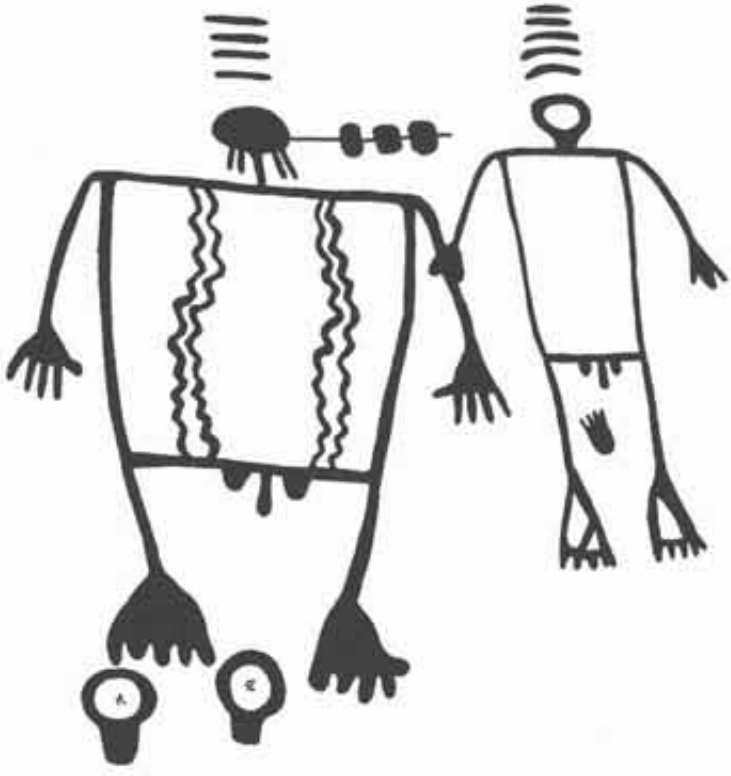
Truesdale, James A., and William R. Latady, Jr.
1991 48UT920, Implications for Fremont Adaptation in Southwestern Wyoming. Paper presented at the 49th Plains Anthropological Conference, Lawrence, Kansas.

Vehik, Susan C.
1977 Bone Fragments and Bone Grease Manufacturing: A Review of Their Archaeological Use and Potential. *Plains Anthropologist* 22(77):169–182.

Vlcek, David, and Josephine Merewether
1980 *An Intensive Cultural Resource survey of the Amoco Champlin 535-C #1 Access Route, Sweetwater County, Wyoming.* Prepared for Amoco Production Company. Archaeological Services, Laramie, Wyoming.

Wormington, H. M.
1955 A Reappraisal of the Fremont Culture. *Proceedings of Denver Museum of Natural History No. 1.* Denver.

Zier, Christian J.
1982 *The Oyster Ridge Site, Late Prehistoric Antelope Utilization in the Bridger Basin, Southwestern Wyoming.* Wyoming Contributions to Anthropology 3:26–38. University of Wyoming, Laramie.



REPORTS

LATE BASKETMAKER ARCHAEOLOGY ON THE MIDDLE VIRGIN RIVER, WASHINGTON COUNTY, UTAH

Shane A. Baker, Office of Public Archaeology, Brigham Young University, 105 Allen Hall, Provo, Utah 84602

Lorna Beth Billat, Office of Public Archaeology, Brigham Young University, 105 Allen Hall, Provo, Utah 84602

INTRODUCTION

During the early part of 1987, the Office of Public Archaeology (OPA) at Brigham Young University (BYU) completed a data recovery program at five archaeological sites along the Virgin River in Washington County, Utah. The project area lies in the heart of the Virgin Anasazi Culture area, a region that can still be characterized as poorly understood. The work completed by BYU on the State Route 9 (SR-9) Project contributed crucial data at a time when a number of significant projects were coming to completion in the region. This surge of research included several projects completed during the late 1970s and early 1980s, which together constitute the first substantial investigation of Virgin Anasazi riverine sites to be conducted since the 1960s. These include investigations at the Red Cliffs Site (Dalley and McFadden 1985), Greensprings (Westfall et al. 1987), the Little Man Sites (Dalley and McFadden 1988), and a number of sites in the Quail Creek Reservoir project area (Walling et al. 1986). The SR-9 Project sites add an important piece to this growing picture of prehistoric adaptations in the St. George Basin and surrounding area.

OPA's investigations at the SR-9 sites provided an opportunity to explore questions on the ecology and subsistence strategies employed by Virgin Anasazi groups during the Late Basketmaker Period. In addition, information was recovered that helps to elucidate questions about site structure and architectural developments in the region.

The sites that were the subject of the OPA data recovery project were 42Ws324, 42Ws326, 42Ws329, 42Ws331, and 42Ws2225. They are located in the interior of the Virgin River drainage between Dalton Wash and Grafton, Utah (Figure 1). All of the sites except 42Ws329 are located on the north side of the river on or at the base of a pronounced basalt, boulder-strewn talus slope. Site 42Ws329 is on a sand dune terrace directly overlooking the river. The regional topography and geology are dominated by extensive flat-topped mesas cut by the Virgin River and its tributaries.

The project area lies at the extreme northeastern edge of a small extension of the Mohave Desert, and is characterized by generally dry, hot conditions with limited precipitation but a long growing season. Vegetation consists of a variety of upland desert species including creosote bush, catclaw acacia, honey mesquite, bursage, saltbush, blackbrush, and sagebrush on the slopes and mesa tops; and riverine species including cottonwood, willow, and arrow-weed along the stream channel. The relatively inhospitable aspects of the environment are tempered by several positive factors, including the availability of perennial water, and a diversity of natural resources, which give the area both advantageous and limiting qualities (Dalley and McFadden 1985, 1988). The location of the project sites adjacent to the Virgin River is in keeping with a general pattern of sites being situated close to permanent water sources, an essential requirement for making a living in this arid area (Dalley and McFadden 1985).

SITE DESCRIPTIONS

Three of the five sites selected for mitigation, 42Ws324, 42Ws331, and 42Ws2225, provided only limited information and will not be discussed here (see Billat et al. 1992 for complete descriptions of all findings on this project). The majority of the research questions were addressed by information obtained from sites 42Ws326 and 42Ws329, which proved to be substantial with both habitation and storage structures present.

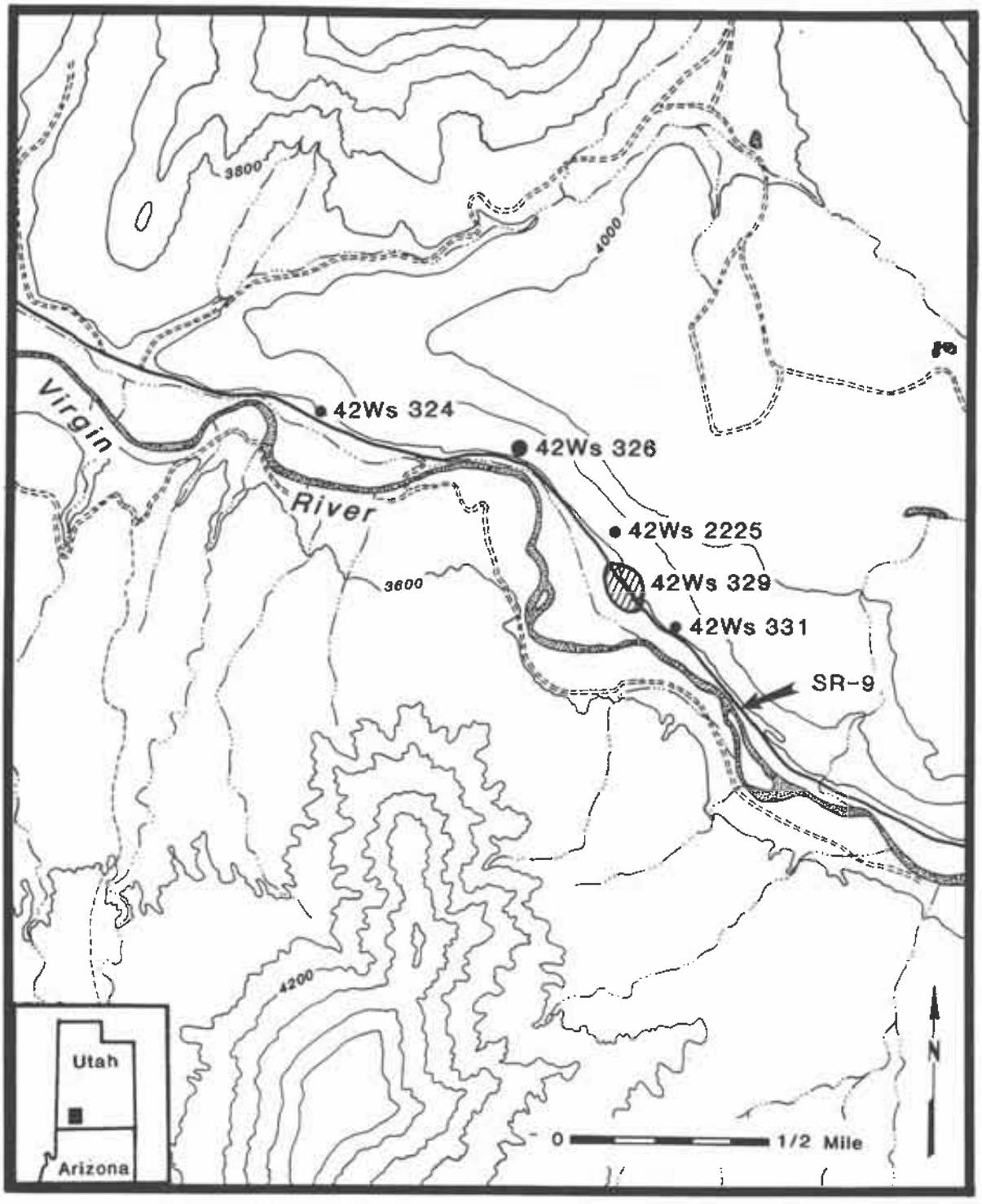


Figure 1. Project area and site location map.

Table 1. Cists at 42Ws329

	Size (cm)	Shape	Comments
Cist 1	80 L x 80 W x 35 H	Circular	Contiguous w/ Cist 2
Cist 2	38 L x 51 W x 23 H	Rectangular	Contiguous w/ Cist 1
Cist 3	112 L x 85 W x 27 H	Oval	

42Ws329—Big Dune Site

The Big Dune Site (42Ws329) was the smaller of the two habitation sites. It was situated in a large dune area north of the Virgin River about 5 miles east of Virgin, Utah. The extensive nature of the dune sediments, and the possibility of obscured subsurface features led OPA to decide upon specialized investigations at the site. Geo–Recon of Seattle, Washington, was contracted to conduct an extensive magnetic gradiometer survey of the entire site area. This technique can detect minor differences in magnetic fields between undisturbed areas of soil and buried features. Eight anomalies (strong variations in the magnetic readings) were identified. These included five that Geo–Recon felt might indicate cultural features, and three that they believed were geological in nature, or caused by modern trash, etc. (Musser and Dalan 1987). OPA used the results of the Geo–Recon survey to help define a systematic testing strategy for the site.

All of the hot spots identified by Geo–Recon were tested for subsurface cultural remains. In addition, a number of other locations were selected either randomly, or on the basis of surface artifact concentrations. The testing procedures included hand trenching, backhoe trenching, and shallow scraping tests that exposed larger areas by removing surface sediments.

None of the anomalies identified by the gradiometer survey were cultural. All were caused by natural geological features. The test excavations did find five isolated cultural features not indicated by the gradiometer survey: two hearths and three cists. The latter were associated with a previously located pithouse (Southworth and Nielson 1986, 1987). These six features were excavated by OPA. Aside from a few isolated artifacts, most of the test trenches were devoid of cultural materials.

Feature Descriptions

Isolated Hearths 1 and 2. Two small hearths were identified during testing, and were excavated. One was buried quite deep, about 14.5 m below ground surface. It was a simple, unprepared hearth with no associated artifacts and yielded a calibrated C^{14} date with a range of 1410–750 B.C. The other was shallower, approximately 38 cm below surface, and was slab lined. This second feature yielded a calibrated date range of 1320–480 B.C. and also lacked any associated artifacts.

Cists 1–3. Three cists were found at the site, the details of which are summarized in Table 1. Cists 1 and 2 were located about 10 cm below the surface, just to the southwest of the pit structure. Constructed of sandstone slabs and clay mortar, they were both roughly circular in shape and were conjoined on one side. Cist 3 was located a short distance to the southwest, and was slightly larger in size and more oval in shape. It was also made of wet-laid, upright sandstone slabs. No diagnostic artifacts were found in association with any of the cists.

Pithouse 1. The remains of half a slab-lined pithouse and hearth were found near the center of the site. The structure was only partially intact, with somewhat poorly defined boundaries. It appears to have been about 2.6 m in diameter and roughly circular in shape. The southwestern portion of the interior pithouse wall was slab-lined. A simple, unprepared, roughly circular-shaped hearth 36 cm in diameter was located in the center of the feature. The floor was marked only by compaction.

The material culture included 25 North Creek Gray sherds from the pithouse, and 15 Southern Paiute Utility Ware sherds from the site surface north of the pithouse. Lithic artifacts included 25 flakes, 1 core, 9 hammerstones, and 5 whole or fragmentary ground stone artifacts.

The evidence indicates that the site was used for short periods of time, or seasonally; however, at least three separate and different periods of use are apparent. These include Late Archaic (ca. 1100 B.C.) indicated by the isolated hearths; an Anasazi Basketmaker III occupation (A.D. 650–900) indicated by the pithouse and associated artifacts; and a very light Southern Paiute use (ca. A.D. 1500–1850) revealed by the presence of Southern Paiute ceramics on the site surface. Of the three, the Basketmaker occupation is clearly the most intense, and the presence of a pit structure suggests a short term residential base; whereas, the very ephemeral remains affiliated with the earlier and later occupations indicate nothing more than very short-term campsites.

42Ws326–Road Runner Village

The largest and most complex site investigated during the project was Road Runner Village (42Ws326). This was a small village located on a prominent, boulder-strewn bench at the foot of the talus slope, on the north side of the Virgin River about 2 miles east of the town of Virgin. The site contained 4 pithouses, 23 storage cists, 2 firebox features, a shallow midden, and an exterior work area (Figure 2). The structures and artifactual debris covered a 90 m by 30 m area on a high bench overlooking the river (Figure 3).

The site was first recorded by Intersearch, of Cedar City, Utah, in early 1985 (Thompson 1985a), and was subsequently tested by them later that same year (Thompson 1985b; Walling 1985). Several features were either tested or excavated in their entirety. Much of the early testing focused on those structures that were obvious because of the presence of partially exposed upright slabs on the surface. Prior to the time that OPA began work at the site, the presumption was that most of the major features had been located, and had been either tested or excavated by Intersearch. This assumption proved to be incorrect. A significant portion of the site was well disguised and showed few surface indications of the numerous, buried features. Many of the structures, even major features such as pithouses, were found only by widespread subsurface testing over large areas of the site. The cautionary warning to be drawn from this, and already sounded by other researchers (Dalley and McFadden 1985:35), is that sites in the region may be very difficult to interpret by surface indications alone, and may often appear to be much smaller and simpler than they really are.

Feature Descriptions

The features and structures were dispersed across the area of the site, but tended to aggregate at the west end, where three pithouses and two large cist complexes were closely associated. A third cist complex and the fourth pithouse were located to the east along the bench, together with several other isolated features.

Pithouse 1. This was the largest habitation structure on site. It measured 5.5 m (north to south) by 5.92 m (east to west), and was roughly oval in outline (Figures 4 and 5). A small, parabolic-shaped antechamber, measuring 1.75 m by 3.8 m, was incorporated on its southeastern side. Three primary postholes were located in the floor in the northwest, northeast, and southeast quadrants (evidence of a fourth posthole was inexplicably absent), suggestive of a four-post quadrilateral interior roof support system.

The pithouse was constructed by excavating a deep, circular depression into undisturbed caliche sediments underlying the site. On the north side of the structure, the excavation intruded down about 80 cm into the caliche. This compact, noncultural stratum of gravel and caliche underlies almost all of the site, sloping off considerably to the south due to the natural topography. The net effect at Pithouse 1 is a vertical, clearly defined wall on the north side of the pithouse that is the result of the feature being cut into the caliche layer. To the south, however, the caliche slopes off, and the feature is not as deeply intruded into underlying sterile sediments. Large basalt stones appear to have been used to form a short wall on the south side of the pithouse to compensate for this. These wall stones were not dressed or mortared, and appear to have simply been stacked along the edge of the pit to form a wall or side to the structure. The basalt stones also extend eastward, defining the north side of the antechamber. The top of the sterile caliche was leveled and prepared by smoothing and compacting to form the floor of the structure.

Fourteen subfloor pits were found on the main floor of the pithouse, and one in the antechamber. Three of the pits were used for main roof support posts, while the remainder were probably pot rests, secondary postholes, and other features. The subfloor pits were mostly round to oval in shape and range from as large as 36 cm in diameter to as small as 15 cm in diameter,

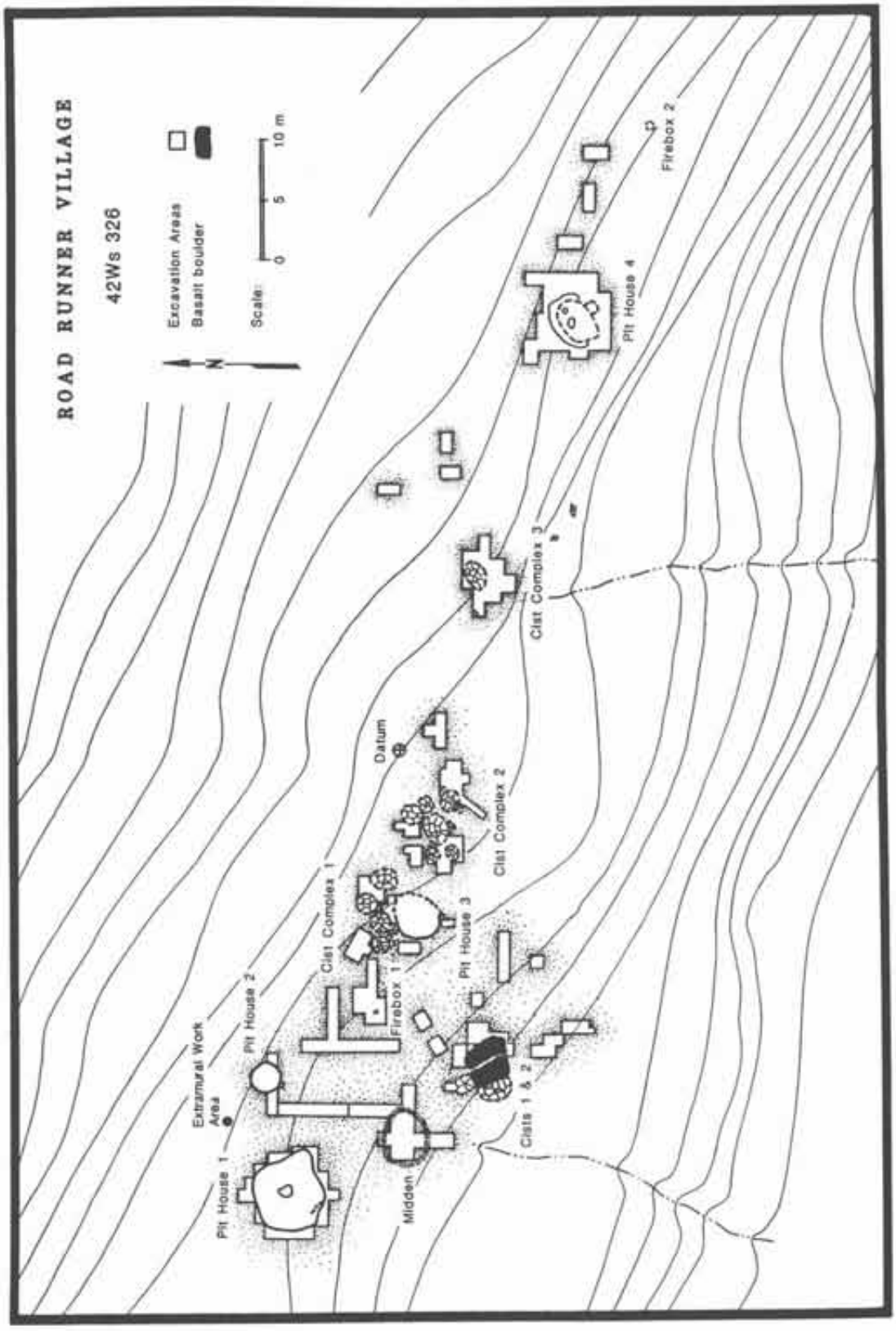


Figure 2. Plan map of 42Ws326.

Figure 3. Overview of 42Ws326.

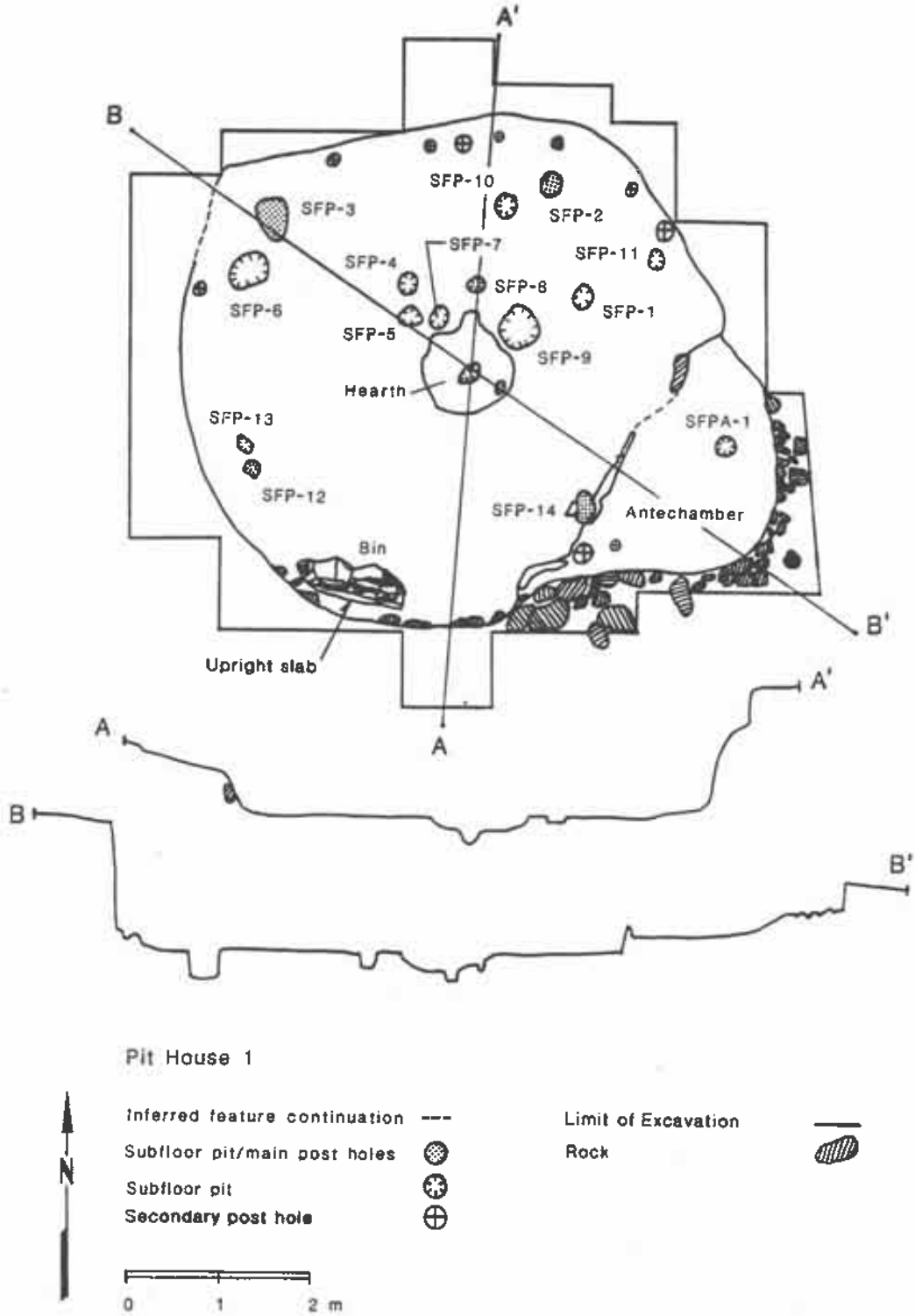


Figure 4. Plan map of Pithouse 1.

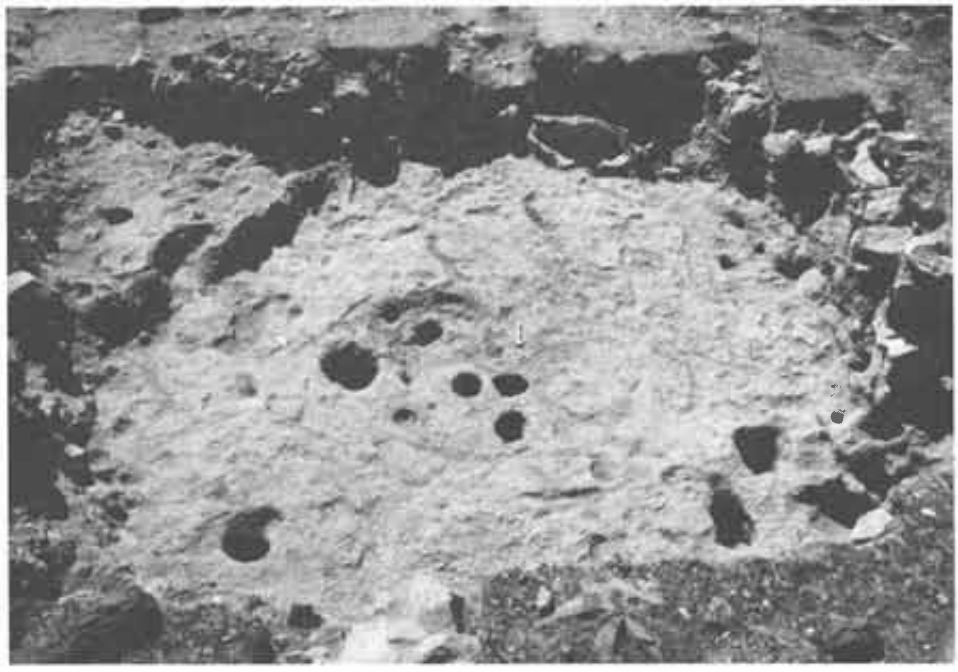


Figure 5. View of Pithouse 1 looking southeast.

and from 50 cm to as few as 5 cm deep. Several smaller pits were located around the floor edge, and were inferred to be secondary postholes for roof and wall support.

A shallow, basin-shaped hearth with no apparent rim or clay lining was found in the center of the main room of the pithouse. The hearth was slightly irregular, about 85 cm in diameter, and contained two distinct pits.

The only other architectural feature in the main area of the pit structure consisted of the incomplete remains of an upright slab bin feature located close to the exterior wall on the south side. The bin appears to have originally been a small, oval-shaped, slab-lined feature about a meter long. The bin may have been a late addition to Pithouse 1, or an intrusive feature built after abandonment and partial filling of the structure. Disturbed and eroded sediments in the area around the bin, and the incomplete nature of the feature itself make it impossible to be certain which is the case.

The antechamber was separated from the main portion of the pithouse by a short, raised clay ridge. Several portions of this ridge contained indentations that indicate small posts were incorporated along with mud to make a jacal wall between the pithouse and the antechamber. Like the main floor area, the antechamber floor was formed from compacted caliche. The floor surface sloped noticeably upwards to the southeast.

The roof and superstructure of the pithouse were partially burned following occupation. This is indicated by quantities of small charcoal pieces in the roof fall zone, a thin layer (1 cm) of ashy fill widespread over the floor, and by two well-burned posts in the floor. In addition, a large area of the floor west of the fire hearth was very well burned and fire blackened. However, the absence of extensive burned roof fall or burned beams suggests that most or all of the superstructure was removed after the structure was abandoned, and before the posts burned.

Pithouse 2. This nearly circular pithouse was about 2.5 m in size, with a small (70–80 cm) squarish extension that probably functioned as an antechamber or entryway on the southeastern side (Figures 6 and 7). Eight to ten possible postholes were noted in the floor around the periphery of the main room, together with ten subfloor pits and basins scattered throughout the interior of the room.

The pithouse was constructed by excavating a shallow circular depression about 50 cm deep into the

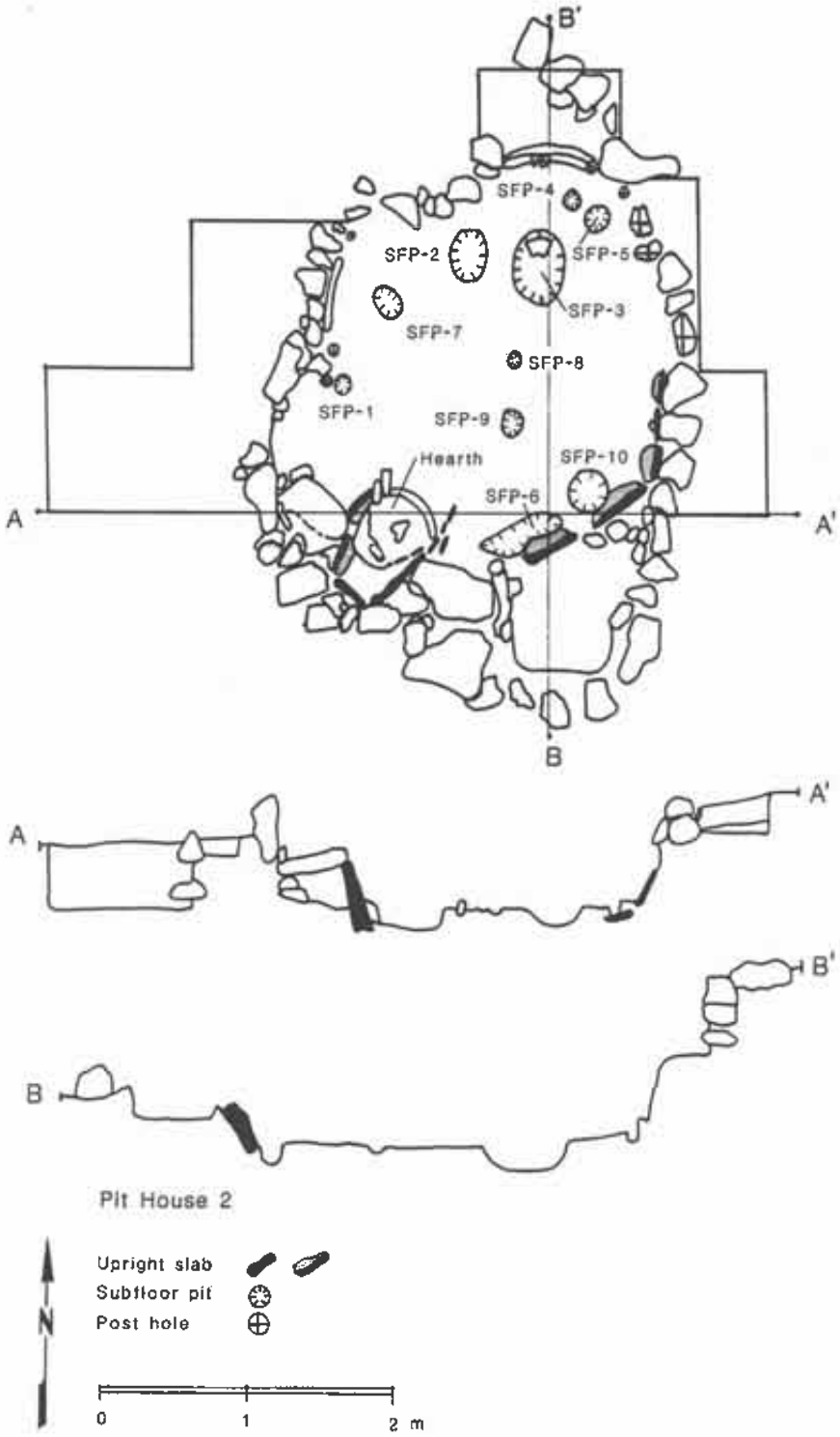


Figure 6. Plan map of Pithouse 2.

Figure 7. View of Pithouse 2 looking northeast.

caliche substratum of the site area. The pit was dug deeper into the east and north than on the other sides because of the slope of the building area. A ring of basalt boulders on the surface outlined the edges of the structure.

The interior use surface was a hardened, prepared, sandy clay layer placed on top of the caliche. The floor sloped up to the house edges, where in places it curved up the wall. Much of the floor had been damaged by extensive rodent activity, making it difficult to define. The postholes along the exterior wall of the pithouse were generally shallow, unevenly spaced, and averaged about 15 cm in diameter.

Eight subfloor pits were found distributed unevenly around the interior of the structure. Most were oval to round in shape and ranged from 50 to 10 cm in diameter, and from 50 cm to 7 cm in depth. Four were clay-capped, suggesting that not all of the features were in use at the same time, and that various arrangements of pits were probably used at different times. Some may have served as pot rests or for storage, but others are more enigmatic in nature. One exceptionally large pit, (SFP-10 subfloor pit), located in the southeastern quadrant of the structure, was very deep and bell shaped. The feature measured 32 cm wide at the floor level but broadened to a maximum of 43 cm wide and 50 cm deep. Buried in the pit were several pigment specimens, a basalt maul and some chipped stone fragments. It was clay-capped at the level of the floor of the pithouse. A slab and clay-lined hearth was situated adjacent to the southwestern wall of the structure, and was slightly recessed about 10–15 cm below the floor.

A small antechamber or entryway was found on the southeastern wall of the pithouse, separated from it by a large upright stone slab divider. The antechamber was excavated 10–15 cm below the top of the caliche and filled with 7–10 cm of loose sandy clay that had been topped by a compacted sand layer 0.5–3 cm thick. It appears that at the time of initial construction, the floor extended uninterrupted throughout the entryway and the large stone slab divider was added later.

Fill within the structure suggests that the roof collapsed following a period of abandonment, as there is a layer of mottled sand between the roof fall matrix and the floor. Very little wood, charcoal or burned soil was evident in the roof fall or on the floor, indicating that the pithouse did not burn.

Pithouse 3. Pithouse 3 was roughly oval-to-circular in shape, and measured 4 m (east to west) by 4.5 m (north to south) (Figures 8 and 9). It was located in the midst of Cist Complex 1 and was bordered on the north side by Cists 5 and 6. Existing side walls were found 75 cm high above the caliche use surface. This structure was partially excavated by Intersearch in 1985, and much of the interior fill, particularly in the western half, was removed.

Pithouse 3 was constructed by excavating down to the top of the caliche and gravel stratum underlying the site. Basalt boulders were placed around the upper edge of the excavated pit, with their generally flat sides facing the interior. There were no apparent postholes or hearths, although one centrally located area contained a considerable amount of ashy and burned soil. OPA uncovered what little remained of the floor, primarily in the northeastern section of the structure. The fill in Pithouse 3 contained numerous large basalt boulders that may suggest the exterior rock wall was substantially higher, at least on the eastern side. Fill in the western half of the structure also contained rock rubble and boulders (Walling 1985), confirming the possibility of substantial walls of unshaped rock. There was no evidence of roof fall within the fill or postholes on the floor to suggest the presence of a substantial wood and mud roof as was indicated for the other pithouses at the site. The structure may have had a more temporary roof of some kind, such as light brush or boughs.

The floor of Pithouse 3 was not a prepared clay surface, but was instead a compacted sand, reddened and charcoal stained in some areas. Walling (1985) reported that several ashy areas were noted in the cross-section of the pithouse, suggesting the presence of several possible undefined hearth areas. This may indicate short but repeated occupations of the structure, which could have functioned as a light-duty pithouse or field house as described by Dalley and McFadden (1985) at Red Cliffs.

Pithouse 4. This structure was located on the eastern part of the site on a relatively flat area of the bench. It was a circular, slab-lined structure about 3.57 m (east to west) by 3.4 m (north to south) (Figures 10 and 11). It contained a clay bench in an arc along the north side of the structure that appeared to be fire-reddened in some areas. The structure was constructed by excavating through a thick layer of noncultural clayey soil to the top of the sterile gravels that underlay most of the site. Slabs were then placed around the perimeter, with the clay bench being added afterwards. This pithouse was the deepest of all the structures at the site, with the floor being nearly 2 m below the modern ground surface on the uphill side. The floor consisted of very patchy, introduced clay, which for the most part lacked any significant burned or stained areas. The absence of a hearth and a well-prepared floor may reflect limited use. Very few artifacts were found in association with the structure.

A squarish slab-lined storage cist was built at the edge of the pithouse, set directly on top of and adjacent to a large, basalt boulder incorporated into the southeastern wall. The cist measured 80 cm by 80 cm in size and 40 cm deep. Upright sandstone slabs and a broken metate were used in its construction.

Four subfloor features were found inside Pithouse 4. All were oval to round in shape and were situated in the northern half of the structure. The three largest were about 50–60 cm in size and 7–38 cm deep, and were clustered in the northeastern quadrant of the room. The fourth was a small circular pit only 30 cm in diameter and 4 cm deep on the west side of the pithouse. Like the subfloor pits in the other habitation structures, these pits appear to be pot rests or small storage features.

Storage Cists. Twenty-three storage cists were found and excavated at the site in the areas surrounding and adjacent to the pithouses. The storage cists were grouped in three distinct aggregations (designated as complexes), plus two isolated cists. Cists 1 and 2 were not part of a complex and were located by themselves to the south and west of the two largest cist complexes. They were constructed against a large, prominent basalt boulder near the southeastern edge of the site (Figure 2). Complex 1, comprised of cists 3–9, was located just north of Pithouse 3 amid a scatter of basalt boulders (Figure 8). Cist Complex 2 (Figure 8) was just east of Complex 1, separated from it by a dense pile of basalt boulders, and included cists 10–19. To the east, between Cist Complex 2 and Pithouse 4, was Cist Complex 3 (Figure 2), which contained cists 20–23. The cist complexes appear as somewhat irregular groups or clusters that were not aligned in linear or arc-shaped arrangements. They were not directly connected to houses other than Pithouse 3.

The cists varied in size and shape but were constructed using similar basic methods and materials. Data on the individual cists are summarized in Table 2. Most of the walls were made from upright

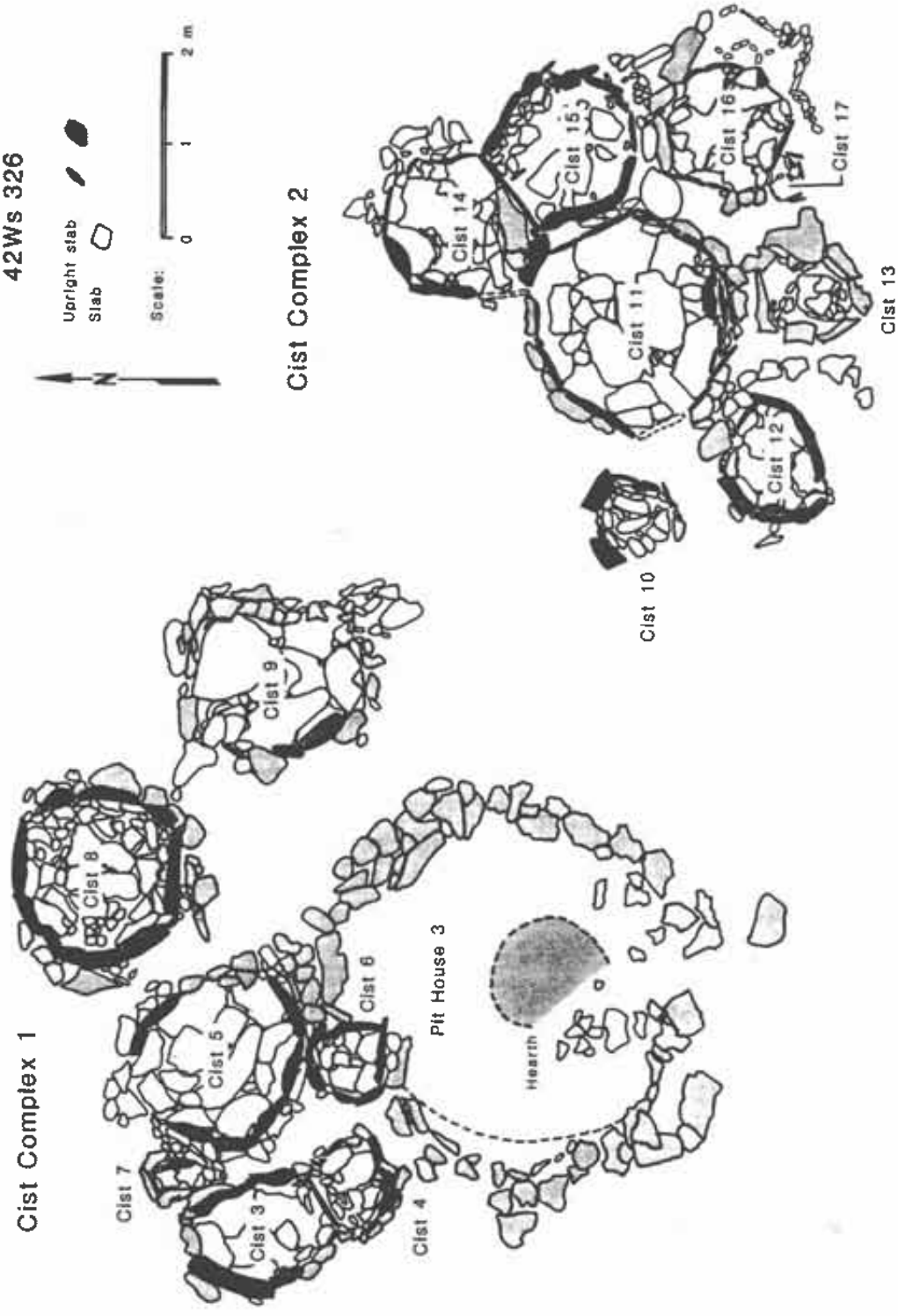


Figure 8. Plan map of Pithouse 3 and adjacent Cist Complexes 1 and 2.

Figure 9. View of Pithouse 3 looking north.

sandstone slabs, although in a few instances large, basalt boulders were used. Slab size varied but was usually proportional to the size of the cist, with larger slabs necessarily being used to construct the larger cists. Most of the slabs did not exhibit evidence of extensive shaping or modification. The main wall slabs were laid either abutting or slightly overlapping, and secondary smaller slabs were then used to chink gaps near the floor and between slabs. Clay mortar was used in most instances to seal cracks and cement the walls. Cist floors were constructed of small-fitted slabs, which sometimes underlaid wall slabs and sometimes were laid inside wall slabs. Most were either partially or completely covered with a clay seal.

Five cists (3, 5, 9, 11, and 12) showed clear evidence of low-coursed, tabular, sandstone masonry walls laid on top of the upright slabs to complete their upper portions. Three other cists (4, 13, and 16) incorporated irregular-shaped, basalt boulders or cobbles in low walls around their openings. The few artifacts recovered from inside the cists were contained in post-occupational fill. It is assumed that most of the cists were originally covered with flat or slightly domed roofs comprised of sticks, brush, and mud. Roof fall, found infrequently in the cists, usually consisted of a thin stratum of jumbled clay and badly decomposed organics in a heterogeneous layer.

Fireboxes. Two small, exterior hearth/fireboxes were found at the site (Figure 2). Firebox 1 was a small, squarish, slab-lined feature found in a cleared area between the midden and the western most cist complex. The feature was constructed of several upright sandstone slabs, and measured 32 cm in diameter and 20–33 cm deep. The firebox was open to the west, but it is not clear if it was originally constructed that way, or was damaged by erosion. Firebox 2 was located at the bench edge, just east of Pithouse 4. Excavation showed it to be a pentagonal-shaped, slab-lined feature. It measured 52 cm (east to west) by 54 cm (north to south) and was approximately 37 cm deep. It contained a layer of dark-gray, ashy, stained sand that completely covered the lower side walls and the slab floor. Its construction was different from other structures on the site in that several concentric rows of thin sandstone slabs were used to form its walls. Unlike Firebox 1, the basin was completely slab-lined with patches of what appeared to be burned clay mortar at the corners, primarily in its western half. No other artifacts were found in the feature. Its proximity to Pithouse 4 may

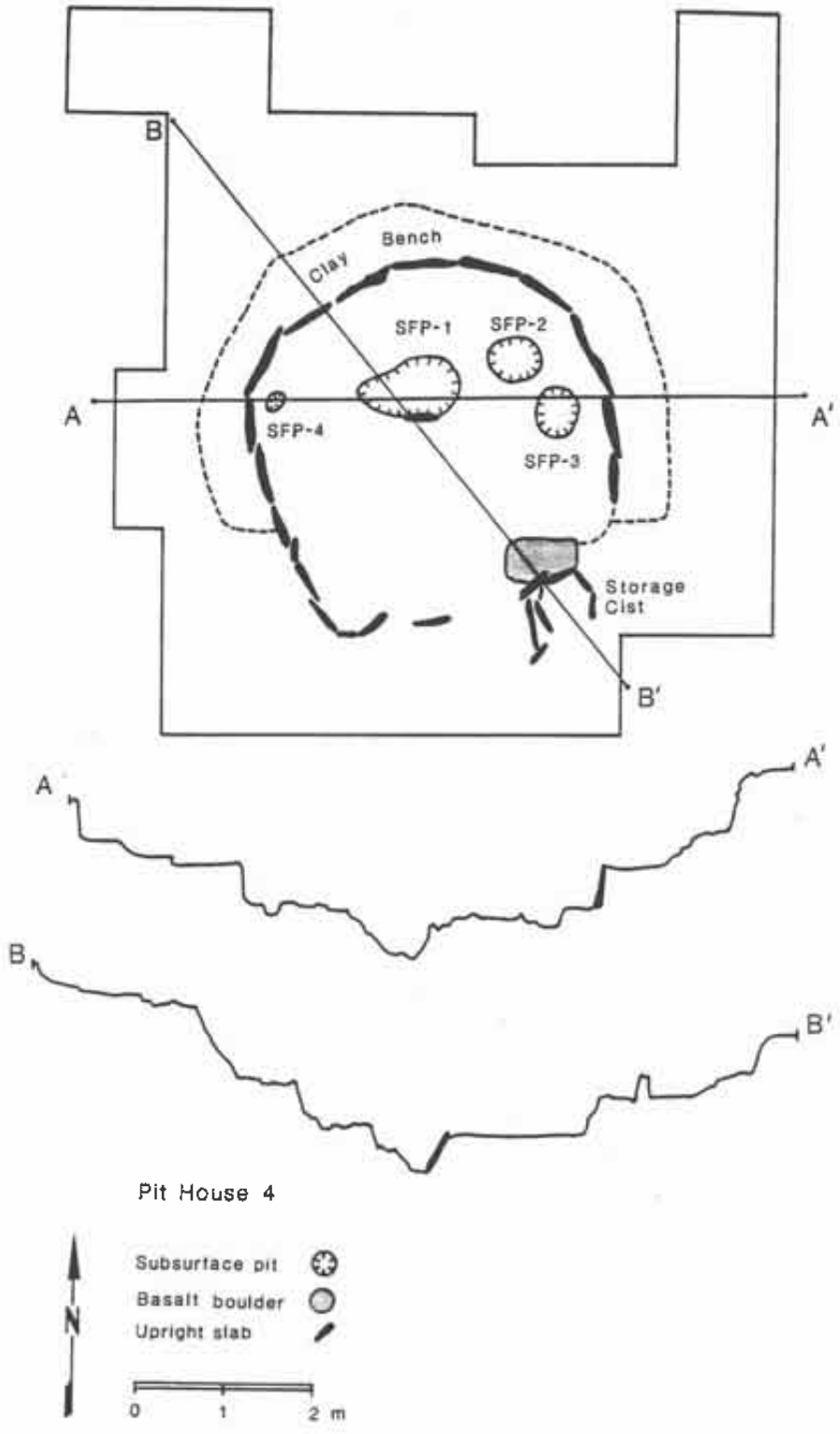


Figure 10. Plan map of Pithouse 4.

Figure 11. View of Pithouse 4 looking south.

suggest its use as an exterior hearth for that feature, which lacked an interior hearth.

Midden. A relatively small, thin trash midden was situated south of Pithouses 1 and 2, and to the northwest of Cists 1 and 2 (Figure 2). It covered a 5 m (north to south) by 3 m (east to west) oblong area along a natural wash that cut through the southwestern edge of the site. The majority of fill was a medium-brown, loose sandy sediment. It was heavily stained with charcoal and contained most of the artifacts, the majority of which were ceramics. The midden was not well stratified as erosion, sheet wash, and secondary processes had mixed and disturbed the deposits.

Material Culture and Ancillary Studies

42Ws326 yielded a larger number of artifacts than any of the other sites but would still have to be described as somewhat sparse in terms of material culture. Artifacts recovered included ceramics, chipped and ground stone, faunal remains, and miscellaneous exotic materials.

A total of 3,213 sherds was recovered from excavations at the site. The assemblage included one partially reconstructible vessel and 29 edge-modified sherds. All but six of the sherds were identified as North Creek Gray (Virgin Series). The exceptions included four olivine-tempered sherds, classed as Moapa Brown (Moapa Series); and two small, unidentified, black-on-gray, decorated sherds that were too small to classify fully (unidentified Virgin Series Black-on-gray). The provenience of the recovered ceramics is summarized in Table 3.

A total of 1,273 chipped-stone specimens was collected from site 42Ws326. The majority of artifacts were made from general cryptocrystalline silicates (CCS), with local agate, jasper and quartzite being the other most common lithic source materials. Two obsidian flakes and one obsidian projectile point were also found. The majority of the assemblage was unmodified debitage (87%), while worked flakes and other tools comprised the remainder of the lithic materials (13%). The provenience and quantities of recovered lithic tools are summarized in Table 4. Seventeen partial or complete projectile points were recovered (59% of the total assemblage), including 8 projectile point preforms. Thirteen of the finished projectile points are typical of arrow points found in Anasazi sites in southwestern Utah, and were classified as Rosegate (Thomas 1981), or Rosegate-

Table 2. Cists at 42Ws326

	Size (cm)	Shape	Comments
Cist 1	270 L x 190 W x 40 H	Oval	Possible use as work/use area
Cist 2	140 L x 100 W x 40 H	Oval	Contiguous w/ Cist 1
Cist 3	150 L x 122 W x 120 H	Oval	
Cist 4	110 L x 70 W x 45 H	Semi-rectangular	Contiguous w/ Cist 3
Cist 5	177 L x 180 W x 70 H	Circular	
Cist 6	63 L x 55 W x 40 H	Circular	
Cist 7	70 L x 30-15 W x 38 H	Triangular	
Cist 8	167 L x 185 W x 95 H	Circular	
Cist 9	200 L x 220 W x 100 H	Circular	Two floors
Cist 10	79 L x 73 W x 87 H	Circular	Incomplete
Cist 11	220 L x 220 W x 130 H	Circular	Largest cist at site
Cist 12	104 L x 130 W x 50 H	Oblong	
Cist 13	87 L x 75 W x 90 H	Circular	Possible firebox (?)
Cist 14	180 L x 140 W x 70 H	Oblong	Contiguous w/ Cist 15
Cist 15	145 L x 165 W x 40 H	Oblong	Contiguous w/ Cist 14
Cist 16	145 L x 137 W x 70 H	Circular	
Cist 17	50 L x 50 W x 45 H	Circular	Very small
Cist 18	60+ L x 20+ W x 50 H	?	Badly eroded, incomplete
Cist 19	60+ L x ? W x 16 H	?	Badly eroded, incomplete
Cist 20	70 L x 50 W x 40 H	Rectangular/Square	Superimposed over Cist 21
Cist 21	150 L x 150 W x 50 H	Triangular	
Cist 22	76+ L x 46+ W x 40 H	?	Badly eroded, incomplete
Cist 23	?	?	Badly eroded, incomplete

like points (Figure 12*b–e*). The two exceptions were Elko Series points, a type usually associated with the late Archaic and possibly early Formative periods (Figure 12*a*). These two artifacts may have been curated from earlier deposits, or reused by the inhabitants of 42Ws326. A total of 82 partial or complete ground stone tools was also recovered, including 56 manos and 26 metates.

Two additional stone artifacts were found at 42Ws326. These are a very fine-grained, dark, blackish-brown siltstone cloud blower or pipe (Figure 12*f*), and a white/pinkish, white gypsum yo-yo-like, grooved cylinder (Figure 12*g*). The cloud blower is from the lower portion of the fill in Pithouse 1, about 20 cm above the floor, and the grooved cylinder was found in the sediments beneath the floor of Cist 20, but above the floor of Cist 21.

Table 3. Provenience of Ceramics Recovered from 42Ws326

Provenience	North Creek Gray	Virgin Series Unidentified B/G	Moapa Series Moapa Brown	Total
PH 1 Subfloor/Floor	37	—	—	37
PH 1 Hearth	17	—	—	17
PH 1 Post-Occupational Fill	458	—	—	458
PH 2 Subfloor/Floor	5	—	—	5
PH 2 Hearth	5	—	—	5
PH 2 Post Occupational Fill	147	—	1	148
PH 3 Floor 1	34	—	—	34
PH 3 Floor 2	2	—	—	2
PH 3 Post Occupational Fill	296	—	1	297
PH 4 Subfloor/Floor	8	—	—	8
PH 4 Post Occupational Fill	78	—	—	78
Cist 1	388	—	—	388
Cist 2	37	—	—	37
Cist 4	5	—	—	5
Cist 5	19	—	—	19
Cist 8	40	—	—	40
Cist 9	14	—	—	14
Cist 11	23	—	—	23
Cist 12	8	—	—	8
Cist 13	46	—	—	46
Cist 15	6	—	—	6
Cist 16	54	—	—	54
Cist 17	3	—	—	3
Cist 18	5	—	—	5
Cist 21	6	—	—	6
Cist 22	2	—	—	2
Firebox 2	1	—	—	1
Midden	783	2	1	786
Test Areas	658	—	1	659
Surface	22	—	—	22
Total	3,207	2	4	3,213

Table 4. Chipped Stone Tools Collected at 42Ws326

Structure or Feature	Projectile Points		Other Tools					
	Rosegate	Elko Series	Bifaces	Drills	Utilized Flakes	Scrapers	Hammerstones /Choppers	Totals
Fill: PH 1	—	1	3	1	10	2	16	33
Floor zone: PH 1	—	—	—	—	1	—	2	3
Subfloor Pit: PH 1	—	—	—	—	1	—	—	1
Hearth: PH 1	—	—	—	—	—	—	4	4
Fill: PH 2	1	—	—	—	8	—	—	9
Roof Fall: PH 2	2	—	2	—	4	—	—	8
Floor zone: PH 2	—	—	1	—	3	—	1	5
Subfloor Pit: PH 2	—	—	—	—	2	1	—	3
Fill: PH 3	—	—	1	—	6	1	4	12
Fill: PH 4	2	—	2	1	9	—	1	15
Floor zone: PH 4	—	—	—	—	2	—	2	4
Subfloor Pit PH 4	—	—	—	—	—	—	1	1
Fill: Cist 1	2	—	—	—	8	2	11	23
Fill: Cist 2	—	—	—	—	1	—	—	1
Fill: Cist 4	—	—	—	—	1	—	—	1
Fill: Cist 11	—	—	1	—	3	—	—	4
Fill: Cist 12	—	—	—	—	1	—	—	1
Fill: Cist 13	—	—	—	—	—	1	—	1
Fill: Cist 15	—	—	—	—	—	—	4	4
Fill: Cist 16	—	—	—	—	—	—	1	1
Fill: Cist 17	—	—	—	—	—	—	6	6
Fill: Cist 22	—	—	—	—	—	—	1	1
Midden	3	—	1	—	20	3	11	38
Ochre/Sherd Cache	—	—	—	—	—	—	6	6
General Fill	2	1	1	—	9	5	7	25

Table 4. Continued

Structure or Feature	Projectile Points		Other Tools					
	Rosegate	Elko Series	Bifaces	Drills	Utilized Flakes	Scrapers	Hammerstones /Choppers	Totals
Surface	1	—	—	—	5	—	5	11
Provenience Unknown	—	—	2	—	24	—	—	26
Totals	13	2	14	2	118	15	83	247

Detailed analyses were conducted on 37 pollen and 51 macrofossil samples recovered at 42Ws326. Pollen data show that cheno-ams, ephedra, cattail, cactus, and buckwheat were probably used for food or medicine at 42Ws326. Corn pollen was very rare and was recovered only from one cist at the site. However, other corn plant remains (seeds and plant parts) were found in Pithouses 1, 3, and 4 confirming that corn was being used by the inhabitants. Cattail pollen in Cist 14, and buckwheat pollen in Cist 5 suggest that these plants were being stored by site occupants. Macrobotanical remains showed that corn, cheno-ams, hackberry, grasses, gourds, cacti, spurge, and mustard were utilized. All of these taxa are known to have been used for food, containers or medicines by indigenous peoples in the region (See Billat et al. 1992, Appendix M). Identified faunal remains were sparse but indicate the use of deer, cottontail rabbits, and possibly other small rodents (Table 5).

Chronology

Five radiocarbon dates were returned on various samples from 42Ws326. These, along with their calibrated age ranges, are shown in Table 6. Two dates from Pithouse 1 (1300 ± 50 and 1465 ± 85 B.P.) are probably the best reflection of the actual period of initial site occupation. Both are from a subfloor pit in Pithouse 1, with the 1300 B.P. age assayed on charcoal, and the 1465 B.P. age assayed by accelerator mass spectrometry on fragments of corn kernels. The weighted average (Long and Rippeteau 1974; Stuiver and Reimer 1987) of the two ages is 1342.4 ± 43 B.P. The calibrated age range of this average is A.D. 604–773, with a 94% probability that the target date falls within the period A.D. 637–773. These dates probably more accurately reflect the actual age of Pithouse 1 occupation than any other dates from the site.

The three remaining dates from 42Ws326 are older: 1620 B.P., 1760 B.P., and 1830 B.P. The calibrated range of this average is A.D. 131–387, with a 96% probability that the target date is in the A.D. 131–365 range. These dates are significantly older than the corn and charcoal dates averaged above. The 1620 and 1830 B.P. determinations are both from the remains of posts found within postholes on the floor of Pithouse 1. Age 1760 B.P. is from small pieces of charcoal from the hearth on the floor of Pithouse 3.

The use of C^{14} dating on structural wood can often yield problematical results because of several factors, most notably that of the curation and reuse of previously used, therefore, older wood (cf. Ahlstrom et al. 1991). When compared to the other two dates from the pithouse floor, on corn kernels and small charcoal, it appears that the posts were old wood and that the two younger dates are closer to the actual date of occupation of Pithouse 1. The somewhat conflicting data from the radiocarbon dates can be combined with other evidence to provide an acceptable interpretation of the site chronology (see Billat et al. 1992, Chapter 9). The pollen data indicate that Pithouse 1 was occupied during a period of increased relative effective moisture, while Pithouses 2, 3, and 4 were used during a period of decreased effective moisture. These distinct periods of moisture fluctuation correspond to patterns of environmental variation that occurred throughout the Anasazi region (Gumerman 1988; Plog et al. 1988). These later pithouses are not as large and may have been used for shorter periods than Pithouse 1. Many of the cists at the site seem to have been used during the first occupation, and a few probably were used by the later

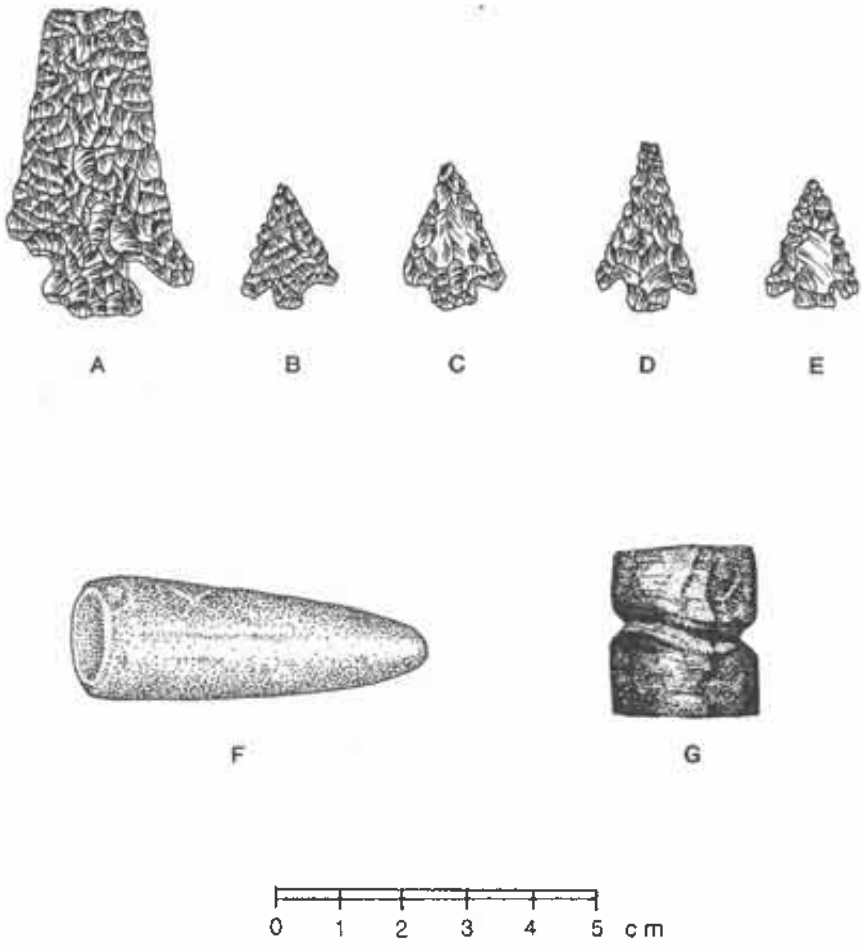


Figure 12. Miscellaneous artifacts recovered from 42Ws326: *A*, Elko Series, knife from Pithouse 1, fill; *B*, Rosegate/Parowan point from Pithouse 2, roof fall; *C*, Rosegate point from Pithouse 2, roof fall; *D*, Rosegate point from Cist 1, fill; *E*, Rosegate point from midden; *F*, Cloud blower found near floor of Pithouse 1; *G*, Grooved cylinder found in Cist 20.

inhabitants. The stratigraphic and artifactual evidence also suggests that Pithouse 1 was dismantled and used for some time as a refuse disposal site. The simplest explanation is that Pithouse 1 was constructed first, and is the earliest of all the habitation structures at the site. Following a brief hiatus, Pithouse 3 was probably built, followed by Pithouse 4 and Pithouse 2. Pithouse 1 was probably inhabited sometime between A.D. 650 and 750; Pithouses 2, 3, and 4 were probably used between A.D. 750 and 850.

The shallow character of the sediments over much of the site, and the widely dispersed features made it impossible to link stratigraphically the structures with each other and with the cists; thus, it is impossible to prove conclusively the temporal relations between all the features by stratigraphy. There is no superpositioning at the site, but the radiocarbon dates, pollen data, and other circumstantial evidence strongly suggests two general periods of occupation as discussed above.

The site represents a Basketmaker III occupation, based on the ceramic and architectural data corroborated by the two best C^{14} dates, which center at about A.D. 700. The structures have characteristics of both Basketmaker III and Pueblo I construction styles as described by Dalley and McFadden (1985:42–43),

Table 5. Provenience of Faunal Bone Recovered from 42Ws326

Provenience	Large Mammal	Small Mammal	Unknown	Geomyidae (gophers)	Cricetidae (mice)	*Sylvilagus sp.* (cottontail)	*Odocoileus hemionus* (deer)	Total
PH 1—Fill	17	21	8	2		2		50
PH 1—SFP-9		9						9
PH 2 Roof fall		1	2					3
PH 2 Posthole						1		1
PH 3—Fill	1							1
PH 3—Floor		1						1
PH 4—Fill	2	3	5	1	1			12
PH 4—Floor	1							1
Midden	2		2					4
Cist 1 Floor			2					2
Cist 9 Fill		1						1
Cist 16 Fill			1		1	1		3
Cist 20 Fill		6						6
Cist 21 Roof fall	1	2		2				5
Test Trench near Cists 20 and 21	84	11	73				5	173
General Fill	1	1						2
Test Trench Fill	1							1
Total	110	56	93	5	2	4	5	275

Table 6. Radiocarbon Dates from 42Ws326

BETA-Analytic Lab Number	Sample Location	Radiocarbon Age	Calibrated Range 2 Sigma (Stuiver & Reimer 1987)	Probability
Beta-21477	Post in Pithouse 1, SFP-2	1830 ± 60 B.P.	A.D. 52–264	86%
			A.D. 273–342	13%
Beta-21478	Corn cob in SFP-4, Pithouse 1	1465 ± 85 B.P.	A.D. 404–692	98%
Beta-24502	Charcoal in SFP-4, Pithouse 1	1300 ± 50 B.P.	A.D. 641–781	90%
			A.D. 789–810	4%
			A.D. 838–866	4%
Beta-21481	Post in Antechamber Pithouse 1	1620 ± 90 B.P.	A.D. 227–638	98%
Beta-21476	Possible hearth in Pithouse 3	1760 ± 160 B.P.	90 B.C.–A.D. 610	100%

although Basketmaker traits are predominant. These data suggest a late Basketmaker/transitional Pueblo period of use.

DISCUSSION AND CONCLUSIONS

Research conducted by the Office of Public Archaeology in the middle Virgin River drainage has added new data on the archaeology of the Virgin Anasazi occupation of southwestern Utah. Investigations were focused on two habitation and storage sites, which yielded the largest amount of data, and three other smaller sites, which yielded more limited information. The sites revealed information primarily on a restricted period early in the Virgin Anasazi occupation sequence, and some minor details about Late Archaic and Late Prehistoric/Protohistoric use of the area.

Late Archaic peoples used the area around 1100 B.C., as shown by the presence of two hearth features at 42Ws329. Other than these isolated hearths, and two possibly curated Elko-style points from 42Ws326, there was little evidence found of Archaic use of the area. The data suggest that use was light in the vicinity of these sites until around A.D. 650, when the first Virgin Anasazi occupation occurred at 42Ws326.

On the basis of evidence from the sites examined during the project, the most intensive use seems to have occurred during the late Basketmaker/early Pueblo period as evidenced by the rather complex remains found at sites 42Ws326 and 42Ws329. Artifacts at these two sites revealed that the expected suite of household activities occurred at both sites. These included lithic tool production, food processing and preparation, storage, and house maintenance. Later relatively intense occupations dating to the Pueblo I and II periods may be represented by sites noted in the vicinity during the project, but which were outside the project area.

The last prehistoric use of the study area occurred during the Late Prehistoric period, probably sometime between A.D. 1500 and A.D. 1850 (Walling et al. 1986:448). Southern Paiute utility-ware sherds were found in surface sediments near the central portion of site 42Ws329. No features or other Late Prehistoric artifacts were found in association with the sherds. No other Late Prehistoric artifacts were found in the study area.

The most complete data set from the project came from 42Ws326, which yielded more information on chronology, architecture, site structure, material culture, subsistence, and paleoenvironment because of its larger size. Site 42Ws326 represents one of only a few known large Basketmaker sites on the Washington County portion of the Virgin River (Dalley and McFadden 1988:20). Site structure and organization conform to a general pattern common to Basketmaker III sites, which typically combine pit structures and associated cist complexes in a random or nonformalized arrangement (Dalley and McFadden 1985). The cists at 42Ws326 are generally deep,

circular in shape and occur in clustered arrangements, which Dalley and McFadden suggest is the most typical pattern; although some other roughly contemporaneous sites in the region such as Little Man 3 (Dalley and McFadden 1988) and Quail Creek (Walling et al. 1986) exhibit linear arrangements. Some of the cists at 42Ws326 also exhibited coursed-masonry walls on top of the vertical slabs, a trait more commonly found in Pueblo I sites. The site contained rather typical, circular-shaped pithouses with antechambers (Altschul and Fairley 1989; Billat et al. 1992, Appendix O). The overall impression is one of some mixing of Basketmaker and Pueblo I traits, confirming the transitional dating of the site. Many of the features and construction methods, particularly at 42Ws326, become more common in later sites around the region. Interior benches, slab and boulder lining, antechambers, and standardized central hearths are formal features incorporated in Pueblo I and Pueblo II sites.

Several models have been proposed for Virgin Anasazi subsistence, including two divergent outlines suggested by Dalley and McFadden (1988) on the one hand; and Allison (1990), Westfall et al. (1987), and Walling et al. (1986) on the other. Dalley and McFadden (1988) argue for a narrow focus centered on cultivated domesticates almost to the total exclusion of any wild plant or animal resources. They assume that certain productive wild plant resources such as mesquite, pine nuts, and cattail were ignored since no evidence for their use had been recovered in Virgin Anasazi sites. Allison, drawing on the earlier works, proposed a subsistence regimen that was broad based, eclectic, and relied on a mix of domesticated crops supplemented by both wild plant and faunal resources. The model suggests that the Anasazi in the St. George Basin were heavily dependant upon horticulture, supplementing their produce with the seeds and greens of weedy plants from nearby disturbed areas and agricultural fields together with animals and wild plants from both upland and low desert environments.

The results of the faunal, pollen, and macrobotanical analyses from 42Ws326 support the subsistence model proposed by Allison (1990) and others. The suggestion that the Virgin Anasazi had a mixed economy with both domesticates and wild resources is confirmed by the mix of species indicated at 42Ws326. The data show that the prehistoric inhabitants of 42Ws326 were in fact dependant to some degree on horticulture as indicated by corn pollen and other remains, as well as a gourd rind. These domesticated food crops were supplemented by other nondomesticated locally available species including cacti, composites, hackberry, grass, cattail, buckwheat, cheno-ams, and other-disturbed area plants. The high percentage of cattail pollen found in Cist 14 is significant in that it represents storage of this plant and points to prehistoric use of riparian/marsh environments. This does not necessarily suggest that the inhabitants of 42Ws326 were riverine in adaptation, but that they used this resource as well as lowland and upland resources to supplement horticulture practiced at the site. Macrophytes and pollen samples confirm the use of corn and either wild or domestic gourds by the inhabitants at 42Ws326. Faunal remains were in poor condition but suggested that both large and small mammals were hunted and processed by the people in these sites. The overall picture of subsistence during late Basketmaker III and Pueblo I times in the study area is of a mixed economy, with reliance on horticultural plants supplemented by wild seeds and game. No information was obtained about subsistence during the Late Archaic or Late Prehistoric periods.

Finally, pollen samples from 42Ws326 have contributed to our understanding of the regional paleoenvironment. The suite of taxa from primary contexts in the site have shown that two periods of occupation occurred, one during a moist period and one during a drier period. Pithouse 1 was the primary structure on the site during the wetter period, and radiocarbon ages of corn and charcoal suggest it was occupied between A.D. 650 and A.D. 750. These dates exactly correspond to a period of increased effective moisture shown by studies of erosion/deposition, tree growth, and pollen to have occurred throughout the Anasazi region (Gumerman 1988; Plog et al. 1988). Pithouses 2 through 4 were occupied during a drier period and depositional and ceramic data suggests that this followed, rather than preceded, the wetter times. The dry period began in the region around A.D. 750 and lasted until around A.D. 1000.

The information from the SR-9 Project makes a useful contribution to a growing data set about the Virgin Anasazi, but additional information is still needed to test further questions about chronology, culture history, regional trade networks, and subsistence adaptations. Certainly, a pattern is emerging that shows considerable variation throughout the region. This range of variability needs to be more

fully documented before more synthetic generalizations can be made.

ACKNOWLEDGMENTS

This project was sponsored and administered by the Utah Department of Transportation (UDOT) and the Utah Division of the Federal Highway Administration (FHWA). We wish to thank Kenny Wintch, former UDOT archaeologist, for his support and encouragement throughout the duration of the project. We also wish to express our gratitude to volunteers from the Jennifer Jack-Dixie Chapter USAS, who helped excavate the sites. Dr. Richard Thompson and Barbara Walling of Intersearch conducted the initial survey and testing in the project area and were extremely helpful in sharing notes and information. In addition, we thank Gardiner Dalley, Cedar City District Bureau of Land Management, for his comments and helpful insights; Joel Janetski for his input on an earlier draft; and Bob Kohl for helpful comments on this paper.

REFERENCES CITED

Ahlstrom, Richard V. N., Jeffrey S. Dean, and William J. Robinson
1991 Evaluating Tree-Ring Interpretations at Walpi Pueblo, Arizona. *American Antiquity* 56:628–644.

Allison, James R.
1990 *Anasazi Subsistence in the St. George Basin, Southwestern Utah.* Unpublished Master's Thesis, Department of Anthropology, Brigham Young University, Provo, Utah.

Altschul, Jeffrey, and Helen Fairley
1989 *Man, Models and Management: An Overview of the Archaeology of the Arizona Strip and the Management of its Cultural Resources.* Statistical Research, Plateau Archaeology, Dames & Moore, Inc. Report prepared for the USDA Forest Service and USDI Bureau of Land Management, Contract No. 53-8371-6-0054.

Billat, Lorna Beth, James D. Wilde, and Richard K. Talbot
1992 *Archaeological Testing and Excavation of Five Western Anasazi Sites along State Route 9, East of Virgin City, Utah.* Museum of Peoples and Cultures Technical Series No. 90-2. Brigham Young University, Provo, Utah.

Dalley, Gardiner and Douglas McFadden
1985 *The Archaeology of the Red Cliffs Site.* Bureau of Land Management, Cultural Resource Series No. 17. Salt Lake City.
1988 *The Little Man Archeological Sites: Excavations on the Virgin River Near Hurricane, Utah.* Bureau of Land Management, Cultural Resource Series No. 23. Salt Lake City.

Gumerman, George J. (editor)
1988 *The Anasazi in a Changing Environment.* Cambridge University Press, Cambridge.

Long, A., and B. Rippeteau
1974 Testing Contemporaneity and Averaging Radiocarbon Dates. *American Antiquity* 39:205–215.

Musser, John M., and Rinita Dalan
1987 *Archaeo–geophysical Survey for the Utah DOT SR-9 Project, Site 42Ws329, Virgin River, Utah.* Geo–Recon International, Seattle, Washington. Submitted to Office of Public Archaeology, Brigham Young University, Provo. Project Number J87-367.

Plog, Fred, George J. Gumerman, Robert C. Euler, Jeffrey S. Dean, Richard H. Hevly, and Thor N. V. Karlstrom
1988 Anasazi Adaptive Strategies: the Model, Predictions, and Results. In *The Anasazi in a Changing Environment.* Edited by George J. Gumerman, pp. 230–276. Cambridge University Press, Cambridge.

Southworth, Don, and Asa S. Nielson
1986 *A Brief Evaluation of Sites on SR-9, Washington County, Utah.* Museum of Peoples and Cultures Technical Series No. 86-30. Brigham Young University, Provo, Utah.
1987 An Addendum to: *A Brief Evaluation of Sites on SR-9, Washington County, Utah.* Museum of Peoples and Cultures Technical Series 86-30. Brigham Young University, Provo, Utah.

Stuiver, M., and P. J. Reimer
1987 CALIB and DISPLAY 2.1. Quaternary Isotope Lab, University of Washington, Seattle.

Thomas, David Hurst
1981 How to Classify the Projectile Points from Monitor Valley, Nevada. *Journal of California and Great Basin Anthropology* 3:7–43.

Thompson, Richard A.
1985a *An Archeological Survey along State Route 9 from Virgin to Coalpits Wash, Washington County, Utah.* Intersearch, Cedar City, Utah.
1985b *The SR-9 Project: Site Testing (An Interim Report).* Intersearch, Cedar City, Utah.

Walling, Barbara A.
1985 *The SR-9 Project: 42Ws326 Test (Final Report).* Intersearch, Cedar City, Utah.

Walling, Barbara, Richard Thompson, Gardiner Dalley, and Dennis Weder
1986 *Excavations At Quail Creek.* Bureau of Land Management, Cultural Resource Series No. 20. Salt Lake City.

Westfall, Deborah, William Davis, and Eric Blinman
1987 *Green Springs: An Anasazi and Southern Paiute Encampment in the St. George Basin of Utah.*

Bureau of Land Management, Cultural Resource Series No. 21. Salt Lake City.

ARCHAEOLOGICAL SITES AROUND A DRY LAKE IN SOUTHWESTERN UTAH

Roy Macpherson, Salt Lake-Davis Chapter, Utah Statewide Archaeological Society, 5669 Laurelwood, Salt Lake City, Utah 84121

INTRODUCTION

Archaeological sites dating to the late Paleo-Indian or early Archaic period have been recorded in numerous locations in the Great Basin in association with ancient playa or dry lake features (Aikens and Madsen 1986; Copeland and Fike 1988). Interest in sites of this age led to the investigation of a southern portion of Tule Valley in southwest central Utah because of its geographical similarity to pre-Archaic sites in eastern Nevada (Willig and Aikens 1988; Beck and Jones 1988; Hutchinson 1988; Price and Johnston 1988) and its proximity to the well-studied, pre-Archaic site 42Md300 (Simms and Lindsay 1989) in the lower Sevier Valley. This specific area was surveyed because the U.S. Geological Survey maps indicated a small depression or dry lake bed at an elevation of 5,180 ft, which is above the highest level of Lake Bonneville (Currey et al. 1984). Although the dry lake associated sites reported here cannot be specifically classified as pre-Archaic because of lack of diagnostic artifacts or datable materials, the sites have useful archaeological information.

LOCATION AND DESCRIPTION OF AREA

The dry lake referred to is located between the House and Confusion mountain ranges in the southern end of Tule Valley, approximately 55 miles southwest of Delta, Utah (Figure 1). The playa is about 1 km from the highest shoreline of Lake Bonneville (Currey et al. 1984) and only about 30 m above it.

The dry lake bed is about 800 m wide and 2,500 m long and runs basically north and south. It has no visible outlet, and is fed by a drainage area of less than 30 square km. The dry lake is bounded by a ridge or low rise on the west with one wide opening to its major drainage area. The northern section of this ridge is a soft sandstone outcropping that forms a low cliff area about half way down the dry lake bed. The modern life zone in the area can be classified as Upper Sonoran. The vegetation is primarily shadscale. The soils in and around the dry lake bed are sandy silt with the lake bed itself tending toward playa hardpan. Shadscale grows profusely in the hardpan indicating a relatively low level of salts in this soil.

An unimproved road runs through the dry lake bed from east to west. Drainage ditches cut in the bottom of the dry lake bed run both north and south and east and west to a dug out pond area in the west central side of the dry lake bed. The pond, measuring about 20 m by 50 m, could be used as a stock pond when it rains but is usually dry.

SURVEY METHOD AND SITE DESCRIPTION

The basic archaeological survey was made by walking two concentric circles around the dry lake bed, one about 15 m and one about 30 m back from the edge of the hardpan. The sloping area to the west of the dry lake was also covered by walking serpentine paths about 15 m apart from the hardpan to beyond the ridge that borders the west side of the dry lake. Six random transects across the hardpan were made. The area west, north, and south of the rockshelter (43Md1030) and quarry (42Md1034) sites was surveyed (about 1 km radius).

Seven prehistoric sites were found and recorded: a rockshelter, a quarry, and five lithic scatters (Figure 1). The rockshelter and the five lithic scatters were found at the edge of the hardpan on the west, north, and east sides of the dry lake, while the quarry was located on a ridge southwest of the rockshelter. No sites were found on the relatively open and flat south and southeast sides of the dry lake or in the hardpan itself. During this survey and reporting activity, no artifacts were collected and no archaeological test pits were dug.

Rockshelter Site 43Md1030

This site is about 55 m wide and 75 m long and extends from the sandstone cliff to the hardpan of the lake bed (Figure 2). On this surface area were 111 lithic tools: 1 crude non-diagnostic obsidian point, 2 gravers, 8 bifaces, and 100 utilized flakes, and 228 lithic flakes. The lithics tend to be in concentrations with the highest 8 per square meter. The only other artifact found was a jar or mug handle identified as

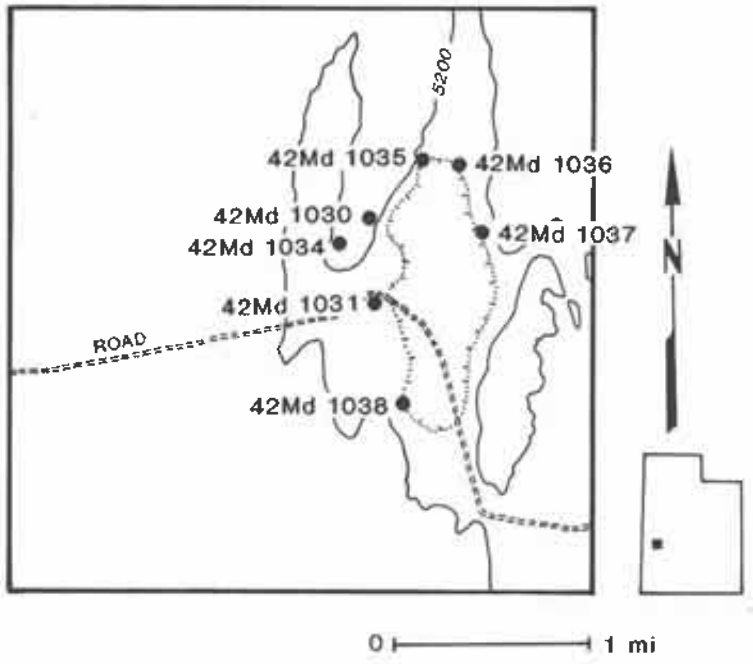


Figure 1. Site locations around a dry lake in Tule Valley.

Fremont Snake Valley Gray. No other ceramics were found. The rockshelter is at the base of the 10 m high cliff and has an opening 1 m to 3 m high. The shelter measures 10 m across the opening and is up to 3 m deep. No artifacts or soil staining were found in or close to the rockshelter. The soil depth in the rockshelter was estimated to be at least 50 cm by probing with a wire marking flag.

Blow Out Site 42Md1031

The Blow Out Site, which is surrounded by sand mounds, is a lithic scatter on the west side of the lake bed. The artifacts cover an area of 40 m by 60 m and are located on the hardpan or on low, sandy mounds. A total of 34 utilized flakes (samples shown in Figure 3) and 137 other lithic flakes were found. Most of the lithics at this site were prepared from quartzite (Figure 4).

Northwest Site 42Md1035

This lithic scatter site is located adjacent to the hardpan and contains mostly quartzite lithics (Figure 4). One biface; 1 crude, non-diagnostic quartzite point; 41 utilized flakes; and 29 other lithic flakes were found. They were not in concentrations but were spread throughout the site. No other artifacts were found. The site measures 36 m by 60 m and has a low, sandy ridge that runs through it from east to west toward the hardpan.

Northeast Site 42Md1036

This all-quartzite, lithic scatter has three small artifact concentrations, and a total surface area of 625 square meters and an overall surface measurement of 50 m by 95 m. It contained 1 core, 2 bifaces, 48 utilized flakes, and 52 other lithic flakes. The three areas of artifacts were found on two sandy ridges that run east and west toward the hardpan.

East Site 42Md1037

This lithic scatter measures 30 m by 55 m and runs north and south. It is on the east side of the hardpan and almost due east of the rockshelter site 43Md1030. The artifacts that are all made of quartzite include 2 cores, 2 bifaces, 38 utilized flakes, and 76 other lithic flakes. A sandy ridge runs northeast and southwest through the site toward the hardpan. The lithics are not in concentrations.

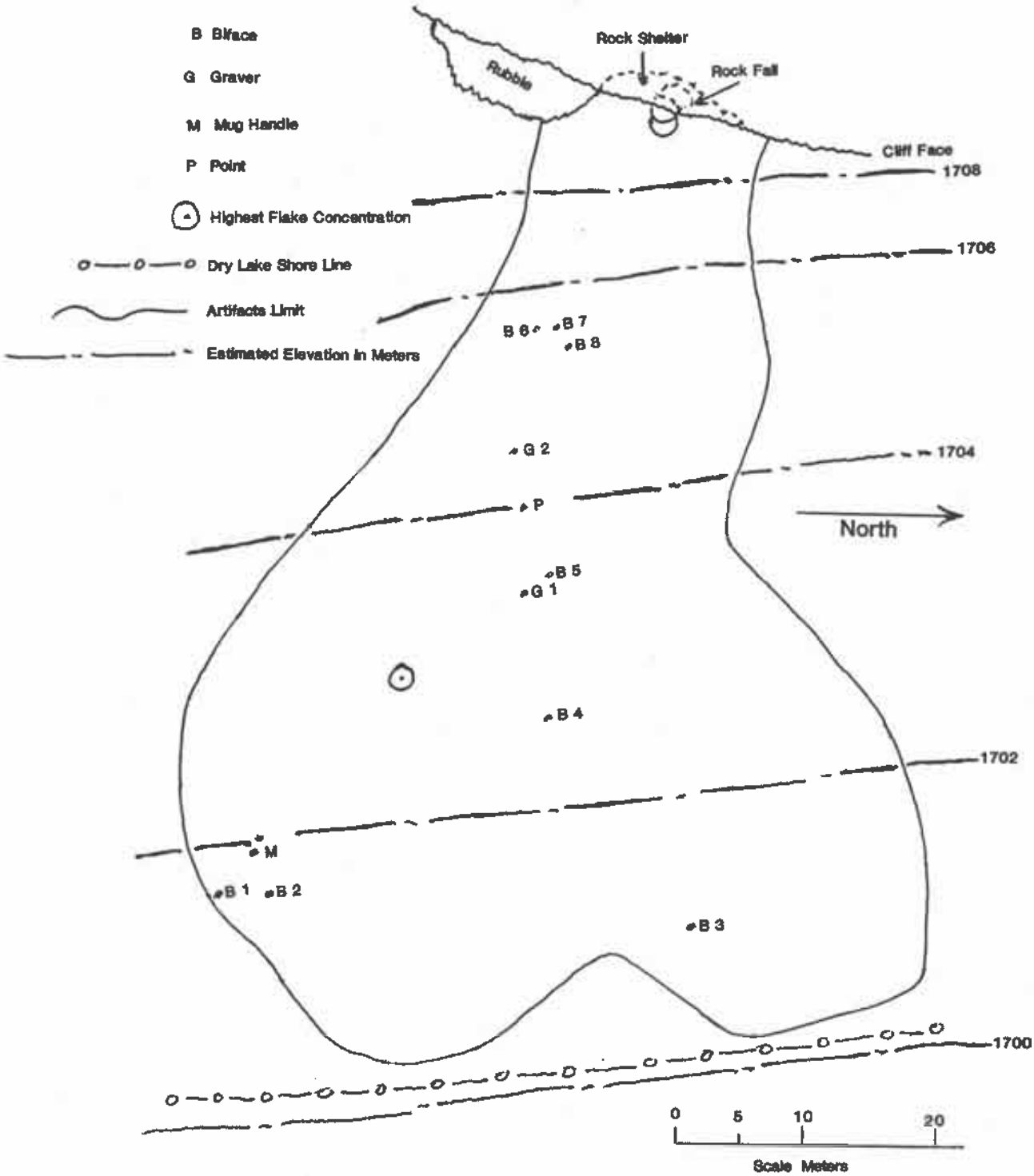


Figure 2. Dry Lake Rockshelter (42Md1030).

Figure 3. Utilized flakes from 42Md1031.

Southwest Site 42Md1038

This lithic scatter has a total surface area of only 700 square meters concentrated in four areas. It contains mostly obsidian lithics (Figure 4) and measures 40 m by 80 m across all four areas. It is made up of a series of sandy ridges and hardpan valleys at the southwest side of the hardpan and adjacent to it. The artifact content of the site includes 2 crude, non-diagnostic obsidian points; 1 biface; 28 utilized flakes; and 51 other lithic flakes.

Quarry Site 42Md1034

The quarry site is located on a rocky ridge, less than 0.5 km south and west of the rockshelter site and covers an area that measures 12 m by 30 m. The site was made up of 24 cores, 36 decortication flakes, and 4 secondary flakes. All the lithics were red-spotted quartzite. Four unworked nodules of red-spotted quartzite were also found.

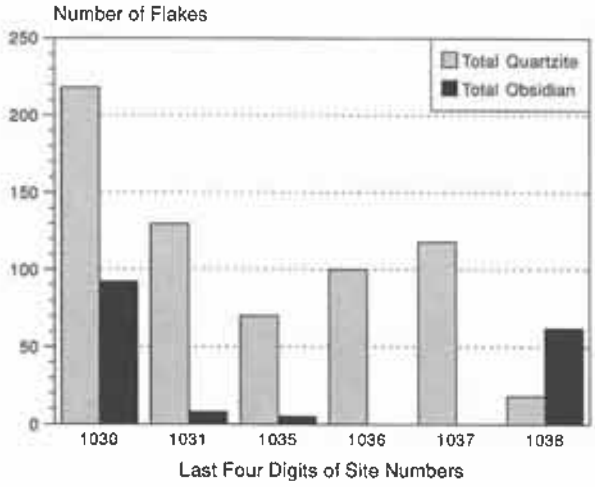


Figure 4. Material types of lithic flakes at dry lake margin sites.

Isolated Finds

Lithics, usually utilized flakes, were found as isolated finds about every 100 m to 500 m between the Southwest Site (42Md1038), around the northwest side of the dry lake, and to the site on the east side (42Md1037) during the survey. No artifacts were found on the southeast and southern side of the dry lake. The isolated finds consisted of one to four flakes, usually large (5 cm to as large as 10 cm long) and mostly quartzite varying in color from red spotted, to pink, white, and rust. About 20 isolated finds were noted around the dry lake.

DISCUSSION

Lithics

The lithic scatter sites are made up of widely dispersed, mostly large secondary and utilized flakes. The dispersion varies from about 0.1 to 3 flakes per square meter. The flakes are usually from 2 cm to 5 cm across and show multiple flake scars on one side of the flake. Most of the flakes are made from quartzite (Figure 4). The lithic tools on all the sites could be classified as expedient and not curated because of their simple and crude workmanship. The lithic scatters are usually found around undulations of the sand on the shoreline around the dry lake or around sand dunes.

Dating

Because no diagnostic artifacts (other than the Fremont Snake Valley jug handle) or other datable materials were found at the sites, two other approaches were used in an effort to get temporal information. The first approach was to better understand the moisture cycles of the Great Basin, and based on these cycles, see if time periods for human use of the dry lake area could be established. The assumption was that the sites around the dry lake would be more likely to have been occupied during a wet cycle. Wet and dry cycles in the Great Basin probably come every 50 to 150 years, and this has been happening at least since the time of Lake Bonneville (Donald Currey, 1991 personal communication). Unfortunately, Dorothy Sack's (1990) recent work on the geology and geography of Tule Valley, did little to clarify the wet-dry cycles in the Tule Valley area. Sack's work indicated that there were wet and dry cycles in Tule Valley after the demise of Lake Bonneville but details on time periods were not reported. The limited available information on wet and dry cycles in Tule Valley did not help in dating the sites.

The second approach was to excavate the now dry lake to explore for stratification. If datable material could be found resulting from shore or lake associated vegetation and sediment sorting, the strata could perhaps be associated with the cultural manifestations (this was suggested by both Shelley Smith, Bureau of Land Management (BLM) Utah State Archaeologist; and Dave Madsen, Utah State Archaeologist, Division of State History). Work of this type had been done successfully in eastern Oregon on a Paleo-Indian site (Willig 1988). The area selected for excavation was 400 m north of the rockshelter site (42Md1030), at the edge of the hardpan, well removed from known cultural deposits. Three trenches were dug, about 1 m long by 30 cm wide and 15 m apart on an east-west line extending up slope away from the shoreline and the hardpan. The depth of the trenches was 50 cm at the hardpan and 75 and 100 cm respectively going away from the shore, so that the bottom of the trenches were about at the same level. No visible stratification was found. The top 5 cm to 15 cm of the soil was more sandy while the bottom portions were more silty. Some roots were found in each of the trenches.

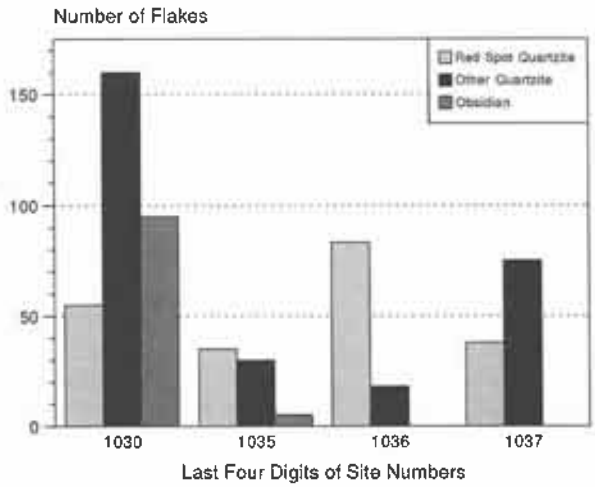


Figure 5. Material types of lithic flakes at the four northern dry lake sites.

INTERPRETATIONS

At the present time, the area around the dry lake bed is very arid and lacks resources that could have been used by prehistoric people. Based on this and the fact that the artifacts are located on the shoreline of the dry lake, prehistoric people probably used this area during climatic wet cycles. The arrangement and classification of the flakes in the lithic scatters indicate activities that were not principally tool making because of the low concentration of the lithic flakes, and the fact that a large percentage (possibly most) of them were utilized. Utilization is based on the size and shape (big enough to hold comfortably) and edge condition (serrated). Prehistoric people used marsh and shoreline resources such as cattails for food, and reeds and tules for basket making (Madsen 1982). It is possible that prehistoric peoples may have been cutting and gathering lake side flora at these lithic scatter sites. The large number of lithics found on the surface (over 800 flakes) (Figure 4) indicates the lakeshore was used by a large number of people at one time or was used repeatedly.

The only diagnostic artifact found was the Fremont Snake Valley Gray jug or mug handle. One artifact does not establish a cultural presence, but Parowan Fremont did frequent the area based on evidence from a rockshelter site (42Md983) less than 5 miles to the

southeast in Steamboat Pass where diagnostic ceramics were found[1]. A large assortment of artifacts was collected by Berge (1964) in Tule Valley some 30 to 40 miles to the north. They included Early to Late Archaic, Fremont, and Late Prehistoric lithic diagnostics and some ceramic diagnostics, but no fluted points.

A variety of lithics (a point, gravers, bifaces, etc.) were found at the rockshelter site (42Md1030) indicating multiple functions. Perhaps this was more of a general use living area. There was easy access to the lakeshore from the rockshelter.

A high percentage (over 40%) (Figure 5) of the flakes at the four northern lithic scatter sites were made from red-spotted quartzite that is very similar in appearance to the quartzite found at the quarry site (42Md1034). These tools are of the expedient type and appear to be made in the area from local material.

The similarity of the location and types of tools in the lithic scatter sites and the close proximity of all 7 sites indicates that all the sites and the isolated finds could probably be classified as one continuous site. This would include the area from the southwest side of the dry lake (42Md1038) around the rockshelter (42Md1030) to the north and around the dry lake to the east side (42Md1037).

CONSIDERATIONS FOR FUTURE WORK

Excavation of the rockshelter could yield important information about how prehistoric people lived in western Utah. Since the seven sites are all located in a relatively small area around a dry lake, they could be culturally related. The interaction between these sites and the dry lake could lead to meaningful data on the lifeway of prehistoric peoples. The presence of Fremont diagnostics is particularly interesting as the use of the western deserts by these farmers is not well understood (cf. Simms 1986). The potential for recovering data on Paleo-Indian also exists, although none was observed on this project.

The dry lake area is very desirable for an archaeological field school. The rockshelter does not appear to be vandalized and does have some depth of deposits, although they may not be cultural. A rockfall in the shelter is protecting a significant area of the floor, and the rocks could be removed. Since the rockshelter is similar geographically to pre-Archaic sites in Nevada and is near the Paleo-Indian site of 42Md300, there is a chance the bottom deposits date to the pre-Archaic. The soft sandstone cliffs above the rockshelter and aeolian deposits could have helped to stratify the site. A detailed study of the relationship between the five lithic scatters, the quarry, and the rockshelter could give significant data on the lifeways of the prehistoric people that frequented the western Utah area.

NOTE

1. Information found on the IMACS form for 42Md983.

ACKNOWLEDGMENTS

This survey was done with the concurrence of present and past BLM Richfield Archaeologists Nancy Shearin, Craig Harmon, and La Mar Lindsay. Kevin Jones as Utah Statewide Archaeological Society advisor made a major contribution to the conception and execution of the survey plan. Shelley Smith, Joel Janetski, and Dave Madsen have been very helpful in bringing this survey to completion. Thanks to Kevin Jones, Shelly Smith, and Dave Madsen for helping to review this report.

REFERENCES CITED

Aikens, C. Melvin, and David B. Madsen
1986 Prehistory of the Eastern Area. In *Great Basin*, edited by W. L. d'Azevedo, pp. 149–160. Handbook of North American Indians, vol. 11, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Beck, Charlotte, and George T. Jones
1988 Western Pluvial Lakes Tradition Occupation in Butte Valley, Eastern Nevada. In *Early Human Occupation in Far Western North American: The Clovis-Archaic Interface*, edited by Judith A. Willig, C. Melvin Aikens, and John L. Fagan, pp. 273–302. Anthropological Papers No. 21. Nevada State Museum, Carson City, Nevada.

Berge, Dale L.
1964 *An Archaeological Survey of White Valley Millard County, Western Utah.* Unpublished Master's thesis, Department of Anthropology and Archaeology, Brigham Young University, Provo.

Copeland, James, and Richard E. Fike
1988 Fluted Projectile Points in Utah. *Utah Archaeology 1988* 1(1):5–28.

Currey, Donald R., Genevieve Atwood, and Dan R. Mabey
1984 Major Levels of Great Salt Lake and Lake Bonneville. Utah Geological and Minerals Survey, Map 73. Salt Lake City.

Hutchinson, Phillip W.
1988 The Prehistoric Dwellers at Lake Hubbs. In *Early Human Occupation in Far Western North American: The Clovis-Archaic Interface*, edited by Judith A. Willig, C. Melvin Aikens, and John L. Fagan, pp. 303–318. Anthropological Papers No. 21. Nevada State Museum, Carson City, Nevada.

Madsen, David B.
1982 Get it Where the Gettin's Good: A Variable Model of Great Basin Subsistence and Settlement Based on Data From the Eastern Great Basin. In *Man and Environment in the Great Basin*, edited by David B. Madsen and James F. O'Connell, pp. 207-226. SAA Papers No. 2. Society for American Archaeology, Washington, D.C.

Price, Barry A., and Sarah E. Johnston
1988 A Model of Late Pleistocene and Early Holocene Adaptation in Eastern Nevada. In *Early Human Occupation in Far Western North American: The Clovis-Archaic Interface*, edited by Judith A. Willig, C. Melvin Aikens, and John L. Fagan, pp. 231–250. Anthropological Papers No. 21. Nevada State Museum, Carson City, Nevada.

Sack, Dorothy
1990 Quaternary Geology of Tule Valley, West-Central Utah. Utah Geological and Mineral Survey, Salt Lake City.

Simms, Steven R.
1986 New Evidence of Fremont Adaptive Diversity. *Journal of California and Great Basin Anthropology* 8(2):204–216.

Simms, Steven R., and La Mar W. Lindsay
1989 42Md300, An Early Holocene Site in the Sevier Desert. *Utah Archaeology 1989* 2(1):56–66.

Willig, Judith A.
1988 Paleo-Archaic Adaptations and Lakeside Settlement Patterns in the Northern Alkali Basin, Oregon. In *Early Human Occupation in Far Western North American: The Clovis-Archaic Interface*, edited by Judith A. Willig, C. Melvin Aikens, and John L. Fagan, pp. 417–482. Anthropological Papers No. 21. Nevada State Museum, Carson City, Nevada.

Willig, Judith A., and C. Melvin Aikens
1988 The Clovis-Archaic Interface in Far Western North America. In *Early Human Occupation in Far Western North American: The Clovis-Archaic Interface*, edited by Judith A. Willig, C. Melvin Aikens, and John L. Fagan, pp. 1–40. Anthropological Papers No. 21. Nevada State Museum, Carson City, Nevada.

DEFORMITY AND LEFT HIP FUSION IN A PREHISTORIC GREAT BASIN SKELETON

Carol J. Loveland, Department of Sociology, Social Work and Anthropology, Utah State University, Logan, Utah 84322-0730

Denise Furlong, Department of Sociology, Social Work and Anthropology, Utah State University, Logan, Utah 84322-0730

John B. Gregg, Professor of Surgery, School of Medicine, University of South Dakota (Retired), 2807 South Phillips Avenue, Sioux Falls, South Dakota 57105

INTRODUCTION

Medical doctors writing in the nineteenth century documented many cases of a condition that frequently caused hip joint destruction and the fusion (ankylosis) of the patient's hip and femur. In these reports inflammatory hip joint disease, with or without fusion, was usually ascribed to trauma, a birth defect, pus forming bacterial infection, or tuberculosis (Bryant 1873; Dorsey 1813; Erichsen 1878; Gibson 1827; Good 1829; Keen and White 1893; Kellogg 1905). Senior orthopedists (Robert VanDemark, personal communication 1990) and surgeons (Howard Shreves, personal communication 1990), who practiced during the pre- and early antibiotic era, describe the severe pain experienced by individuals affected by inflammatory hip disease. Affected individuals often drastically modified their posture in an attempt to alleviate their pain, and, in the process, many have induced permanent skeletal deformity (Figure 1).

This condition is seldom seen in contemporary societies, thanks to preventive medicine and improved health care techniques. The efforts of veterinarians to eradicate bovine tuberculosis around the turn of the century resulted in a significant decrease in hip deformity, as bovine tuberculosis is one of the leading causes of this disease (Howard Shreves, personal communication 1990).

Despite the frequent mention of hip deformity and fusion in early medical literature, surprisingly few cases are described in paleopathology literature, and only one other case has been reported from the New World (Bennike 1985; Bennike et al. 1986; Bennike

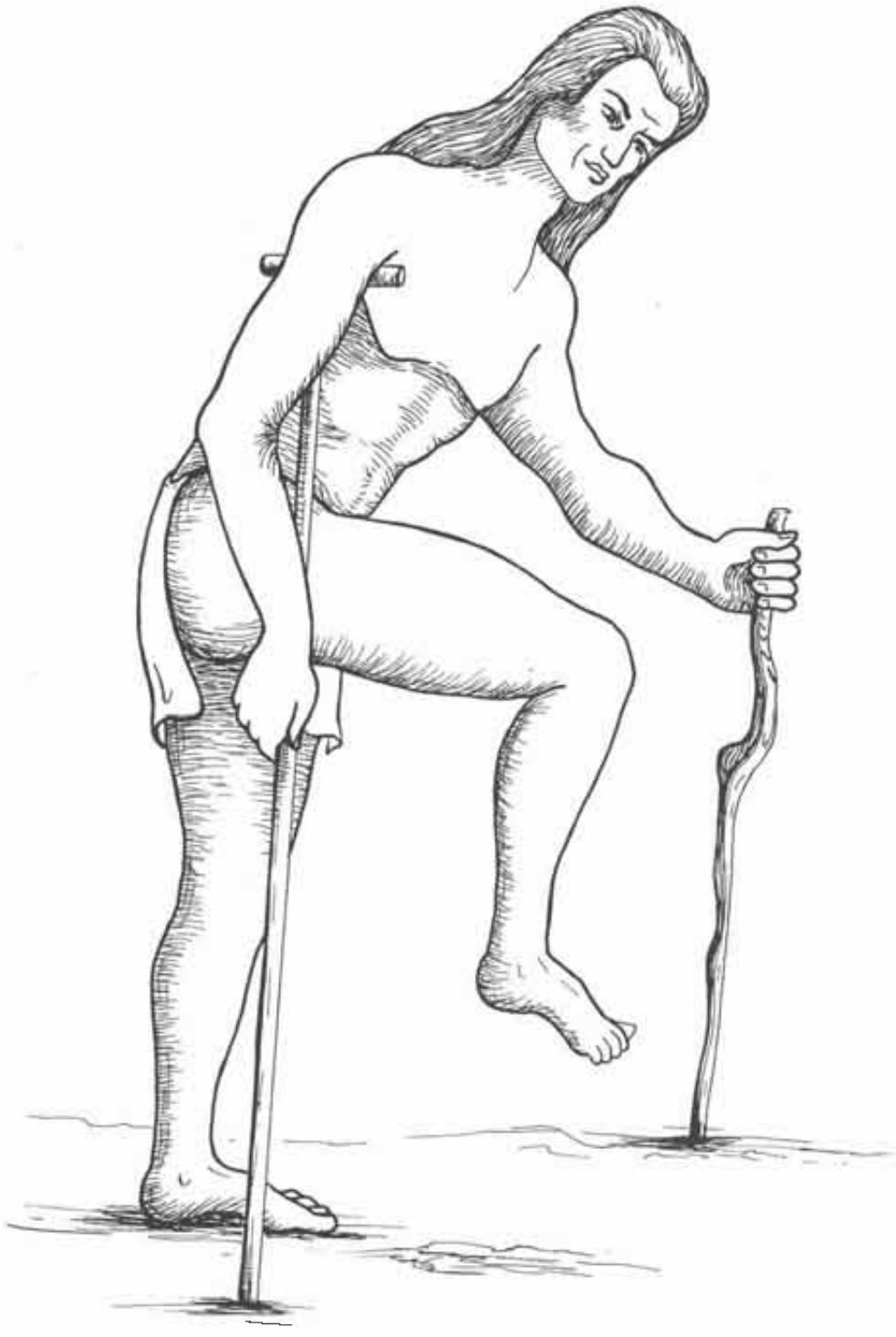


Figure 1. Artist's rendition of posture assumed by Fremont Indian as a result of painful hip disease. The leg is held in a forward position about hip high and parallel to the ground. The pelvis is tilted forward, causing the individual to assume a stooped position.

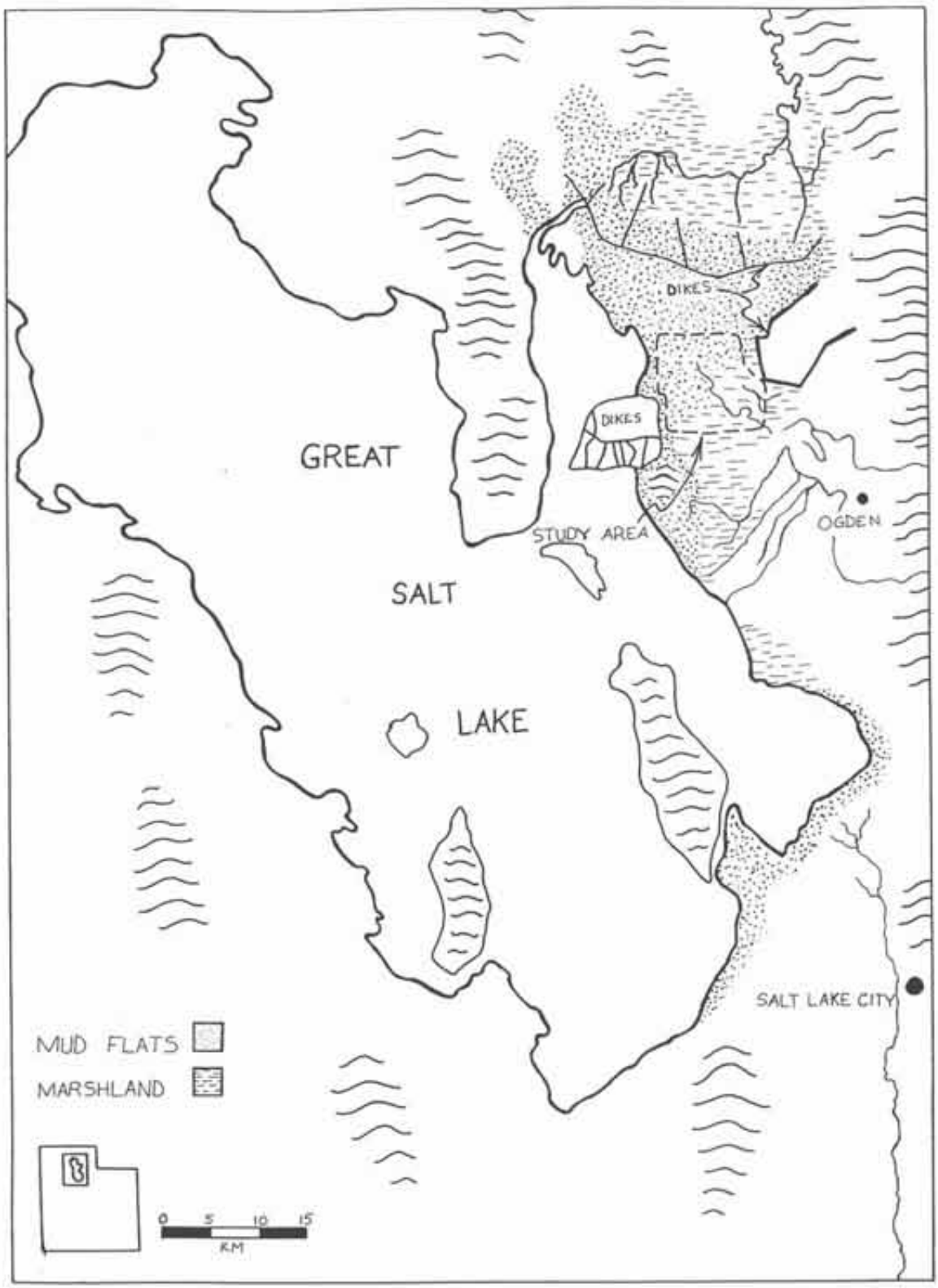


Figure 2. Map of study area located near Ogden, Utah.

Figure 3. Ankylosis (fusion) of left femur and innominate.

and Bro-Rasmussen 1989; Janssens 1989; Jarcho et al. 1963; Ortner and Putschar 1981).

This paper reports the first instance of spontaneous extensive hip joint destruction and bony fusion (ankylosis) in a pre-Columbian skeleton from the Great Basin.

ARCHAEOLOGICAL BACKGROUND

An extremely wet cycle in Utah during the 1980s caused the Great Salt Lake to rise several feet and inundate large portions of the shoreline. Wave and ice action during this high-water period eroded the land along the shores, exposing archaeological sites. A subsequent drop in the lake level exposed cultural remains and human skeletons from two cultural periods, the Fremont (A.D. 400–1300) and the Late Prehistoric (after A.D. 1300) (Simms et al. 1990).

In 1990, researchers from Utah State University recovered 75 skeletons from the eastern shore of Great Salt Lake (Figure 2).

A 35–45 year old male (Burial 53), one of eleven skeletons recovered from site 42Wb324, was located in darkly stained soil, most likely a remnant of a living floor from prehistoric times. Portions of several skeletons were mixed by water action. The presence of Fremont artifacts alongside the burials are evidence that this site predated A.D. 1300.

The fact that the skeleton was well preserved permitted researchers to observe and measure several skeletal attributes that allow reliable sex and age determination. For sex determination, these included observations on hip and skull configuration (Bass 1987), femoral midshaft circumference (Black 1978), and femoral head measurement (Krogman, 1962). The developmental stage of the pubic portion of the hip

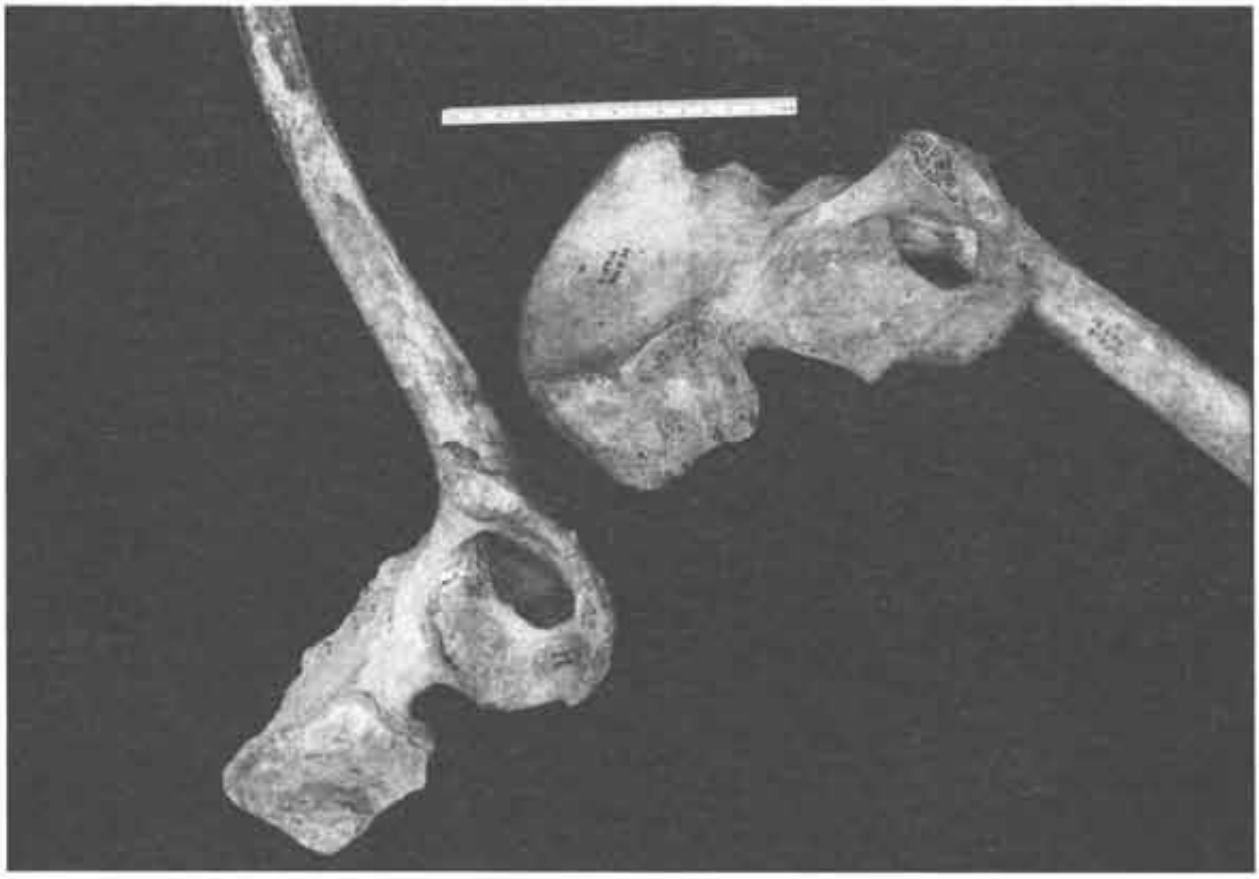


Figure 4. Comparison of left femur and innominate of Burial 53 (left) with that of another individual (right). Note anterior position of fused femur.

bone (Katz and Suchey, 1986) and the observed degree of dental attrition (Ubelaker, 1989) allowed the age of the individual to be fixed within the 35–45 year range.

ANATOMIC FINDINGS

The left hip joint was fused, with the leg held in a forward position so that the femur would have been parallel to the ground. The effect would have been similar to someone enacting an exaggerated march step. The raised leg was turned slightly inward (Figures 3 and 4).

The individual would have bent forward from the waist and moved with a hopping motion, probably using crutches or a staff for support. The leg and hip bones eventually fused in this position, making the left leg entirely useless for locomotion. The femur and the hip socket appear to have been completely destroyed by the infection; however, foreign matter has clouded the radiograph (X-ray), making this interpretation uncertain (Figure 5).

The individual's attempts to compensate for the hip disability caused other skeletal modifications to occur. The individual's left arm bones were more robust and possessed more prominent muscle attachments than the right arm bones, suggesting that the individual supported his body with a crutch held in that arm. Both arms exhibit the degenerative changes typical of arthritis, a condition not unusual among Great Basin Indians (Andrews 1972; Stark 1983; Brooks et al. 1988). However, the degeneration is most acute in the left arm, a predictable outcome if that arm were used consistently to bear the body's weight and assist in locomotion.

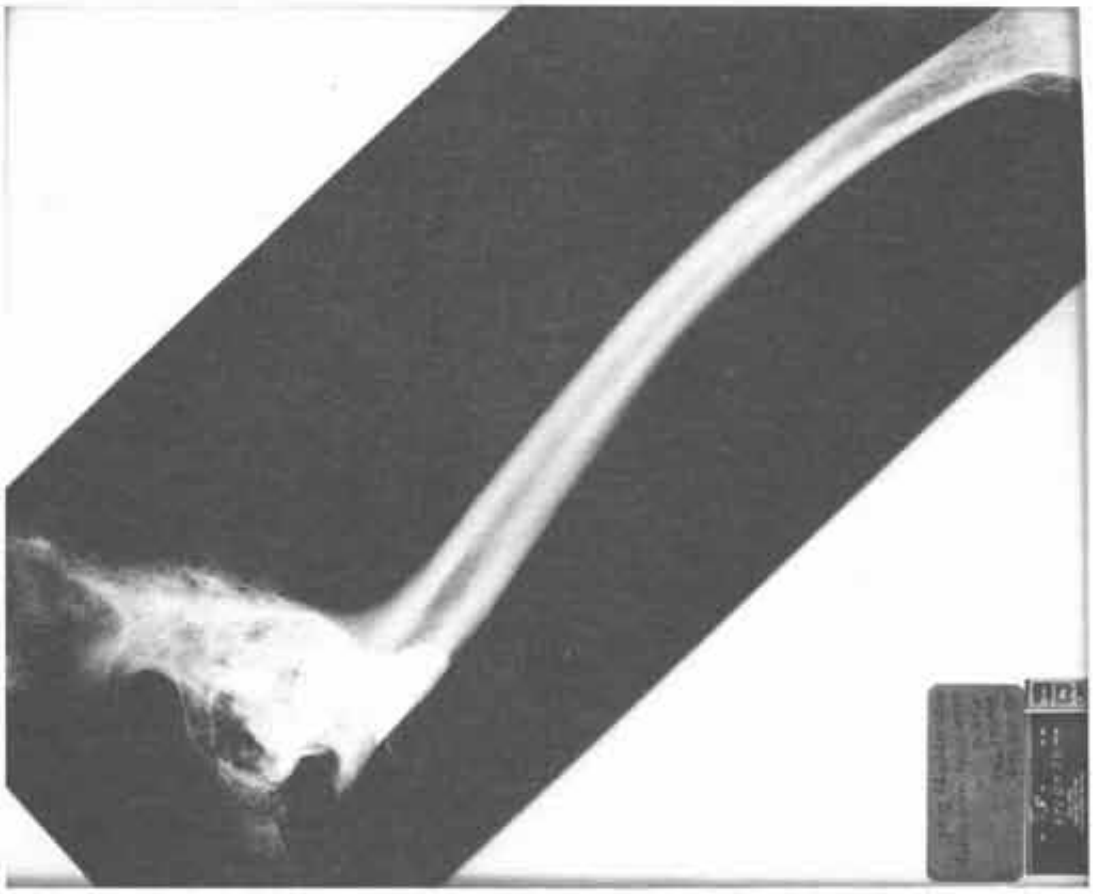


Figure 5. Radiograph of fused area indicates extensive destruction of femoral head and acetabulum; foreign matter conceals most hip anatomy.

These findings are similar to Deitrick's in a subadult skeleton with evidence of prolonged survival with congenital hip dislocation (Lynn Deitrick, personal communication 1980; Gregg and Gregg 1987).

Latimer and Lowrance (1965) reported that long bones in the arms tend to be heavier and longer on the right side, irrespective of handedness. Since the opposite occurs in this individual, this lends further support to the conjecture that this individual used a crutch.

The individual's skull also underwent changes attributable to the same infection that immobilized his hip. The bones of the skull, especially those on the side and rear (parietals and occipital), were thickened due to the expansion of bone tissue between the inner and outer bone surface (Figure 6). Pitting (ectocranial porosity) occurred on the outer bone surface. Both of these characteristics suggest that the individual was anemic. Abnormalities in the bony structure of the long bones, which are visible on the radiographs, confirm that the individual suffered from a debilitating, lengthy illness, probably associated with secondary anemia (Gregg and Gregg 1987; Zimmerman and Kelley 1982). Acquired anemia, though often associated with nutritional disorders, often accompanies debilitating infectious disease such as that which affected this individual (Mensforth et al., 1978; Ortner and Putschar, 1981).

Figure 6. Radiograph of skull indicates thickening, especially of the parietals and occipital.

DISCUSSION

Medical accounts published before A.D. 1900 frequently discuss spontaneous hip joint destruction, with or without fusion (ankylosis). Infections, trauma, and congenital disease are listed as the cause, in order of decreasing frequency. Infections implicated include tuberculosis and infectious arthritis, which results from the introduction of disease organisms into a joint. Tuberculosis is cited as the most frequent cause of hip joint disease. Today, by virtue of advancements in health care, reports of this problem are primarily from third world countries.

In his discussion of spontaneous hip joint destruction, Bryant (1873) reports that the affected extremity might be held in any position, but the flexed and adducted (turning in toward the center) position is most common, especially in untreated cases. Pain in the diseased hip causes the affected individual to draw and hold the femur toward the body (Figure 1). Continuous strain upon a joint held in an aberrant position results in fibrous fixation; as muscles, nerves, tendons, and other soft tissues adjust to the abnormal position of the joint by stretching or shortening. Fibrous ankylosis can occur within a few months (Bennike and Bro-Rasmussen 1989).

If the infection completely destroys the cartilage in the joint, bone will eventually form in and around the joint space, obliterating all evidence of the joint (Paul and Juhl 1972).

Fusion of the hip and femur in the described individual was the result of a lengthy illness. During the most virulent stage of the infection, the individual was probably bedridden, necessarily relying on others for care. Once his hip had fused, his mobility would have been impeded. Although he could undoubtedly have performed a limited number of tasks, he would not have been able, in all likelihood, to participate in the hunting activities typical of his gender. He may have undertaken tasks that allowed him to remain stationary and that did not require a full range of motion. In any event it is obvious, given the seriousness of this condition, that this individual was cared for and supported by other members of his group.

CONCLUSIONS

The limitations imposed by the data and the rarity of this condition in the archaeological record prevent a certain choice between infectious arthritis and tuberculosis as the cause of the observed hip fusion. The evidence does not support a conclusion that the fusion resulted from a birth defect or from trauma. Regardless of the cause, this case deserves the attention of the archaeological community because of the paucity of similar cases and their complete absence in the archaeological record of the Great Basin.

Historical references attest to the frequency of this condition in Europe and North America 200 years ago. Recently, as part of the soul searching to determine

Christopher Columbus's true place in history, much thought has been given to the origin of many health problems and diseases. The origin of *Mycobacterium tuberculosis* (var. hominis and bovis) remains unsettled, but the presence of tuberculosis in prehistoric New World populations is well established (Buikstra and Williams 1991).

Although it is presently impossible to specify the microorganisms present in the skeleton of Burial 53, tuberculosis is certainly a strong possibility. Diagnostic techniques presently under development may make possible the future identification of pathogens responsible for diseases such as those suffered by the individual described above. An ongoing project to isolate and prove the presence of tuberculosis DNA in ancient skeletons and mummies offers hope for improved diagnosis in paleopathology (Arthur Aufderheide, personal communication 1991).

Unfortunately, Burial 53 along with the other Great Basin skeletons, is to be repatriated in the near future. If sophisticated diagnostic techniques do not become available soon, the pathogenesis of hip destruction and ankylosis in this and other prehistoric skeletons may never be known.

ACKNOWLEDGMENTS

This research was funded, in part, by Utah Department of Natural Resources, Project Number 090UC090, Steven R. Simms, principal investigator. Our thanks for assistance goes to Drs. A. Aufderheide, Duluth, Minnesota; J. T. Malouf and J. A. Nelson, Logan, Utah; and H. B. Shreves and R. E. Van Demark, Sioux Falls, South Dakota. The Eastman Kodak Company supplied radiographic film, and radiographs were taken at Western Surgery Center, Logan, Utah. Chris Sutherland prepared Figures 1 and 2.

REFERENCES CITED

Andrews, Janet
1972 *The Paleopathology of the Eastern Great Basin Fremont Population.* Unpublished Master's thesis, Department of Anthropology, University of Utah, Salt Lake City.

Bass, William M.
1987 *Human Osteology.* A Laboratory and Field Manual. Missouri Archaeological Society, Columbia.

Bennike, Pia
1985 *Paleopathology of Danish Skeletons.* A Comparative Study of Demography, Disease and Injury. Akademisk Forlag, Copenhagen.

Bennike, Pia, Klaus Ebbesen, and Lise B. Jorgensen
1986 Two Early Neolithic Bog Skeletons from Bolkilde. *Antiquity* 50(230):199–209.

Bennike, Pia, and Frede Bro-Rasmussen
1989 Contracture and Anchylosis of the Hip in a Right Angle: Five Paleopathological Cases. *International Journal of Anthropology* 4(3):137–151.

Black, Thomas K.
1978 A New Method of Assessing the Sex of Fragmentary Skeletal Remains: Femoral Shaft Circumference. *American Journal of Physical Anthropology* 48:227–231.

Brooks, Sheilagh, Michele B. Haldeman, and Richard H. Brooks
1988 *Osteological Analyses of the Stillwater, Skeletal Series, Stillwater Marsh, Churchill County, Nevada.* U.S. Fish and Wildlife Service, Stillwater National Wildlife Refuge, Nevada.

Bryant, Thomas
1873 *The Practice of Surgery.* Henry C. Lea, Philadelphia.

Buikstra, Jane E., and Sloan Williams
1991 Tuberculosis in the Americas: Current Perspectives. In *Human Paleopathology—Current Syntheses and Future Options*, edited by Donald Ortner and Arthur C. Aufderheide, pp. 161–172. Smithsonian Institution Press, Washington, D.C.

Dorsey, John S.
1813 *Elements of Surgery: For the Use of Students.* Edward Parker, Philadelphia.

Erichsen, John E.
1878 *The Science and Art of Surgery: Being a Treatise on Surgical Injuries, Diseases and Operations.* Henry C. Lea, Philadelphia.

Gibson, William
1827 *The Institutes and Practice of Surgery: Being the Outlines of a Course of Lectures*, vol. 1. Carey, Lea, and Carey, Philadelphia.

Good, John M.
1829 *The Study of Medicine.* J. and J. Harper, New York.

Gregg, John B., and Pauline S. Gregg
1987 *Dry Bones—Dakota Territory Reflected.* Sioux Printing, Inc., Sioux Falls.

Janssens, Paul A.
1989 Coxarthritis and Gonarthritis in a Nunnery at Maaseik Belgian Limburg, 17th and 18th Centuries. *Journal of Paleopathology* 2(2):95–106.

Jarcho, Saul, Norman Simon, and Edgar M. Bick
1963 A Fused Hip from Wupati. *Plateau, The Quarterly of the Museum of Northern Arizona* 35:69–74.

Katz, Darryl, and Judy M. Suchey
1986 Age Determination of the Male Os Pubis. *American Journal of Physical Anthropology* 69:427–435.

Keen, William W., and J. William White (editors)
1893 *An American Text-Book of Surgery for Practitioners and Students*. W. B. Saunders, Philadelphia.

Kellogg, John H.
1905 *The Home Hand Book of Domestic Hygiene and Rational Medicine*. Modern Medicine Publishing Co., Battle Creek.

Krogman, Wilton M.
1962 *The Human Skeleton in Forensic Medicine*. Charles C. Thomas, Springfield.

Latimer, Homer B., and E. W. Lowrance
1965 Bilateral Asymmetry in Weight and in Length of Human Bones. *The Anatomical Record* 152(2):217–224.

Mensforth, Robert P., C. Owen Lovejoy, John W. Lallo, and George J. Armelagos
1978 The Role of Constitutional Factors, Diet and Infectious Disease in the Etiology of Porotic Hyperostosis and Periosteal Reactions in Prehistoric Infants and Children. *Medical Anthropology* 2:1–59.

Ortner, Donald J., and Walter G. J. Putschar
1981 Identification of Pathological Conditions in Human Skeletal Remains. *Smithsonian Contributions to Knowledge No. 28*. Smithsonian Institution Press, Washington, D.C.

Paul, Lester W. and John H. Juhl
1972 *The Essentials of Roentgen Interpretation*. Harper and Row, Hagerstown.

Simms, Steven R., Mark E. Stuart, and Carol J. Loveland
1990 *Preliminary Report of Recovery of Human Skeleton Remains from the Great Salt Lake Wetlands*. Utah State University, Logan.

Stark, Carolyn R.
1983 *The Determination of Variation in Skeletal Remains in Nevada Through the Use of Discrete Morphological Traits and Anthropometry*. Unpublished Master's thesis, Department of Anthropology, University of Nevada, Las Vegas.

Ubelaker, Douglas
1989 *Human Skeletal Remains—Excavation, Analysis, Interpretation*. Taraxacum, Washington, D.C.

Zimmerman, Michael R., and Marc A. Kelley
1982 *Atlas of Human Paleopathology*. Prager Publishers, New York.

SALVAGE EXCAVATIONS AT THE BURCH CREEK SITE 42WB76 WEBER COUNTY, UTAH

Mark E. Stuart, Promontory-Tubaduka Chapter, Utah Statewide Archaeological Society, 1849 Brinker, Ogden, Utah 84401

INTRODUCTION

In March of 1988, members of the Promontory-Tubaduka Chapter of the Utah Statewide Archaeological Society (USAS) tested an open sand dune site on private land in South Ogden City, Weber County, Utah. The project conducted under the direction of Dr. Steve Simms and Ms. Pam Higgins of Weber State University, focused on areas of the site being destroyed by construction activities. Earlier survey work by chapter member Mark Stuart, noted both Fremont and Late Prehistoric artifacts. A Pinto point and a Humboldt point hinted that the site may contain Archaic materials as well. A preliminary report of these excavations has been published in the UPAC Newsletter (Stuart 1988) and a final site report published by the Promontory-Tubaduka Chapter of USAS (Stuart et al. 1992) is on file with the Division of State History, Antiquities Section, Salt Lake City.

SITE DESCRIPTION AND SETTING

The site known as the Burch Creek Site (42Wb76) is situated on the north side of perennial Burch Creek on three alluvial terraces composed of reworked Lake Bonneville gravel and sand deposits covered with rice grass, sagebrush, and scattered stands of oak brush and juniper. Fauna observed in the area included jackrabbit, mule deer, skunk, raccoon, and kit fox; also a variety of birds, small rodents, and reptiles. Prehistorically, elk, bison, and black bear were in the area with mountain sheep in the nearby Wasatch Mountains. Suckers and cutthroat trout were found in Burch Creek.

EXCAVATION STRATEGY AND STRATIGRAPHY

Because the site extends over one-half mile, it was broken down into seven areas that showed evidence of

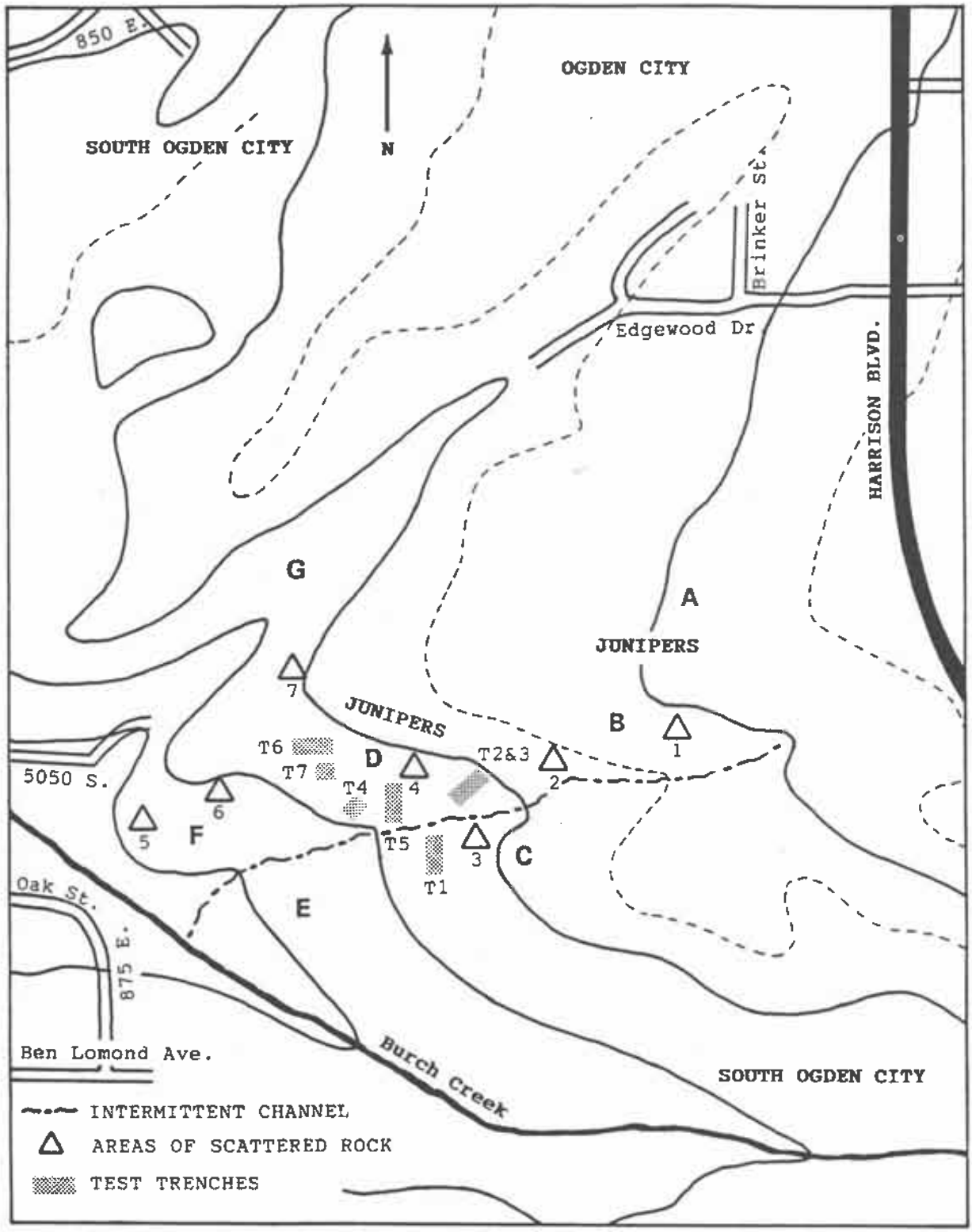


Figure 1. Site overview of Burch Creek.

Figure 2. Area C excavations at Burch Creek.

prehistoric occupation (labeled *A–G* in Figure 1). Seven test trenches were excavated in areas C and D of the site, which, based on surface indications, were thought to contain buried features and/or cultural deposits and had not been too badly disturbed by construction activities (Figure 1). Excavation was begun in arbitrary 10 cm levels to establish natural stratigraphy. Once stratigraphy was established, excavation proceeded by stratigraphic levels. All excavated fill was screened through one-fourth inch mesh or in a few cases, shovel checked and all recovered artifacts bagged by field specimen numbers. Buried cultural deposits were encountered in five of the seven trenches. The cultural deposits were discontinuous and shallow, generally extending only 10 cm to 35 cm below the present ground surface. In trenches where cultural deposits were found, the stratigraphy was quite homogenous. Only two strata were identified. Stratum 1 which began below the top duff layer, was unconsolidated, medium to coarse black-stained aeolin sands with pea gravel throughout containing tiny flecks of charcoal, small scattered pieces of fire-cracked rock, bone fragments, and lithic debitage. Stratum 1 ranged in depth from 10 cm to 35 cm in depth. Underlying Stratum 1 was a light brown, sandy, culturally sterile sediment, which was labeled Stratum 2. Two buried fire pits and a refuse midden were found *in situ*. Two other possible fire hearths, which had largely been destroyed by construction activities, were also shovel tested.

FEATURES

The midden area was first identified as a stratum of black-stained sand with fire-cracked rock, Great Salt Lake ceramics, and two Rosegate Corner-notched arrow points eroding out of the east bank of a gully in area C (Figure 2). This feature (F1) was tested with trench 1 and soon expanded into excavation unit C.

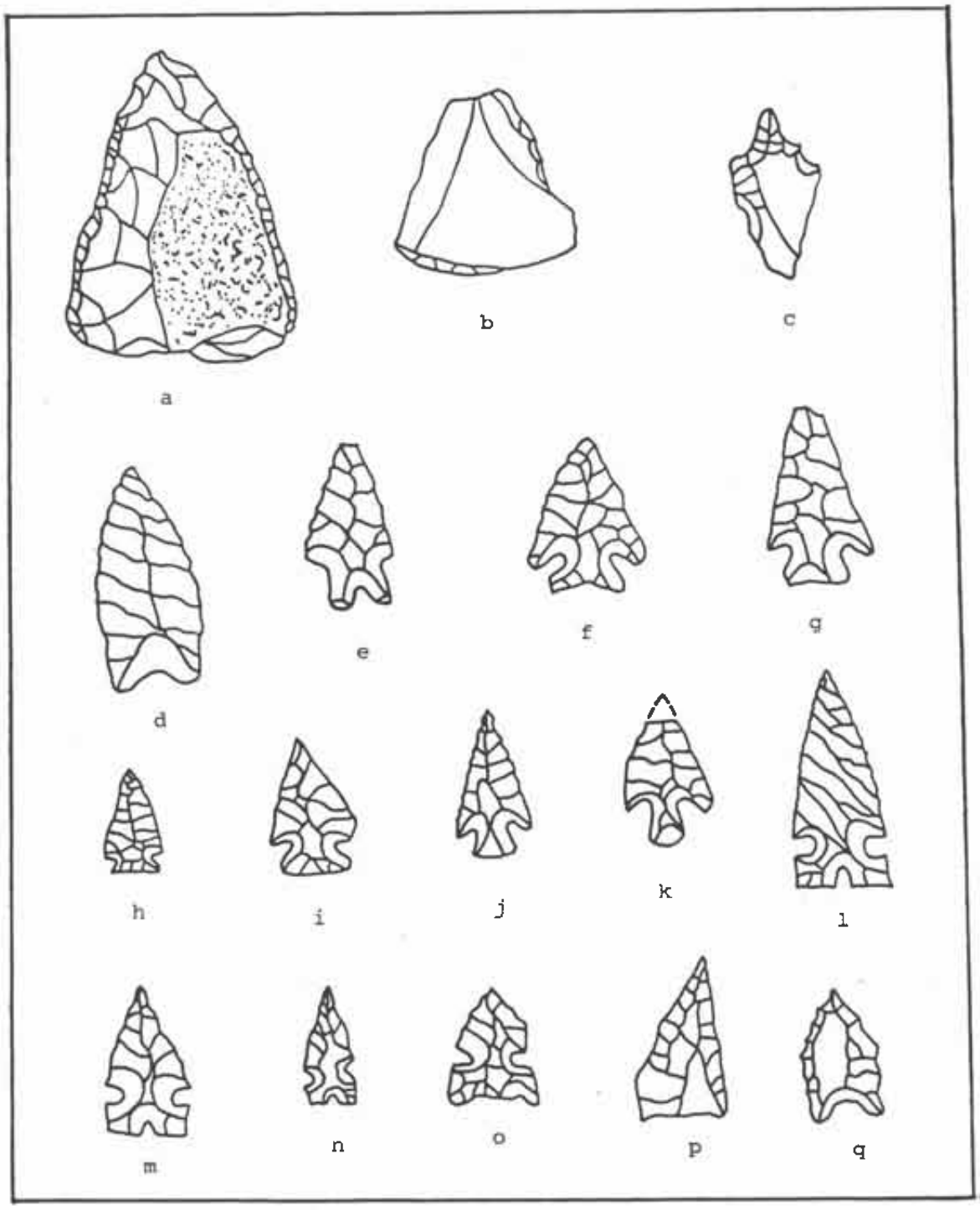


Figure 3. Examples of projectile points recovered during the Burch Creek Project: *a*, biface blade; *b*, end scraper; *c*, graver; *d*, Humboldt; *e*, Pinto; *f–g*, Elko Corner-notched *h*, Uinta Side-notched; *i*, Bear River Side-notched; *j–k*, Rosegate Corner-notched; *l–m*, Desert Side-notched Sierra subtype; *o*, Desert Side-notched general subtype; *p–q*, Cottonwood Triangular; 85% actual size.

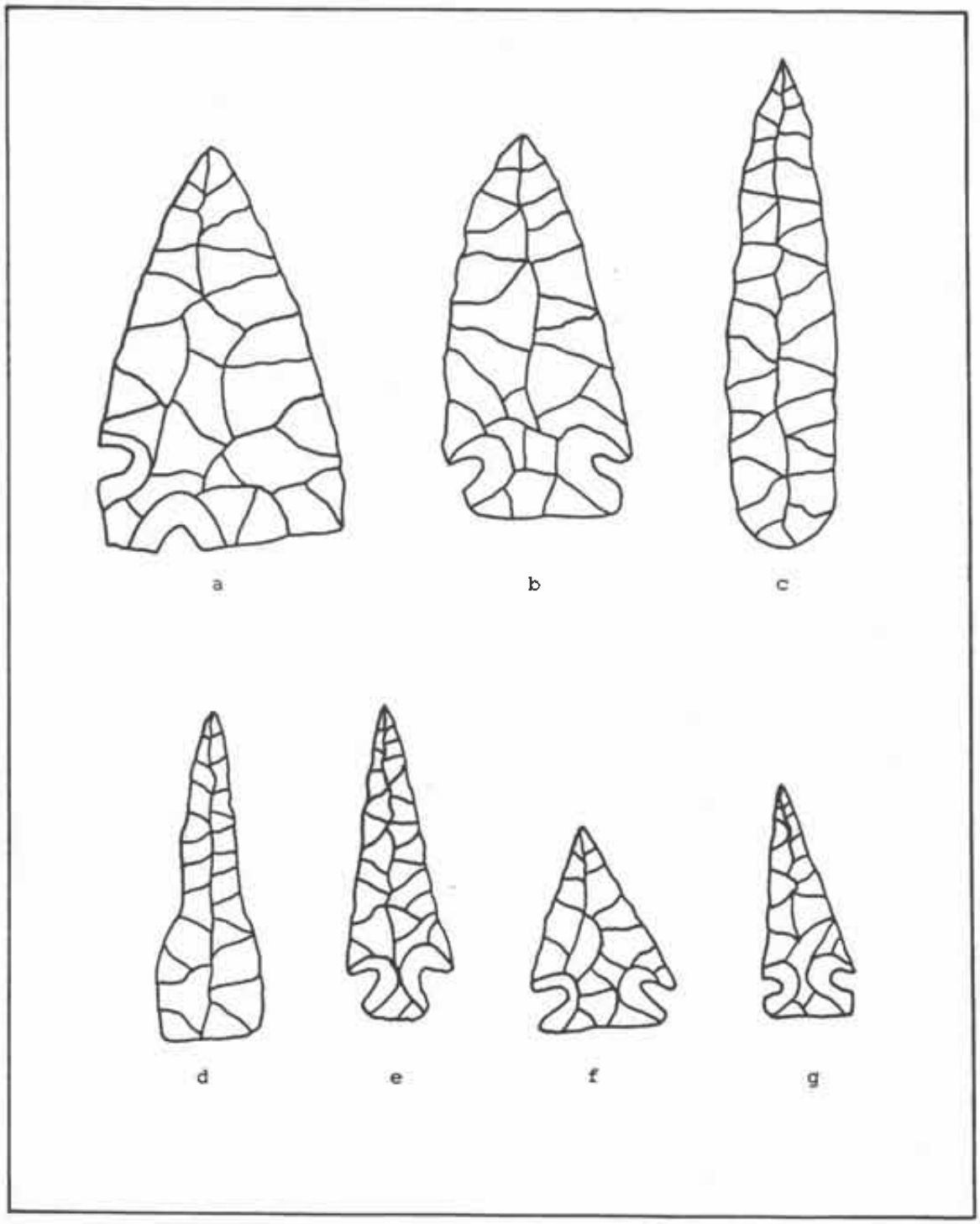


Figure 4. Projectile points from Burch Creek site—Art Combe Collection: *a*, corner tang biface knife; *b*, Corner-notched biface knife; *c*, biface blade; *d*, drill; *e–f*, Elko Corner-notched points; *g*, Elko Side-notched point; 85% actual size.

Table 1. Distribution of Pottery throughout Burch Creek Test and Survey areas

Type and Variety	Area A	Area B	Area C	Area D	Area E	Area F	Area G	Total
Late Prehistoric								
Plain		6	2	19		125		152
Jar Rim				3		4		7
Pot Base						1		1
Fingernail Incised		1		2				3
Sevier Gray								0
Plain	1	1						2
Punched		1						1
Jar Rim (indented)			1					1
Jar Rim (plain)							1	1
Fingernail Incised		1						1
Applique and Incised		1					1	2
Great Salt Lake Gray								0
Plain		2						2
Incised		1						1
Total	1	14	3	24	0	130	2	174

F1 contained 10 cm to 50 cm of cultural fill consisting of charcoal, an unusual concentration of burned juniper wood, scattered fire-cracked rock, occasional tertiary/retouch flakes of quartzite, chert and obsidian, and fragments of deer bone. The only diagnostic artifact recovered was a chert Rosegate Corner-notched arrow point (Figure 3*k*). Digging under the burned juniper wood concentration, we found what appears to be a small tree root. It appears that the charred wood concentration is either a juniper tree burned in place or a large fire hearth. Either way, both appear to be created by human inhabitants and represent a cultural event based on spatial association with the midden and stratigraphic association. Excavation ceased at 50 cm below ground surface when sterile Stratum 2 was reached. Unfortunately, before this area could be explored further, area C was bulldozed and leveled pushing test trench 1 and its environs into the erosional gully for fill. After this destruction only charcoal pieces and a large mano fragment were observed on the disturbed surface.

The two buried fire pits were found in area D, trench 4 (F2) and area D, trench 7 (F3). Both pits were encountered 10 cm to 15 cm below the present ground surface and consisted of clusters of 107 fist-sized, quartzite cobbles in F2 (Figure 4) and 35 such cobbles in F3. These may have been carried to the site from nearby Burch Creek. The cobbles were charcoal stained and often heat fractured and overlaid 10 cm to 12 cm of tiny charcoal flecks and black-stained sand containing rare bone fragments and small-pressure retouch flakes. Unfortunately, not enough charcoal was recovered from either pit for radiocarbon dating purposes. No diagnostic artifacts were associated with either feature, although a Desert Side-notched/Sierra subtype arrow point was found on the surface of F2 (Figure 3*n*).

ARTIFACTS

Artifacts found at the Burch Creek Site include ceramics, chipped stone, and ground stone.

Table 2. Projectile Pints and Chipped Stone Tools

Type	Area								
	Unknown	A	B	C	D	E	F	G	Total
Bear River Side-notched	1		1						2
Biface	1		2			1	2		6
Cottonwood			1		4		1		6
Desert Side-notched (General Subtype)			1		2				3
Desert Side-notched (Sierra Subtype)	2		5		5		4	1	17
Elko Corner-notched	2			5				1	8
Elko Side-notched	2						1		3
Humboldt								1	1
Pinto (Square Shoulder)								1	1
Rosegate Corner-notched			4	2			1		7
Stemmed					1				1
Tang Knife	1								1
Uinta Side-notched	1						1		2
Drill	1		1						2
End Scraper	1		1	1					3
Graver					3				3
Total	12	0	16	8	15	1	10	4	66

Ceramics

Three ceramic types (Madsen 1979) totaling 174 sherds were recovered from the Burch Creek Site (Table 1). Late Prehistoric ware is the predominant type, making up 94% (163 sherds) of all recovered types, followed by two Fremont types—Sevier Gray 4.5% (8 sherds) and Great Salt Lake Gray 1.5% (3 sherds).

Most of the Late Prehistoric sherds are plain with no surface decoration. Three pieces, however, exhibit fingernail impressions just below the jar rim. A single, large basal sherd from a partially reconstructible vessel and nine large rim fragments indicate vessel form to be a wide-mouth utility jar with either flat, thickened rims or rounded rims; straight walls, and a flat bottom conforming closely to what Rudy (1953:96) terms flower pot vessels. A black residue was found adhering to the inside of several sherds from the partially reconstructible vessel representing food remnants. This residue has been analyzed by Patty Dean (personal communication 1988) of the University of Oregon who found it to be burned bulrush seeds.

Finished Stone Tools

A total of 66 finished stone tools were recovered from the Burch Creek Site. Of these, 88% (n=51) were diagnostic projectile points and 12% (n=15) are tools such as bifaces, gravers, drills, and scrapers (Table 2). Most of the chipped stone was recovered from the surface of the site during the preliminary surveys, usually associated with eroded concentrations

Table 3. Taxa Recovered from 43Wb76

Taxa	Area C	Area D Trench 7	Area D Trench 3	West Area D Trench 7	Total
Chenopodium spp.	0	0	4	0	4
Euphorbia spp.	0	0	0	1	1
Juniperus spp.	5	1	2	3	11
Poa spp.	1 (1)*	0	1	(1)*	2 (2)*
Sporobolus	7	3	3	13	26
Unidentified	0	0	3	(1)	3 (1)
Total	13 (1)*	4	13	17 (2)*	47 (3)*

* () denotes charred seeds

of fire-cracked rock. Only two chipped stone artifacts were found during salvage excavations, a brown chert Desert Side-notched arrow point associated with F3 and a chert Rosegate Corner-notched arrow point found in the F1 midden of area C. Also included in this report are 12 artifacts (Figure 4) collected from the site during 1915 to 1920 by Art Combe, one of the early farmers. Although the exact provenience of these artifacts is unknown it is probable, based on Mr. Combe's information, that they came from area G.

The projectile points (Figures 3 and 4) were classified according to Holmer (1986) and included 13 Archaic atlatl points and 38 post Archaic arrow points (Table 2). A total of 21 unidentifiable biface fragments, mostly tip and midsection pieces, were recovered and are not included in the total in Table 2.

Lithic Debitage

Only 104 lithic flakes were recovered from the site. Whether this low number is primarily a function of recovery techniques is not known. The lithic debitage along with the finished stone tools indicate that the site was used for a variety of activities over the years producing tool loss. This explains the large number of finished tools and acknowledges that debitage is present and maybe not so rare as the recovered debitage above indicates. The excavated lithic debitage is mostly pressure retouch flakes or small tertiary flakes, which may indicate that one of the uses of the site was tool maintenance or resharpening. Analysis of lithic debitage and chipped stone tools reveal two dominant material types. The most common is obsidian, which probably originates in either the Grouse Creek Mountains or more likely the Malad source ca. 100 miles to the north/northwest. The second most common material type is a distinctive pink, gray, or yellow-spotted white chert that originates in upland areas of the Wasatch Mountains ca. 35 to 50 miles east of Burch Creek.

Ground Stone

The collection of six ground stone objects from the Burch Creek Site includes two fragmented, sandstone, two-hand manos; a complete one-hand mano; two small, matching, sandstone-slab metate fragments; and a grooved-quartzite maul or hammer. The grooved maul or hammer from area D was associated with Late Prehistoric artifacts and is identical to specimens from the Northwestern Plains which Frison (1978) characterizes as a diagnostic of the Plains Late Prehistoric period.

PLANT AND ANIMAL REMAINS

Four quart-sized sediment samples were taken from the site for the purpose of flotation analysis. Samples were taken from area D, trench 7; Features F2 and F3; and midden area F1 in area C. Forty-seven non-charred and three charred seeds were recovered from the flotation analysis representing five different taxa (Table 3). The only charred seeds from the site were two bluegrass (*Poa*) and one unidentified seed (Brannan 1992). One of the bluegrass seeds was recovered from area C (F1) and the other from area D

(F3). The two charred bluegrass seeds may have been utilized by the inhabitants of the site. Use of bluegrass has been documented among the Gosiute and Southern Paiute (Fowler 1986:76). The non-charred taxa consisted of pigweed (*Chenopodium* sp.), spurge (*Euphorbia* sp.), juniper (*Juniperus* sp.), bluegrass (*Poa* sp.), and saccaton (*Sporobolus* sp.). Whether the lack of charred seeds at Burch Creek is the result of prehistoric subsistence decisions, poor preservation, limited excavation or small sample size is debatable. A pottery sherd with burned bulrush seeds in the residue lining the interior is significant and has been reported elsewhere in this report.

Animal bones were not very abundant at Burch Creek and number less than 50 specimens with most being small, calcined (burned at a high temperature) fragments not easily identifiable. This may indicate bone breakage and boiling to extract fat and grease. Of the bones that could be identified, mule deer is most common, followed by rabbit and a single waterfowl bone.

DISCUSSION

The Burch Creek Site is defined as a large multicomponent campsite of Archaic, Fremont, and Late Prehistoric affiliations. The cultural definitions are based on the presence of diagnostic cultural materials. Typological dating of the site is limited since many of the diagnostic artifacts were produced for long periods of time. Temporal placement of the site occupation is tentatively set sometime between ca. 8000 and 1500 B.P. for the Archaic; between ca. 1500 and 500 B.P. for the Fremont and between 500 to 100 B.P. for the Late Prehistoric time period (Holmer 1986). It appears, based on the number of features associated with diagnostic artifacts, that the heaviest occupation of the site was during the Late Prehistoric period.

The evidence presented in this report suggests that the Burch Creek site was used repeatedly as a short-term transient camp with a variety of functions rather than a base camp. No evidence of structures was found, although surface brush constructions or wickiups built against junipers may have been utilized. Modification of the environment was limited to the shallow, rock-filled fire pits found in area D and scattered fire-cracked rock concentrations found throughout the site along with the charcoal/refuse midden in area C. Evidence of seasonality is limited but seems to indicate the site was probably used on a year-round basis with the heaviest use in late summer through winter, when seeds and mule deer are more readily available. The mule deer bone breakage and boiling may also indicate winter and early spring use. Exactly how often the site was utilized, i.e., annually, biannually or once every few years cannot be determined from the data available. Some evidence, mostly in the form of lithic material types, suggests that the site may have been used as a short-term stopover by groups moving from the numerous prehistoric sites in the wetlands bordering the Great Salt Lake to upland areas in the Wasatch Mountains to the east. The location of the Burch Creek Site allows easy access to nearby Taylor and especially Weber canyons, which are gateways to higher upland areas.

The population size of the aboriginal groups that occupied the Burch Creek site cannot be directly determined. The distribution of cultural features over time, however, shows that probably no more than one to three households could have occupied the site at any one time. Since there is no evidence of shelter structures it is probable that sleeping and social activities occurred in the open, centered around the fire pit features. Excavation revealed that these features were shallow basins filled with 30 to over 100 fist-sized, quartzite rocks carried up onto the sand dunes from nearby Burch Creek. Evidence indicates that these pits were probably used for heating rocks to boil water to cook plant and animal foods in basketry, skin, or pottery containers. Small fragments of calcined bone associated with these features indicates the production of bone grease or juice at the site for immediate consumption during daily meals. Recovered identifiable bone was limited to several mule deer and rabbit bone and a single waterfowl bone.

While the evidence from the salvage excavations at Burch Creek is not overly impressive, it is indicative of the frequent and habitual use of upland sand dune locations with southern exposures for camp sites. The Burch Creek Site is typical of this occupational pattern. It is to date one of the few such sites to be tested and reported in Northern Utah. It is unfortunate that this site will soon be totally destroyed by urbanization as it still contains research potential to answer questions about settlement patterns and lifeways of prehistoric Native Americans in Northern Utah. Other similar and better preserved sites still remain in Northern Utah and will hopefully not be ignored in future research concerns.

ACKNOWLEDGMENTS

I wish to thank Dr. Steve Simms and Dr. Joel Janetski for their constant help and encouragement. I would also like to thank Dann Russell and Molly Prince of the Promontory/Tubaduka Chapter of USAS who assisted in the drafting of maps and illustrations and wrote some of the text for the final site report. James Brannan, also of the Promontory/Tubaduka Chapter did the flotation analysis. A special thanks is due to the members of the Promontory/Tubaduka Chapter who volunteered their time in excavation of the site and endured cold, wind, and snow: the Mark Stuart Family, the Dixie Little Family, the Dann Russell Family, Jim Hartwell, Molly Prince, Betty Caddy, Keith Greenhalgh, and Elizabeth Fry. Without the help of these individuals this paper would not have been possible.

REFERENCES CITED

Brannan, James
1992 Appendix A: Macrobotanical Remains From 42WB76 Through Floatation Analysis. In *Salvage Excavations at the Burch Creek Site 42WB76, Weber County, Utah*, by Mark E. Stuart, Molly Prince, and Dann Russell, pp. 43–46. Report of Investigations No. 92-1. Promontory/Tubaduka Chapter, Ogden.

Fowler, Catherine S.
1986 Subsistence. In *Great Basin*, edited by W. L. d'Azevedo, pp. 64–97. Handbook of North American Indians, vol. 11, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Frison, George C.
1978 *Prehistoric Hunters of the High Plains*. Academic Press, New York.

Holmer, Richard N.
1986 Common Projectile Points of the Intermountain West. In *Anthropology of the Desert West: Essays in Honor of Jesse Jennings*, edited by Carol J. Condie and Don Fowler, pp. 89–115. Anthropological Papers No. 110. University of Utah, Salt Lake City.

Madsen, David B.
1979 Great Salt Lake Fremont Ceramics. In *The Levee Site and the Knoll Sites*, by Gary F. Fry and Gardiner F. Dalley, pp. 79–100. Anthropological Papers No. 100. University of Utah, Salt Lake City.

Rudy, Jack R.
1953 *An Archaeological Survey of Western Utah*. Anthropological Papers No. 12. University of Utah, Salt Lake City.

Stuart, Mark E.
1988 A Preliminary Report of Excavations at the Burch Creek Site 42WB76, Weber County, Utah. *Utah Professional Archaeology Council (UPAC) Newsletter*, Vol. 4, No. 1. Salt Lake City.

Stuart, Mark E., Molly Prince, and Dann Russell
1992 Salvage Excavations at the Burch Creek Site 42WB76, Weber County, Utah. Report of Investigations No. 92-1. USAS Promontory/Tubaduka Chapter, Ogden.

NOTES

HUMAN SCALPS FROM EASTERN UTAH

Julie Howard, Bureau of Land Management, 885 South Sand Flats Road, Moab, Utah 84532
Joel C. Janetski, Brigham Young University, Department of Anthropology and Museum of Peoples and Cultures, 105 Allen Hall, Provo, Utah 84602

INTRODUCTION

Over the past several years the Bureau of Land Management (BLM) in Moab and the Museum of Peoples and Cultures at Brigham Young University (BYU) have obtained collections of prehistoric materials that include human scalps. These items have come from both the Uinta Basin and the Moab area of eastern Utah. Similarities in the scalps and associated material cultural suggest regional affinities, perhaps with the Southwest. The function of these important but highly sensitive artifacts is unknown at the moment, although intriguing insights are available in the ethnographic literature on the Pueblos.

SCALPS WITH BASKETRY FROM THE UINTA BASIN

In 1988 the Museum of Peoples and Cultures at BYU received a large collection of Ute ethnographic items from the heirs of Mildred Miles Dillman, a long-time resident of Vernal, Utah. Among the items were several prehistoric artifacts that, according to the notes with the collection, were from Nine Mile Canyon in eastern Utah. Included in the Nine Mile Canyon material were two human scalps stretched over basketry disks or rosettes (Figures 1 and 2). Each of the disks is 14.5 cm in diameter. Following Adovasio (1977) and Morris and Burgh (1954), the basketry was constructed with an open- or space-coiled, intricate-stitch, interlocked on a one-rod foundation technique (basketry material is unknown). The rim finish is a form of false braid. One of the disks is completely painted red, while the other has a red band painted across it just below the center (Figure 1). Spots of red paint are also present on the leather thongs that tie the rosettes together. One of the scalps is secured to its disk with a fine, two-ply, s-twist type cordage of unidentified plant fibers. Each scalp has two perforations (perhaps three on one) at the lower end or neck portion. The perforations are elongated as if something were tied or hung from them at one point. The scalps are well worn and little hair remains. Each appears to be from a separate individual and approaches being a full scalp. The hair is black and coarse and evidence of parasites is visible. Maximum hair length is about 15 cm. A hair whorl presumably from the back of the head is clearly visible on one of the scalps. The scalps have suffered some insect damage, but the disks are well preserved; however, both are extremely brittle and fragile. The two separate scalps along with the disks are bound together with leather thongs suggesting they were paired for some reason. No details are known of the circumstances of the discovery of these scalps in Nine Mile Canyon.

SCALPS AND BASKETRY FROM THE MOAB AREA

Five scalps are known from the North and the South Forks of Mill Creek Canyon, southeast of Moab. These artifacts are now in Moab in collections at the BLM office and the Dan O'Laurie Museum.

Two of the scalps (Figure 3) were found during the spring of 1986 by a Salt Lake City couple who visited the North Fork of Mill Creek Canyon near Moab. While hiking, they explored several large alcove sites and in one found a woven mat protruding from the sand. Upon investigating, they found the scalps wrapped in the mat buried approximately 20 cm below the surface. Unaware of the antiquity laws, they collected the scalps and returned to Salt Lake. Their discovery was made approximately one week before the Calvin Black case was reported in the newspapers. The couple was concerned about having violated any

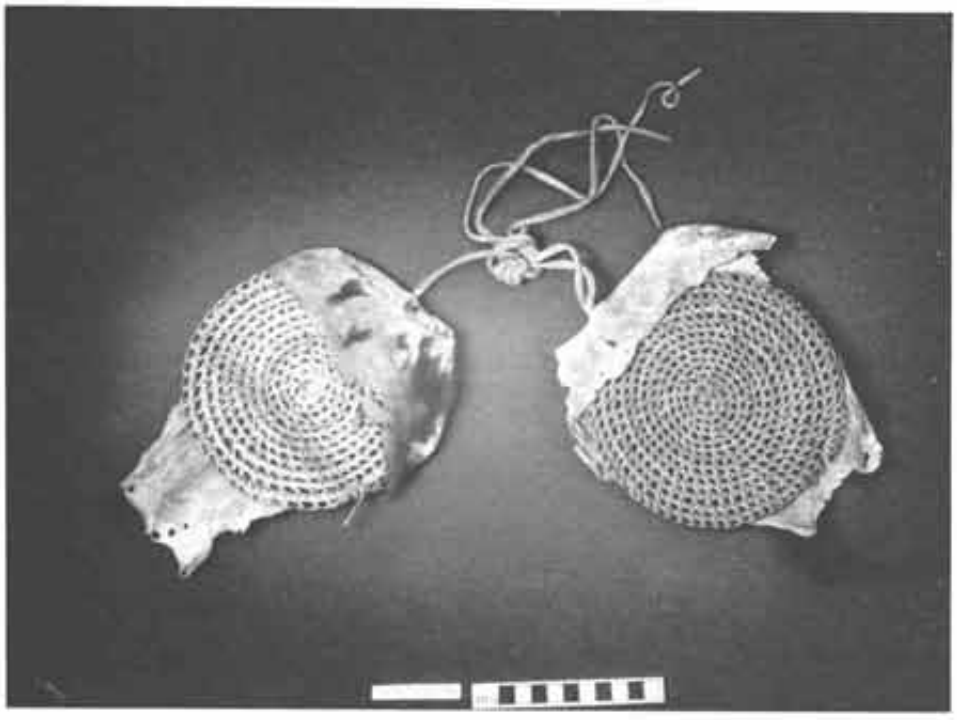


Figure 1. Scalps with basketry disks from Nine Mile Canyon (Museum of Peoples and Cultures Accession No. 88.65.258.1 and 88.65.258.2).

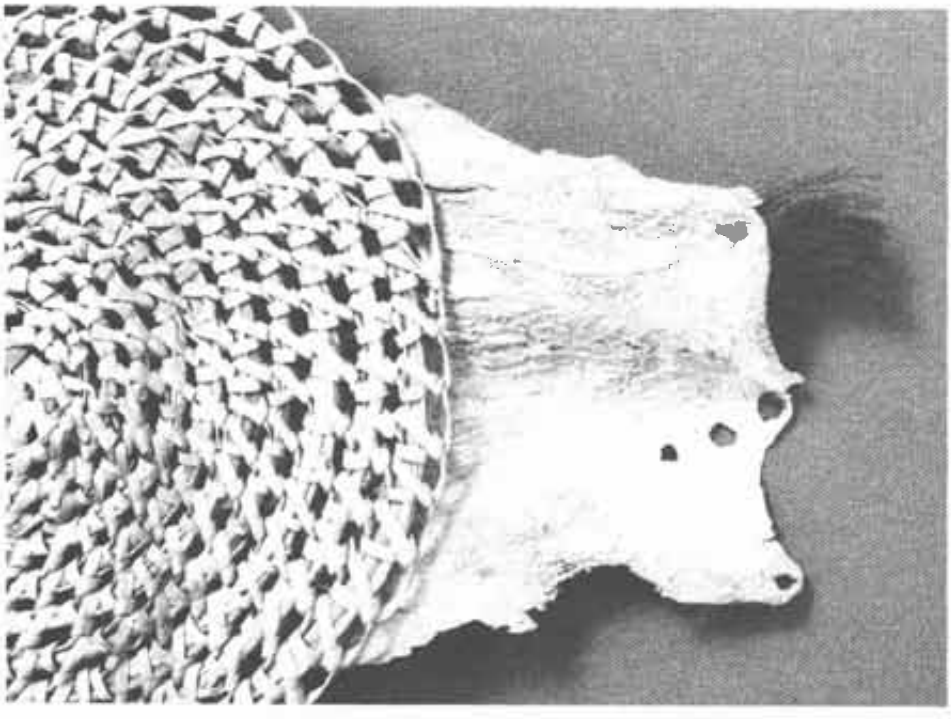


Figure 2. Nine Mile Canyon scalp showing basketry technique.

Figure 3. Scalps of adult woman and child from the North Fork of Mill Creek Canyon.

Figure 4. Lema scalp from the south fork of Mill Creek Canyon.

federal law and subsequently turned the items over to the United States Attorney for the District of Utah. The attorney contacted a special agent who gave them to the Grand Resource Area, Bureau of Land Management archaeologist in Moab.

Analysis of the scalps by a local dermatologist suggests that they are from an adult woman and a child. Both scalps have flat, coiled, basketry disks beneath the skull caps. The basketry disk associated with the adult scalp measures 13 cm in diameter and is decorated with a Greek cross design painted in red. The basketry disk with the child's scalp is smaller, 11 cm in diameter, and is undecorated. The basketry disks are both made using an open-coiled, intricate-stitch construction and false-braid, rim-finish technique similar to the Nine Mile examples described above. Both scalps have suffered beetle infestation in the past that has caused some deterioration of the skin tissue and loss of hair. The hair of the adult varies from 2 cm to 30 cm in length and has been purposefully clipped in places, although there is no evidence of hair manipulation, such as bobs. The adult scalp is supported by a leather thong extending from the top and is connected to the smaller scalp by another thong suggesting they were also paired for some reason. The smaller scalp is almost completely without hair.

A third scalp (Figures 4 and 5) was turned in to the BLM Moab office in March 1989 by Tony Lema, Jr., a local Moab resident. Mr. Lema found the scalp in a Navajo sandstone cave in the South Fork of Mill

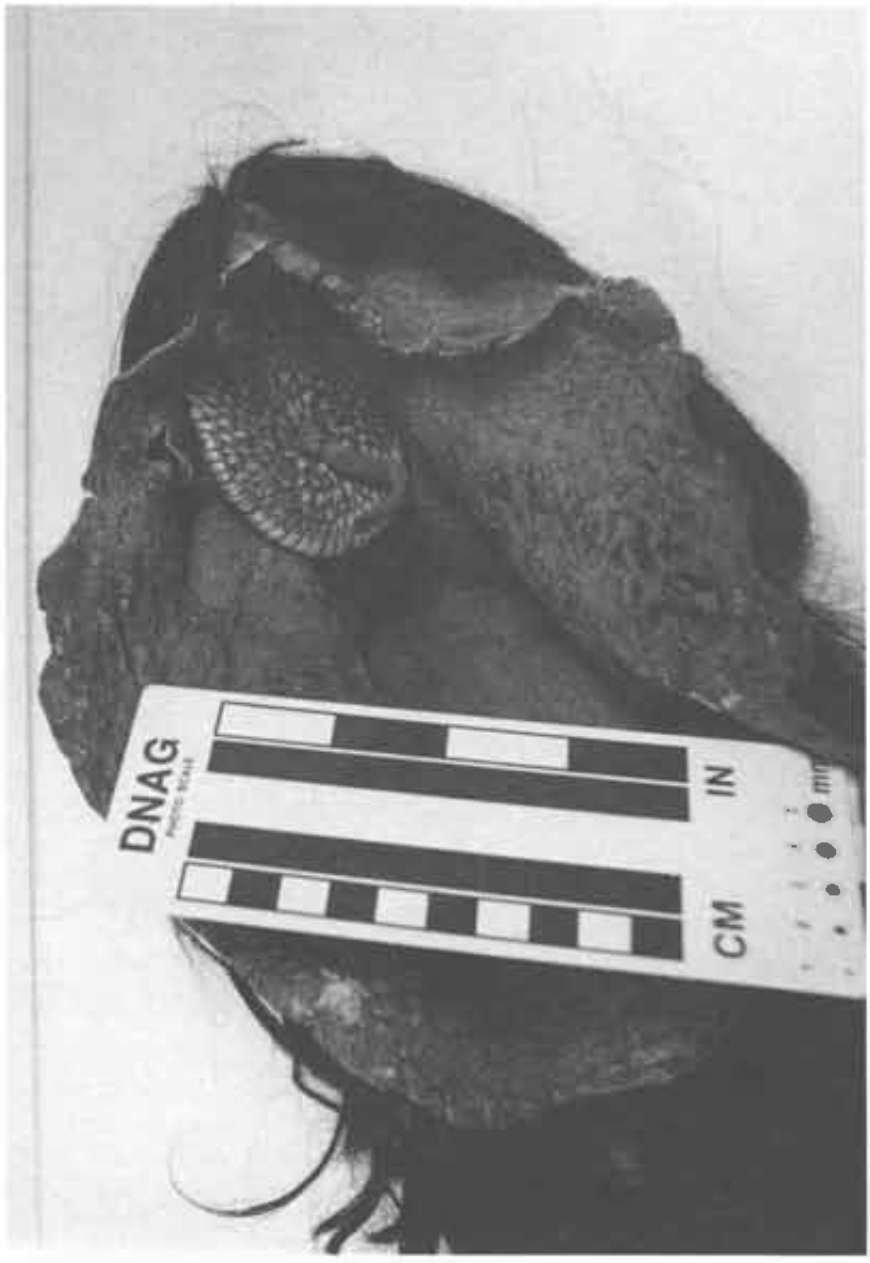


Figure 5. Close-up of the Lema scalp showing basketry disk.

Creek Canyon. The scalp is extremely well preserved and fully intact including ears interbraided with leather, eyebrows, a portion of the neck, and full hair with some strands of gray. The hair length is 7 cm in the front and 50 cm in the back. This scalp was also inspected by the dermatologist who concluded that it most likely was from a man. The graying hair suggests an age of approximately 28 to 35 years. A basketry disk was also associated with this scalp, but is smaller than the North Fork scalps, measuring only 6.5 cm in diameter and is undecorated. The disk basketry has not been well analyzed but is a close-coiled technique with a single-rod foundation and interlocking stitch. The basketry material has been

Figure 6. Williams scalp from the North Fork of Mill Creek Canyon.

identified as *Rhus trilobata* or squawbush. A tanned-leather thong attached to the disk supports the scalp from the top. This scalp was found wrapped in juniper bark, lying within a sealed cist on a colluvium shelf.

The two other Moab scalps are currently curated at the Dan O'Laurie Museum. The first of these (accession number 351/2) is part of the Dr. Williams collection (Figure 6). This scalp was found in 1935 in the North Fork of Mill Creek Canyon by Mel Dalton when he was 12 years old. It was given to Dr. Williams of Moab to display. Author Howard contacted Mr. Dalton in 1992 to inquire about the context of the artifacts, and he stated that the scalp was found buried with two baskets and two basketry disks. Unfortunately, the baskets and disks have been lost. The ears are clearly visible on this scalp which, is almost completely denuded of hair. Beetle infestation has deteriorated the forehead section of the scalp.

The last scalp—also part of the Dan O'Laurie Museum collections (accession number 1/168)—was found on October 4, 1964, by Johnny Green, a local Moab resident. He found it wrapped in woven cedar bark in Mill Creek Canyon. This scalp is very different from the other four Moab scalps. The scalp seemed to have been used as a bundle wrapping with the hair on the inside of the bundle (Figure 7). Within the scalp bundle were a fragment of a loosely plaited, juniper bark mat; a short piece of cordage; and a squash rind fragment. Another piece of cordage is tied through one of the several holes in the edge of the scalp and probably served to tie the bundle up. No basketry is known to have been associated with this scalp.

Figure 7. Green scalp with the contents of the bundle.

RADIOCARBON DATE FROM THE LEMA SCALP

An Accelerator Mass Spectrometric (AMS) radiocarbon date was obtained from the Lema scalp. The sample was taken from a small section of skin from the back of the neck. The sample yielded a raw date of 1845 ± 80 years (Beta Analytic sample number 31535). The tree ring calibration of this date following Stuiver and Reamer (1987) is A.D. 1–359 (two sigma range).

COMPARISON

Additional accounts of human scalps are known from Utah. Reagan (1933:57), for example, observed a pair of human scalps found by collectors in the Rasmussen Caves also in the Nine Mile Area. He described these as: " . . . two scalps of the whole hair part of the head, the inside of the scalps being faced and the two placed face to face." Reagan does not elaborate on what he means by the scalps being faced. Facing is a term that means to cover or line the front or face of an item, especially with a different material. It is probable, therefore, that Reagan meant the scalps were lined in some way. Clearly these scalps were paired as are at least two of the examples reported here. Reagan (1933:58) also described an adult mummy from the same cave that appeared to have been scalped.

A better known example of a prehistoric human scalp is that reported by Kidder and Guernsey (1919) from a Basketmaker II context in the Marsh Pass region of northeastern Arizona. In this case the scalp included not only the haired portion of the head, but also the face. The latter had been removed from the corpse in at least two pieces and sewn back together

and painted. The scalp was found in a burial cist beneath the mummified remains of a young woman and an infant. Kidder and Guernsey (1919:191) called the scalp a trophy.

Rock art panels in both southeastern and eastern Utah are also thought to depict scalps or trophy heads (Cole 1990). Perhaps the most famous of these is the Green Mask Site (42Sa3711) in Grand Gulch, but several other panels, including rows of so-called trophy heads painted green with loops at the top, are present in Grand Gulch. Cole (1990:182) pictures rock art panels from Dry Fork in the Uinta Basin depicting individuals carrying apparent trophy heads or scalps. Reagan (ca. 1930) also described this rock art and referred to the artists as the "head hunting, square shouldered people" referring to the common depiction of what he thought were trophy heads in various panels. He also concluded that the people were Basketmaker or Puebloan. Currently, the rock art panels from southeastern Utah are classified as Basketmaker while those from the north are considered Fremont in style (Cole 1990).

DISCUSSION

The meaning of these scalps is unclear despite the comments of Reagan and Kidder and Guernsey. The term trophy implies warfare and heightened social or political status of the scalp takers. The best known North American ethnographic analogue for scalping behavior comes from the Plains where intertribal warfare was common and scalps were taken as tokens of achievements in war (cf. Ewers 1955:194–196). However, scalping was essentially a pan-Southwestern phenomenon as well (cf. various in Ortiz 1979, 1983). Although the taking of scalps among Puebloan groups was done in the context of warfare, the importance of the act and symbolism of the scalps went far beyond simple trophies of the victory (various in Ortiz 1979, but especially Ellis 1979a, 1979b, and Parmentier 1979; also Cole [1990:123] has likewise questioned whether the scalps from the Colorado Plateau should be characterized as trophies and has suggested that they might be "symbols of death, fertility, and well-being"). Common to all accounts is the symbolic relationship between the taking of scalps, societal well-being, and water or precipitation in some form. Among the Tewa, for example, the ritual name for scalp is *po se e* or "little mists," suggesting a connection of scalps with rain or water (Parmentier 1979:611). Parmentier (1979:110) also points out that the Tewa Women's Society is the caretaker of the scalps and notes the traditional belief that when it is going to rain the scalps cry, again making the connection between scalps and water.

Such ideological insights, at a minimum, provide some basis for posing questions as we ponder the meaning of the elaborately curated scalp included with the burial of the young woman reported by Kidder and Guernsey (1919). It seems unlikely that the scalp here symbolized achievements in war. It would make more sense to speculate about possible membership of the individual in a Basketmaker society, or, given the presence of the infant, about fertility. It is wise, of course, to move cautiously in applying the historic Puebloan analogue to a social system well over a thousand years old. These issues are difficult to resolve and the absence of context for the scalps reported in this paper (which are also located well to the north of the traditional Anasazi homeland) compounds the interpretive problems.

Also important in analyzing these artifacts are questions of style, cultural affiliation, and dating. The basketry disks apparently functioned as a means to hold the scalp in place as they were displayed or carried. The presence of the disks is fortunate, however, as the style of manufacture is distinctive and helps to place the artifacts in time and suggests cultural affinities. The space-coiled, intricate-stitch basketry found with four of the scalps is intriguing as it is neither an Archaic nor a Fremont style. This style is most commonly found in the Anasazi area to the south (Morris and Burgh 1941). Adovasio (1974:121) notes that examples of this construction technique do occur as far north as Wyoming and Idaho, but they are generally considered trade items. Morris and Burgh (1941) report that this technique was characteristic of the Basketmaker II and III periods, which suggests the open-coiled disks and associated scalps are Basketmaker in age. This temporal placement is consistent with the radiocarbon date from the Lema scalp which, even at the two sigma range, is well within the Basketmaker II period (cf. Matson 1991).

Many questions are raised by the presence of these items well north of the Anasazi region. Were they obtained by local peoples through trade with the Anasazi or are they the manufacture of local residents who are maintaining close ties with the Southwest? Are they evidence of a migration of Basketmaker peoples onto the northern Colorado Plateau as suggested by Berry and Berry (1976, 1986)? Recent

research in the central part of the state, which has found corn and bell-shaped cists containing burials dated to just before and after the time of Christ, suggests more extensive and earlier contacts with the Southwest than had heretofore been supposed (cf. Wilde and Newman 1989, Janetski 1992).

REFERENCES CITED

Adovasio, James M.

1974 Prehistoric North American Basketry. In *Collected Papers on Aboriginal Basketry*, edited by Donald R. Tuohy and Doris L. Rendall, pp. 98–148. Anthropological Papers No. 16. Nevada State Museum, Carson City.

1977 *Basketry Technology: A Guide to Identification and Analysis*. Aldine Publishing Company, Chicago.

Berry, Claudia F., and Michael S.

1986 Chronological and Conceptual Models of the Southwestern Archaic. In *Anthropology of the Desert West, Essays in Honor of Jesse D. Jennings*, edited by Carol J. Condie and Don D. Fowler, pp. 253–327. Anthropological Papers No. 110. University of Utah, Salt Lake City.

Berry, Michael S., and Claudia F. Berry

1976 *An Archaeological Reconnaissance of the White River Area, Northeastern Utah*. Antiquities Section Selected Papers 2(4). Salt Lake City.

Cole, Sally J.

1990 *Legacy on Stone, Rock Art of the Colorado Plateau and Four Corners Region*. Johnson Books, Boulder.

Ellis, Florence Hawley

1979a Isleta Pueblo. In *Southwest*, edited by Alfonso Ortiz, pp. 351–365. Handbook of North American Indians, vol. 9, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

1979b Laguna Pueblo. In *Southwest*, edited by Alfonso Ortiz, pp. 438–449. Handbook of North American Indians, vol. 9., William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Ewers, John C.

1955 *The Horse in Blackfoot Indian Culture*. Bureau of American Ethnology Bulletin 159. Smithsonian Institution, Washington, D.C.

Janetski, Joel C.

1992 The Archaic to Formative Transition North of the Anasazi: A Basketmaker Perspective. In *Proceedings of the Anasazi Basketmaker Symposium*, edited by Victoria Atkins. Bureau of Land Management Cultural Resource Series, in press.

Kidder, Alfred V., and Samuel J. Guernsey

1919 *Archaeological Excavations in Northeastern Arizona*. Bureau of American Ethnology Bulletin No. 65. Smithsonian Institution, Washington, D.C.

Matson, R. G.

1991 *The Origins of Southwestern Agriculture*. University of Arizona Press, Tucson.

Morris, Earl H., and Robert F. Burgh

1941 *Anasazi Basketry, Basket Maker II Through Pueblo III, A Study Based on Specimens from the San Juan River Country*. Carnegie Institution of Washington, Publication No. 604, Washington, D.C.

Ortiz, Alfonso (editor)

1979 *Southwest*. Handbook of North American Indians, vol. 9. William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

1983 *Southwest*. Handbook of North American Indians, vol. 10. William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Parmentier, Richard J.

1979 The Pueblo Mythological Triangle: Poseyemu, Montezuma, and Jesus in the Pueblos. In *Southwest* edited by Alfonso Ortiz, pp. 609–622. Handbook of North American Indians, vol. 9., William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Reagan, Albert B.

1933 Anciently Inhabited Caves of the Vernal (Utah) District, with Some Additional Notes on Nine Mile Canyon, Northeast Utah. *Transactions Kansas Academy of Science* 36:41–70.

ca. 1930 Some Notes on the Archaeology of Ashley and Dry Fork Valleys, in Northeastern Utah. Ms. on file, Laboratory of Anthropology, Santa Fe, New Mexico.

Stuiver, M., and P. J. Reimer

1987 CALIB and DISPLAY 2.1. Quaternary Isotope Lab, University of Washington, Seattle.

Wilde, James D., and Deborah E. Newman

1989 Late Archaic Corn in the Eastern Great Basin. *American Anthropologist* 9:712–720.

AN ATLATL FROM SNOW CANYON STATE PARK

David B. Madsen, Antiquities Section, Division of State History, 300 Rio Grande, Salt Lake City, Utah 84101-1182

INTRODUCTION

In early January 1985, hikers discovered the partial remains of a human burial and an associated wooden artifact in a lava tube in Snow Canyon, Washington County, Utah. The burial was sent to the Office of the Medical Examiner for analysis and the artifact was forwarded to the Antiquities Section for examination. Since the artifact is a virtually complete atlatl and the number of atlatls from Utah are rather rare, I here report the limited amount of descriptive information available from these analyses.[1]

DISCOVERY

On January 12, 1985, David Snider of Burrego Springs, California, reported the discovery of human remains to Utah State Parks personnel who, in turn, reported the incident to the Washington County Sheriff's Office. The reporting officer's narrative indicates that:

> . . . The cave was approx. 100 yards so. of the main cave on the left side of the trail. After entering the cave and proceeding left at the end of the cave I observed a small area in the cave. . . . In the dirt exposed were what appeared to be a human skull, femur, rib, and coccyx. . . . At the time of discovery only a portion of the jaw was visible. Also located in the same area was a wooden tool which appeared to be hand carved and of Indian origin.

SITE LOCATION AND DESCRIPTION

On April 4, 1985, La Mar Lindsay and Ric Malcomsen visited the site to record a brief description and obtain locational information. The site form filled out by Lindsay indicates that the site, recorded as 42Ws1811, is located:

> In Snow Canyon State Park about 6 mi. due north of the town of Santa Clara. The site is in the Snow Canyon lava field about 70 m above and to the east of West Canyon and nearly one mile west of Highway 18[2].

He notes that the " . . . site is a large lava tube—mostly collapsed with limited deposition," that " . . . no artifacts were identified," and that the bones and atlatl were deposited in " . . . only about 6 cm of sand."

SKELETAL REMAINS

The skeletal material recovered by the Sheriff's Office was examined by Nenita R. Duazo, M.D. of the Office of the Medical Examiner. The relevant portion of her report describes the burial contents: (1) a human skull without the mandible, sacrum, right femur, and a left rib, (2) rat droppings were observed in the skull, (3) there was some alteration by scavenging animals, (4) there was an old healed skull fracture over the right eye, (5) the teeth exhibited marked signs of attrition, (6) the left femur was 38 cm in length, and (7) the burial was mostly like that of a male about ± 40 years old.

Further examination by Antiquities Section personnel identified a second cranial depression above the left orbit. This second examination also suggests a slightly younger age estimate of 34 to 40 years, and indicates that the posterior portion of the sacrum shows a healed break between the fourth and fifth sacral joint. The joint appears to have misaligned when healing causing some arthritic growth below the break. Neither examination revealed evidence of cradle board deformation.

WOODEN ARTIFACT

The artifact associated with the skeletal remains is a simple atlatl constructed from a single piece of a relatively straight-grained wood of medium hardness, possibly oak. No fiber or hide finger loops were lashed to the handle and no weights were attached. These features may have been present at one time and were possibly removed by weathering or rodent activity, although the absence of gnaw marks suggests the atlatl may have been used as is. There is no evidence of either painted or incised design elements on the surface.

The atlatl is 59 cm long and tapers in thickness from 0.8 cm at the distal end to 0.7 cm at the proximal end. The width is variable. The square-ended handle portion of the atlatl is 2.1 cm wide by 11.1 cm long. From the handle, the atlatl tapers rapidly to a width of 1.4 cm to provide a finger grip, then expands

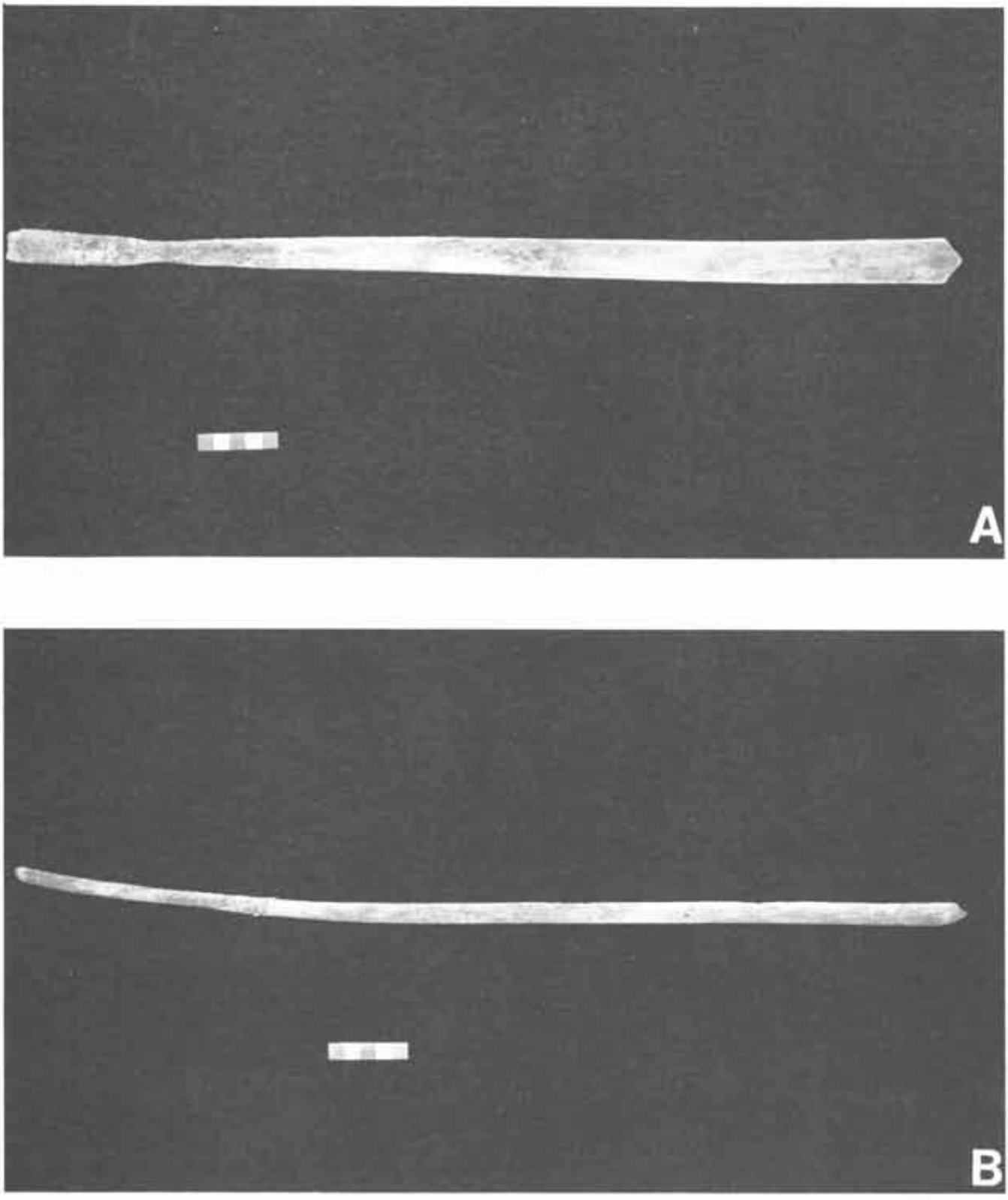


Figure 1. Interior (*A*) and lateral (*B*) views of the Snow Canyon State Park atlatl.

uniformly to the distal end where it reaches a width of 2.9 cm and tapers rapidly to a point.

There is a slight bow of 2.5 cm along the linear axis of the atlatl that is most pronounced in the area of the finger grip. The hooked, or throwing side of the atlatl is on the interior, concave margin of the bow; with the bow thus providing a substantial whipping action and additional force when the atlatl is in use. The hooked side of the atlatl is also concave in transverse cross-section, providing a nest to hold the spear/dart in the proper throwing position.

A raised, sausage-shaped hook with a round articulating surface for nocking dark shafts was carved from the original piece of wood rather than added as a separate bound element. It is 8.0 cm from the distal end of the atlatl, considerably shortening the operating arc of the spear thrower. A 0.9 cm wide by 4.3 cm long by 0.15 cm deep notch or grove has been cut into the atlatl immediately in front of the proximal end of the hood to accommodate spear shafts.

INTERPRETATION AND DISCUSSION

The morphology of the atlatl (Figure 1) is remarkably similar to atlatls recovered from Basketmaker II sites across southern Utah and northern Arizona (see in particular those illustrated in Kidder and Guernsey 1919; Guernsey and Kidder 1921; Guernsey 1931; Lindsay et al. 1958). Features shared with these Basketmaker spear-throwers include the overall tapering from a broader distal end to a narrower proximal end, a rectangular handle and square distal end, notched finger grip above the handle, a concave surface on the throwing face, a rounded projection to nock the dart, a groove cut into the atlatl in front of the hood to allow the dart to seat well on the hook, placement of the hook/groove arrangement well up the shaft from the distal end, and a blunt-pointed finish on the distal end. Unlike these Basketmaker weapons, there is no evidence of finger loops, but that may be attributed simply to weathering.

Great Basin atlatls are markedly different (compare specimens shown in Cressman and Krieger 1942; Dalley and Petersen 1970), and given the large number of attributes the Snow Canyon atlatl shares with Basketmaker II types, it is probable that it has a similar cultural affiliation and age. The atlatl was probably manufactured during late Archaic to Basketmaker II times, some 1,500–2,500 years ago (Jennings 1989; Cordell 1984). A similar atlatl from nearby Antelope Cave, just south of the Utah and Arizona border, dates to 1850 ± 60 B.P. (Janetski 1984). Assuming that the spear-thrower is associated with the skeletal remains, a similar age attribution can be made for the burial.

It appears that after death, the body lay exposed within the lave tube at Snow Canyon and was not interred. Whether or not this was part of normal burial practices or the individual merely died unattended cannot be determined from evidence at hand. It seems likely that the missing skeletal elements can be attributed to nonhuman intervention. Given that the skull and atlatl are the two most likely specimens to disappear after discovery by modern relic hunters and that the remaining elements show signs of gnawing by rodents, it seems most likely that pack rats or other scavengers are responsible for removing the remainder of the burial from the lava tube.

NOTES

1. Since the creation of the Antiquities Section and the Office of the State Archaeologist in 1978, a variety of accidentally discovered archaeological specimens have been reported and/or turned over to the section for analysis (e.g., Lindsay 1976). Many of these are of interest to those concerned with the prehistory of Utah, but there has been limited opportunity to publish the descriptive data associated with these artifacts. With the advent of *UTAH ARCHAEOLOGY*, this descriptive information can now be made available to students of Utah prehistory, and similar short reports should appear in future issues.

2. More specific locational information is available in the Antiquities Section files. The atlatl is currently being curated by the Division of State Parks, and photographs of the site are available at Snow Canyon State Park.

REFERENCES CITED

Cordell, Linda S.
1984 *Prehistory of the Southwest*. Academic Press, San Diego.

Cressman, Luther S., and Alex D. Krieger
1940 Atlatls and Associated Artifacts from Southcentral Oregon. In *Early Man in Oregon: Archeological Studies in the Northern Great Basin*, edited by Luther S. Cressman et al., pp. 16–52. Monograph Studies in Anthropology No. 3. University of Oregon, Eugene.

Dalley, Gardiner F., and Kenneth Lee Petersen
1970 Appendix X—Additional Artifacts from Hogup Cave. In *Hogup Cave*, by C. Melvin Aikens, pp. 283–285. Anthropological Papers No. 93. University of Utah, Salt Lake City.

Guernsey, Samuel J.
1931 *Explorations in Northeastern Arizona; Report on the Archaeological Fieldwork of 1920–23.* Papers of the Peabody Museum of American Archaeology and Ethnology, Vol. 12, No. 1.

Guernsey, Samuel J., and Alfred V. Kidder
1921 *Basket-Maker Caves of Northeastern Arizona; Report of the Explorations, 1916–17.* Papers of the Peabody Museum of American Archaeology and Ethnology Vol. 8, No. 2. Harvard University, Cambridge.

Janetski, Joel C.
1984 Addendum to Brigham Young University Department of Anthropology Technical Series No. 83-73: An Archaeological and Geological Assessment of Antelope Cave (NA5507), Mohave County, Northwestern Arizona. Ms. on file, Department of Anthropology, Brigham Young University, Provo.

Jennings, Jesse D.
1989 *Prehistory of North America.* 3rd ed. Mayfield Publishing Company, Mountain View, California.

Kidder, Alfred V., and Samuel J. Guernsey
1919 *Archaeological Explorations in Northeastern Arizona.* Bulletin No. 65. Bureau of American Ethnology, Smithsonian Institution, Washington, D.C.

Lindsay, Alexander J., J. Richard Ambler, Mary Anne Stein, and Philip M. Hobler
1968 *Survey and Excavations North and East of Navajo Mountain, Utah, 1959–1962.* Bulletin No. 45 (Glen Canyon Series No. 8). Museum of Northern Arizona, Flagstaff.

Lindsay, La Mar W.
1976 Unusual or Enigmatic Stone Artifacts: Pots, Points, and Pendants from Utah. In *Antiquities Section Selected Papers No. 8*, pp. 107–117. Utah State Historical Society, Salt Lake City.

AN UNPROVENIENCED SPLIT-TWIG FIGURINE FROM COWBOY CAVE

Nancy J. Coulam, P.O. Box 813, Moab, Utah 84532

INTRODUCTION

This note describes a split-twig, animal figurine found eroding from the back dirt of Cowboy Cave by patrolling National Park Service Maze District rangers. Split-twig figurines are constructed of a single, long, thin twig or branch that is split down the middle, bent, and folded to create a miniature animal. They were first discovered in the Grand Canyon, where they were believed to be associated with Early Archaic Pinto points, but analysis of Cowboy Cave demonstrated that, at least in the Green River region, split-twig figurines are associated with Gypsum points and the Late Archaic (Schroedl 1976, 1977).

Figure 1. Split-twig figurine from Cowboy Cave.

Cowboy Cave (42Wn420) is a stratified site located on the northern Colorado Plateau near Horseshoe Canyon in the Green River region. A University of Utah archaeological field school excavated Cowboy Cave in 1975, and a site report was published by Jennings (1980). The site is extremely important in Utah archaeology, because, when stratigraphically provenienced and radiocarbon dated artifacts from Cowboy Cave were analyzed in conjunction with those from Sudden Shelter (a Colorado Plateau rockshelter stratigraphically excavated in 1974 [Jennings et al. 1980]), archaeologists were able to piece together sequences of chronologically and culturally diagnostic artifacts for most of the Archaic period (e.g., Holmer 1978; Schroedl 1976).

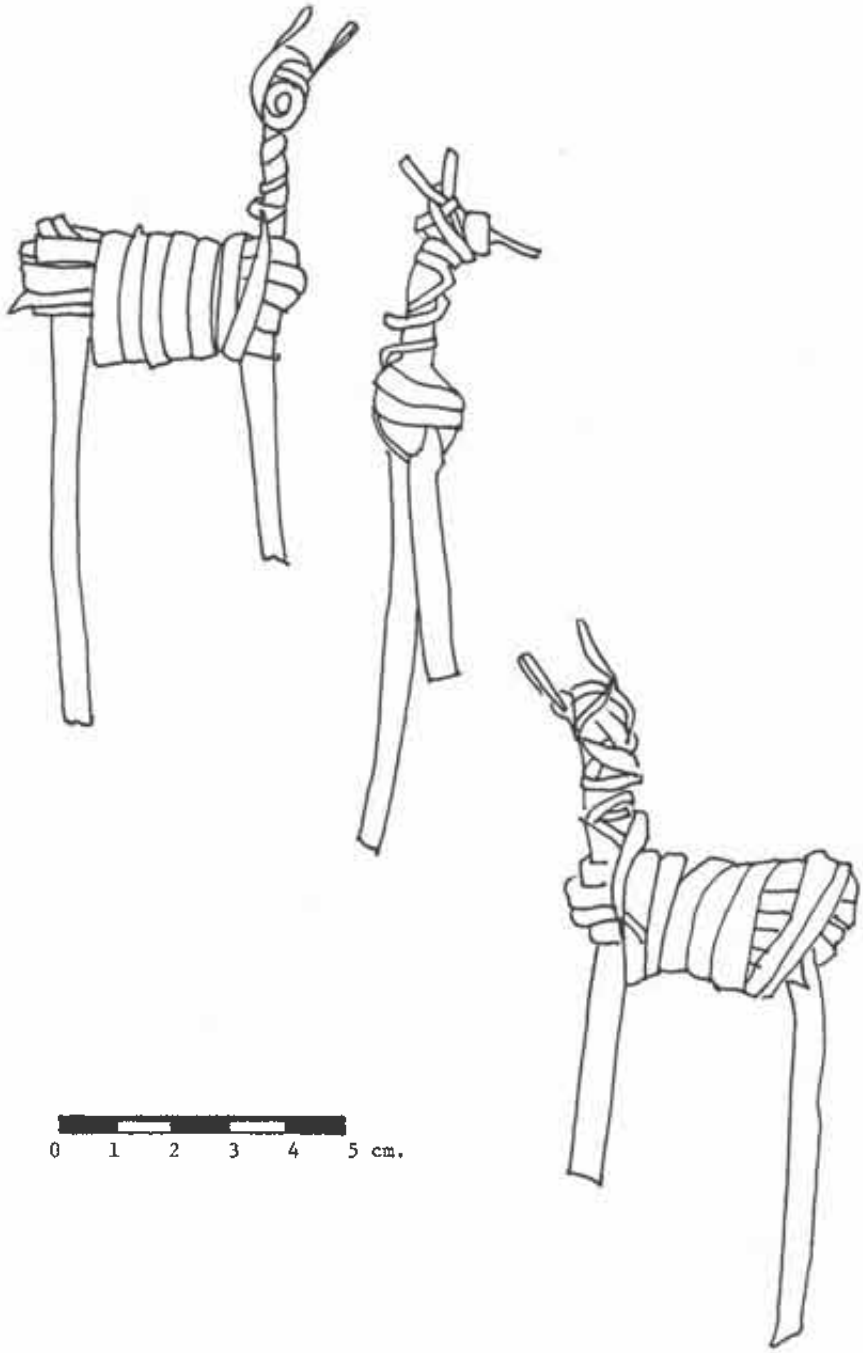


Figure 2. Split-twig figurine from Cowboy Cave: *a*, front; *b*, back; *c*, profile.

While development of the projectile point chronology for the northern Colorado Plateau was probably the single most important outcome of the excavation and analysis of Cowboy Cave, another important contribution was documenting the association between split-twig, animal figurines, Gypsum projectile points, and Late Archaic radiocarbon dates. Of the seventeen stratigraphically

Table 1. Cowboy Cave Split-Twig Figurine Measurements in Centimeters

Neck	Nose to Tail	Top to Bottom	Body Thickness	Provenience
2.0	5.5	13.0	2.0	Back dirt[a]
1.0	10.0	9.5	2.0	No Provenience[b]
—	3.5	8.8	1.0	IVc
—	5.7	10.0	2.0	IVd
—	4.5	13.0	1.5	IVc
—	4.0	5.5	1.0	IVc
—	4.0	4.5	0.8	IVd
—	4.0	7.0	1.2	No Provenience
—	4.5	5.5	1.2	Vb
—	8.7	9.2	—	IVd (lost)
—	6.5	9.2	—	Ivd (lost)

[a]Newly discovered figurine from back dirt.

[b]Measurements reported by Janetski (1980).

provenienced split-twig figurines from Cowboy Cave, one was found on the surface, three came from Unit Vb, three from Unit Va, five from Unit IVd, and five from Unit IVc. Unit IVc has a tree-ring calibrated one sigma age range of 2131–1935 B.C. and Unit IVd's calibrated age range is 2031–1779 B.C. The split-twig figurines are believed to have been constructed and used during these times, while figurines in overlying Unit V and the surface of Cowboy Cave are believed to have been displaced upward when the prehistoric occupants of Unit V dug large pits into underlying Unit IV.

In addition to the 17 stratigraphically provenienced figurines, 5 more split-twig figurines from Cowboy Cave were nonprovenienced, as reported by Janetski (1980). This note describes one more nonprovenienced split-twig figurine from Cowboy Cave.

NONPROVENIENCED SPLIT-TWIG FIGURINES FROM COWBOY CAVE

When deposits slumped or collapsed during the excavation of Cowboy Cave, most of these stratigraphically mixed deposits were screened for artifacts and the recovered artifacts were labeled nonprovenienced; however, some slumped and mixed deposits were simply dumped onto the back dirt pile in front of the drip line. By the summer of 1991, water pouring over the drip line and onto the back dirt eroded a vertical profile through the back dirt deposits. In this profile, patrolling National Park Service Maze District rangers found a split-twig figurine, along with some cordage and lithic artifacts.

DESCRIPTION OF THE FIGURINE

Although wet upon discovery, the newly discovered figurine is well preserved. As shown in Figures 1 and 2, the split-twig figurine is complete with head, ears, muzzle, and both legs; in fact, it is one of the better-made figurines from Cowboy Cave. It is constructed in the Green River figurine style with vertical body wrappings, as opposed to the Grand Canyon split-twig figurine style's horizontal body wrappings (cf. Schroedl 1977; Euler 1984).

To facilitate comparison with other split-twig figurines, the first line of Table 1 lists measurements for the newly discovered figurine found in the back dirt, followed by others measured by Janetski (1980) and in the Cowboy Cave report (Jennings 1980).

Additional measurements for the newly discovered split-twig figurine are as follows: length of nose is 1.0 cm; length of right ear is 1.3 cm; length of left ear is 1.5 cm; length of back leg from bottom of toe to top of the back is 9.0 cm; length of front leg to top of the back is 5.7 cm; the front body is made of seven vertical wrappings, while eight wrappings show on the back.

SUMMARY

In 1991, patrolling National Park Service Maze District rangers found a prehistoric split-twig, animal figurine eroding from the back dirt of Cowboy Cave. This brings the total number of split-twig figurines from Cowboy Cave to 23. Like other split-twig figurines, this newly discovered figurine is constructed of a single, long, thin branch split down the middle, bent, and folded to create an animal. The newly discovered figurine is one of the most well-constructed figurines from Cowboy Cave, and it falls within the Green River figurine style.

None of the Green River style figurines have been directly radiocarbon dated, but directly dated Grand Canyon style split-twig figurines have tree-ring calibrated age ranges from 2879 B.C. to 1260 B.C. (Schroedl 1977). Securely provenienced split-twig figurines from Cowboy Cave were from stratigraphic units radiocarbon dated and tree-ring calibrated to 2131–1935 B.C. and 2031–1779 B.C. Since none of the Cowboy Cave or Green River region figurines have been directly dated, an Accelerator Mass Spectrometric (AMS) radiocarbon date on the bark that flaked off when the newly discovered figurine was drying, would be a welcome addition to our knowledge of split-twig, animal figurines and Late Archaic prehistory of the northern Colorado Plateau and Green River region.[1]

NOTE

1. Of course, an AMS date would only place split-twig figurines more securely within the Late Archaic. There are neither radiocarbon nor stratigraphic data to support Jett's (1991) belief that split-twig figurines might be associated with Anasazi horticulturalists.

ACKNOWLEDGMENTS

I thank Bill Foreman, Scott Brown, Gary and Cindy Cox, Paul Hays, Bob Vance, Barbara Zen, and all other Maze personnel for enthusiastically protecting and preserving cultural resources of the Green River region. I also thank Alan Schroedl for commenting on the first draft of this note.

REFERENCES CITED

Euler, Robert C.
1984 *The Archaeology, Geology, and Paleobiology of Stanton's Cave, Grand Canyon National Park, Arizona.* Grand Canyon Natural History Association, Monograph 3.

Holmer, Richard Newton
1978 *A Mathematical Typology for Archaic Projectile Points of the Eastern Great Basin.* Unpublished Ph.D. dissertation, Department of Anthropology, University of Utah, Salt Lake City.

Janetski, Joel C.
1980 Wood and Reed Artifacts. In *Cowboy Cave*, by Jesse D. Jennings, pp. 75–95. Anthropological Papers No. 104. University of Utah, Salt Lake City.

Jennings, Jesse D.
1980 *Cowboy Cave.* Anthropological Papers No. 104. University of Utah, Salt Lake City.

Jennings, Jesse D., Alan R. Schroedl, and Richard N. Holmer
1980 *Sudden Shelter.* Anthropological Papers No. 103. University of Utah, Salt Lake City.

Jett, Stephen C.
1991 Split-Twig Figurines, Early Maize, and a Child Burial in East-Central Utah. *Utah Archaeology 1991* 4(1):23–31.

Schroedl, Alan R.
1976 *The Archaic of the Northern Colorado Plateau.* Unpublished Ph.D. dissertation, Department of Anthropology, University of Utah, Salt Lake City.
1977 The Grand Canyon Figurine Complex. *American Antiquity* 42:254–265.

THE BROADBENT CACHE SITE

Lora Broadbent, Promontory/Tubaduka Chapter, Utah Statewide Archaeological Society, 3596 East 3600 North, Liberty, Utah 84738

INTRODUCTION

On September 2, 1989, Arden and Lora Broadbent were camped in the Ashley National Forest west of Flaming Gorge Reservoir in an unnamed valley by some perennial springs. Nearby was a long ridge of

sandstone outcroppings. During the course of observing deer habitat, the Broadbents discovered an unusual cache of 35 large, side-notched, stemmed projectile points hidden in crannies in a small rockshelter in the outcroppings. The purpose of this paper is to document this rare and unusual cache of projectile points.

LOCATION

As noted, the site is located on a sandstone ridge approximately 1 mile northwest of the Summit Springs Guard Station on the Flaming Gorge Ranger District of the Ashley National Forest and 90 m north of Forest Road Number 93 (Figure 1). Below the ridge (elevation 8,280 ft) a sandy, colluvial, south-facing slope overlooks a long, narrow valley (Figure 2). The slope is covered with sagebrush, piñon pine, juniper, and mountain mahogany. At the base of this slope near the valley edge, is another stratum of sandstone outcroppings containing a series of vandalized rockshelters and several perennial springs. These shelters show numerous signs of human occupation mostly in the form of smoke-stained ceilings, bone scrap, and abundant lithic debitage. The valley continues south and east into the Sheep Creek area and eventually into Flaming Gorge Reservoir. Big game animal migrations up and down this valley may have been a factor in influencing prehistoric site locations in this area.

CACHE SITE DESCRIPTION

The site is in a rockshelter approximately 30 m long, 1 m deep, and 10 m high. Near the floor of the shelter was a slanting rock shelf containing two narrow crannies divided by chunks of rocks (Figure 3). The rock crannies were very shallow, being less than 30 cm deep, containing fill of organic debris and pack rat droppings. The Broadbent Cache was found in and around these crannies. A few projectile points were found scattered down slope from the rockshelter. Since the rockshelter contains pack rat debris, the cache was probably disturbed by the pack rats, allowing these points to be carried down slope by natural agents. At the time of discovery, 35 projectile points were collected by the Broadbents.

CACHE PROJECTILE POINTS

The Broadbents, after they became affiliated with the Utah Statewide Archaeological Society, realized the importance of this cache find and brought it to the attention of Tom Scott, the Ashley National Forest Archaeologist. The 35 previously collected projectile points were turned over to the United States Forest Service (USFS) for further study and to be eventually displayed at the Flaming Gorge National Recreation Area Red Canyon Visitor Center.

In May of 1990, the site was revisited by the Broadbents and archaeologists from the USFS. At this time the site was formally recorded on Intermountain Archaeological Computer System (IMACS) forms and given the state site designation of 42Da498. During this visit, Lora Broadbent discovered a 36th projectile point approximately 9 m down slop from the original cache crannies. In a survey of the immediate surrounding area, USFS personnel also discovered a red quartzite mano and metate on the slope above and west of the site and Arden Broadbent found a cache of raw lithic material consisting of several flakes, cores, and a large quartzite biface.

The 36 projectile points and the biface (Figure 4) were then sent by the USFS to Dr. Richard Holmer, Director of the Museum of Natural History, Idaho State University, Pocatello, Idaho, for study. After examining the collection, Dr. Holmer sent the collection to the Herrett Museum at the college of Southern Idaho at Twin Falls, Idaho, for further study. Here the cache was examined, measured, and described by James C. Woods and Gene Titmus. The following description is taken from the comments of these individuals:

> It appears that the tools in the cache were manufactured from two general varieties of raw material. Twenty-five of the points (67.6% of the collection) are made of a dark brown, mottled chert. The other 11 points and single biface (32.4% of the collection) are made of a light cream to tan colored quartzite. The chert is fine-grained and semi-lustrous although there is no clear evidence of heat-treating on any of the specimens; the quartzite is a fine-grained variety often called "sugarquartz" by rock hounds. Some of the specimens made of chert show evidence of dehydration, a characteristic of some jasperoid materials. On these pieces, the outer surface of the artifacts has an almost chalky appearance. Some minor recent damage reveals that this dehydration is quite shallow.

Woods and Titmus further stated:

> Given the general appearance of the raw material, it is possible the collection could have been produced from as few as three or four nodules. The cumulative weight of

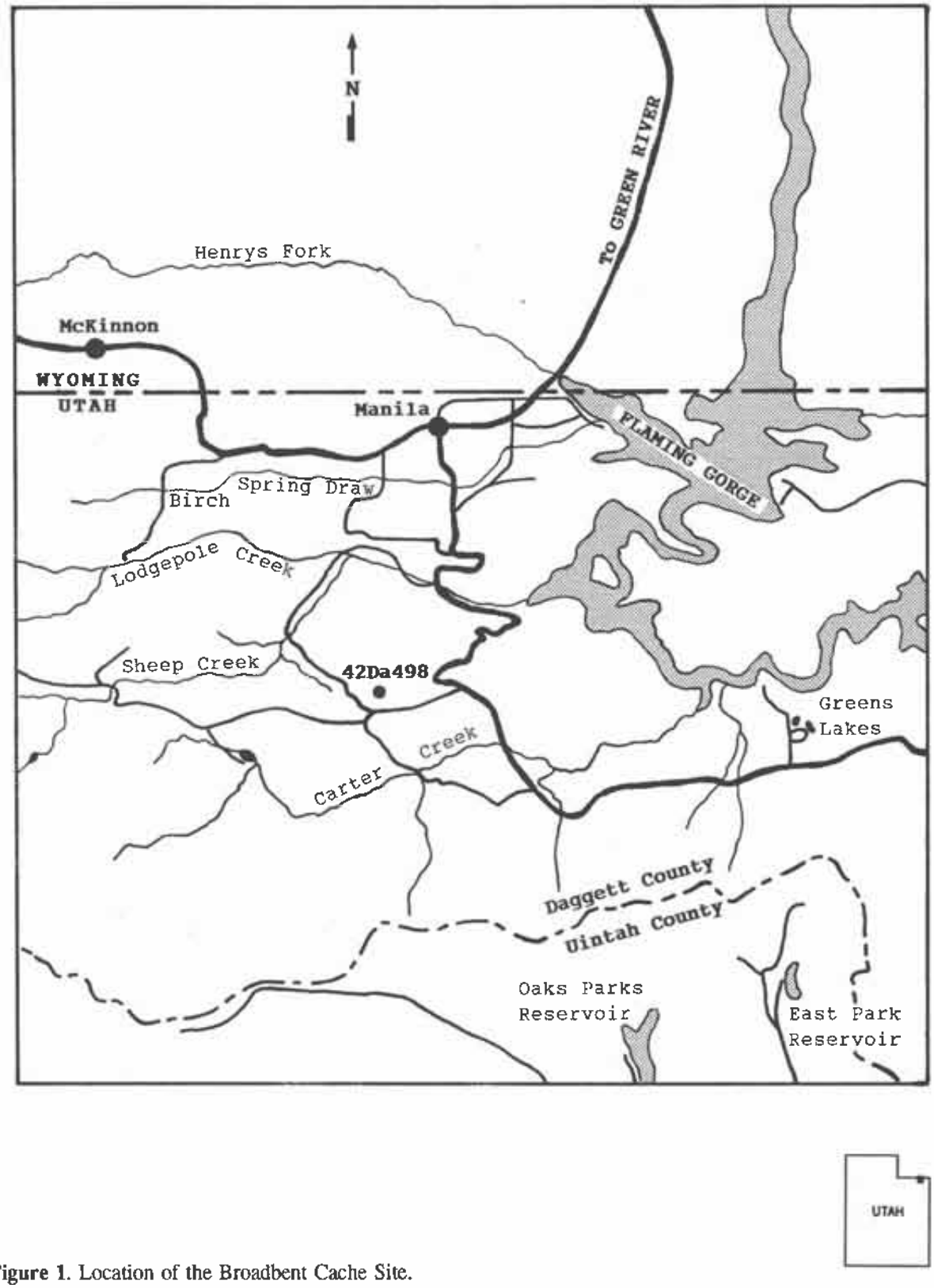


Figure 1. Location of the Broadbent Cache Site.

Figure 2. View of shelter.

Figure 3. Slanting rock shelf.

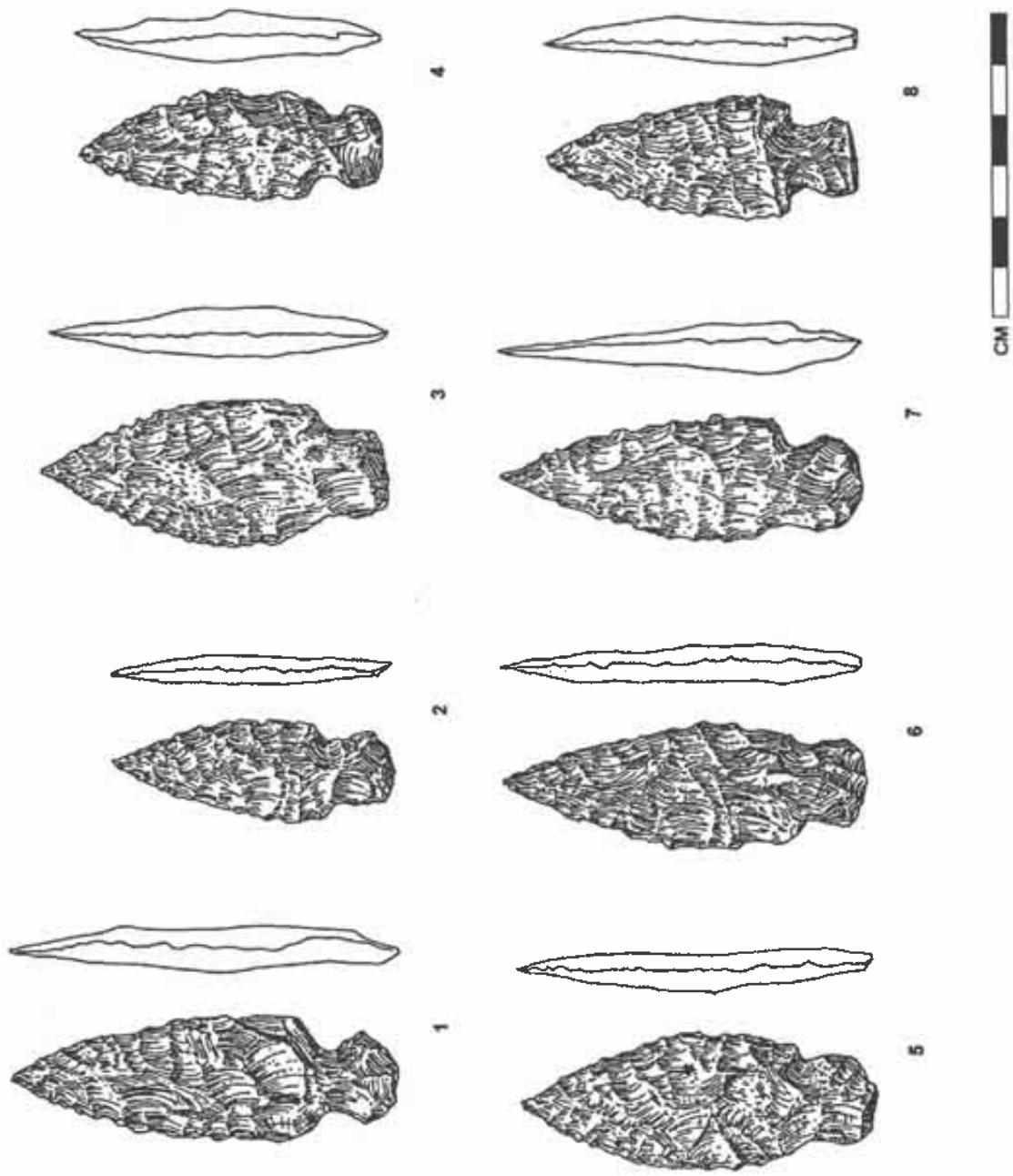


Figure 4. Broadbent Cache projectile points.

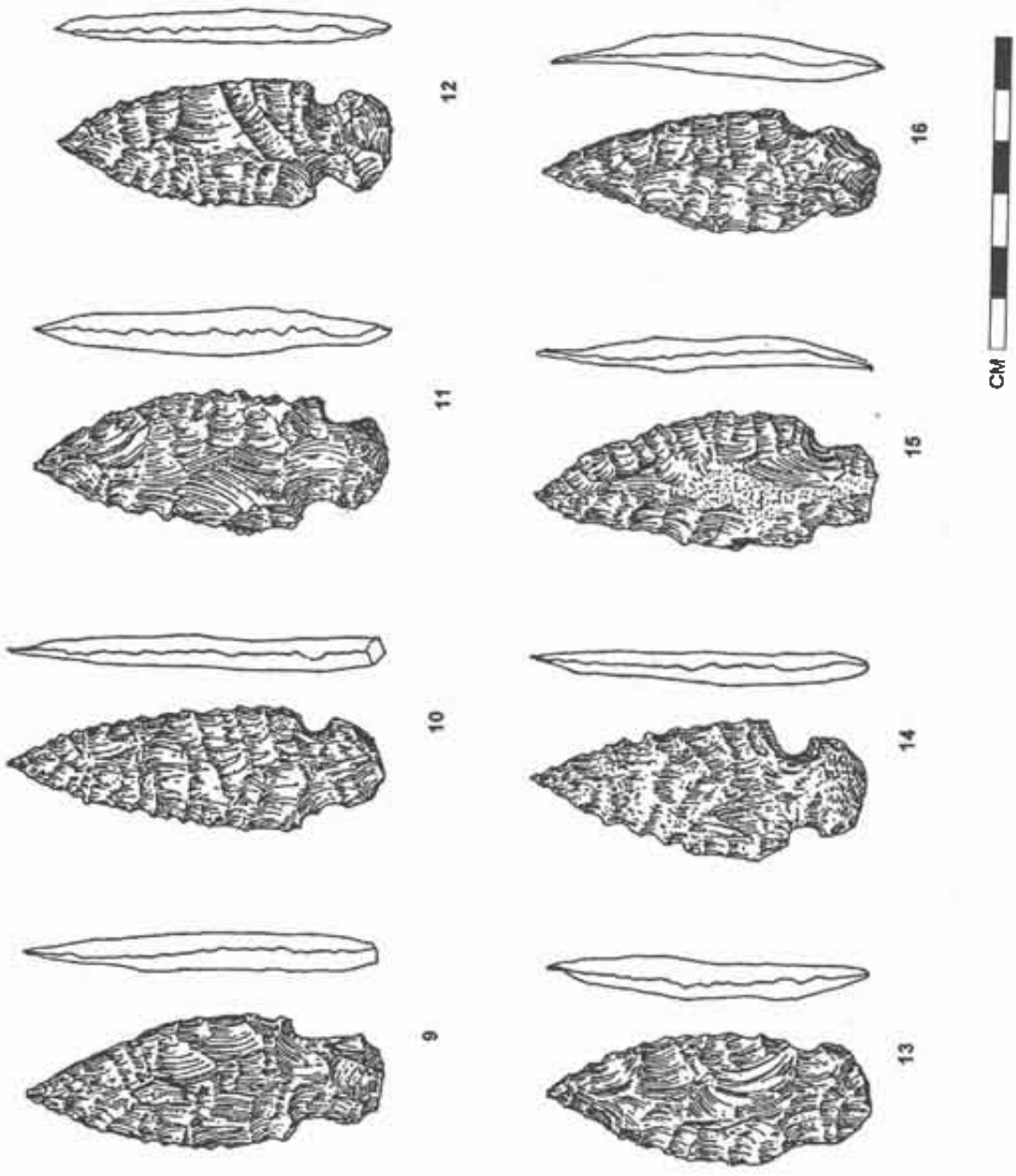


Figure 4. (Continued) Broadbent Cache projectile points.

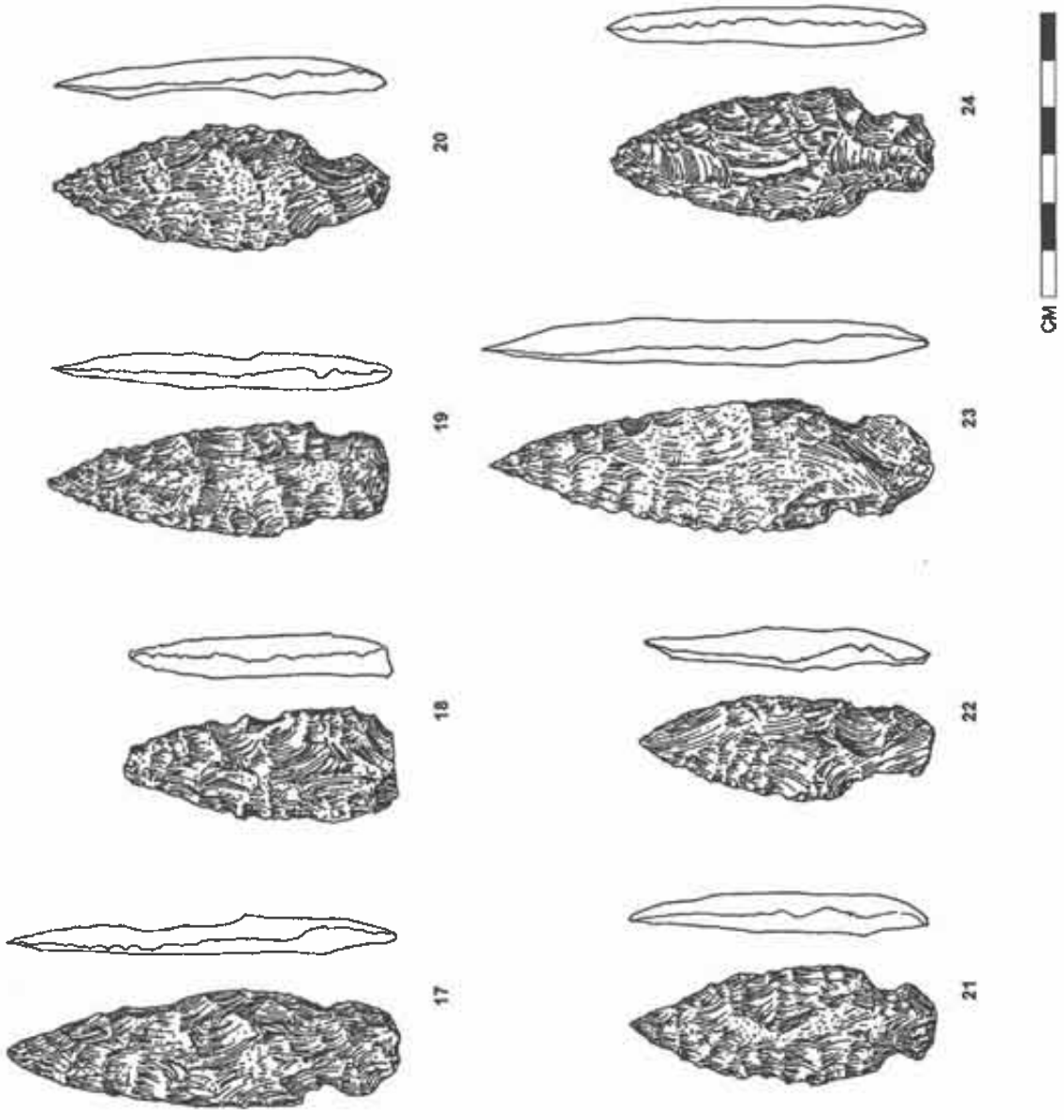


Figure 4. (Continued) Broadbent Cache projectile points.

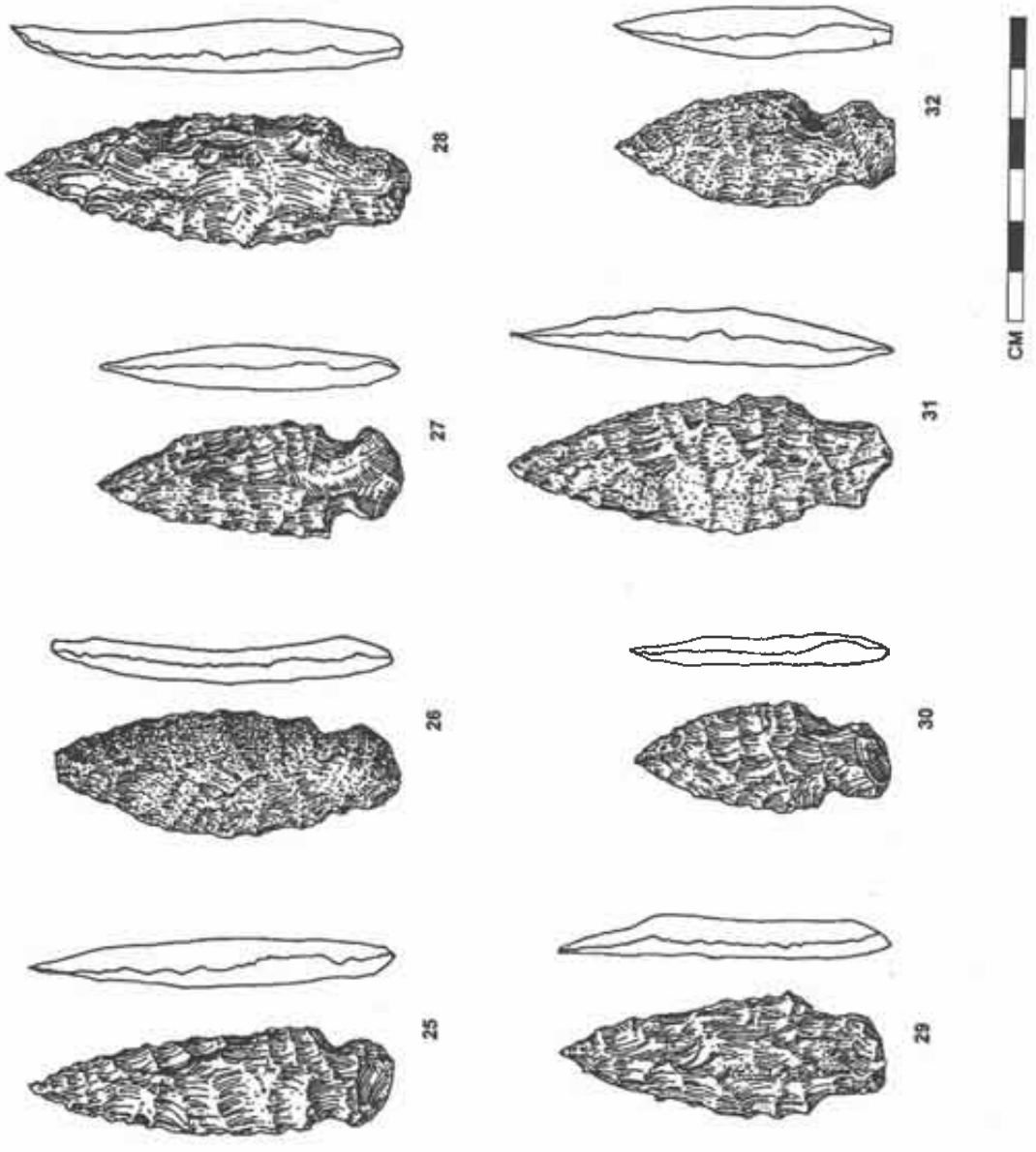


Figure 4. (Continued) Broadbent Cache projectile points.

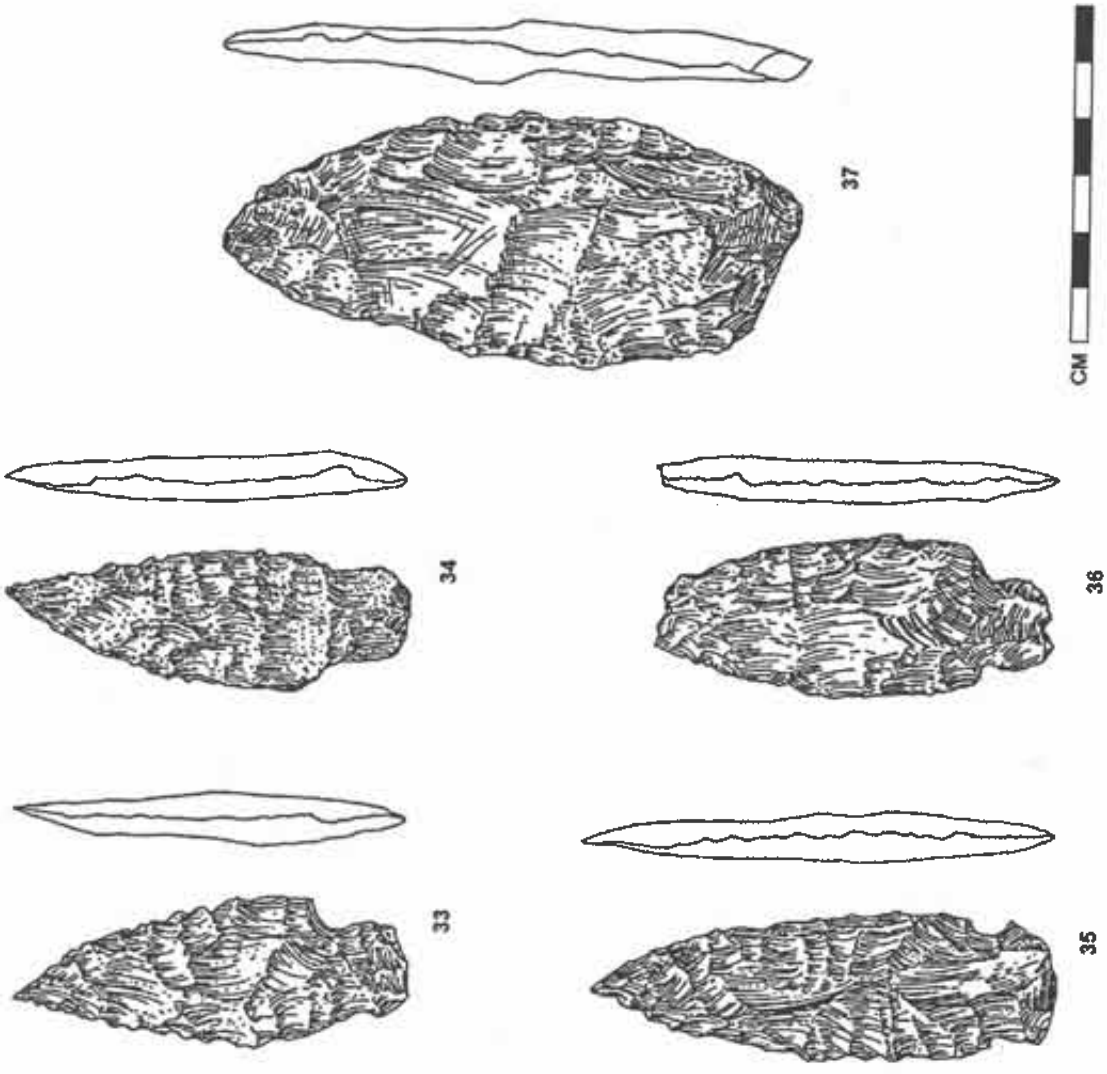


Figure 4. (Continued) Broadbent Cache projectile points.

Table 1. Projectile Point and Biface Descriptions

Case	Length (cm)	Width	Thickness	Weight (g)	Material
1	7.6	2.5	0.9	14.0	Chert
2	5.6	2.0	0.6	6.1	Chert
3	6.8	2.9	0.9	16.3	Quartz
4	6.0	2.2	0.9	10.6	Quartz
5	7.0	2.7	0.8	15.0	Chert
6	7.2	2.5	0.7	11.4	Chert
7	7.2	2.5	1.0	13.3	Quartz
8	6.1	2.5	0.7	9.4	Chert
9	6.9	2.5	0.7	11.8	Chert
10	7.2	2.4	0.6	10.8	Chert
11	6.8	2.8	0.9	13.7	Chert
12	6.4	2.5	0.7	10.6	Chert
13	6.2	2.5	0.8	11.8	Chert
14	6.4	2.7	0.7	10.5	Quartz
15	6.5	2.7	0.8	11.8	Chert
16	6.5	2.3	0.8	10.3	Chert
17	8.3	2.5	0.8	13.8	Chert
18	5.7	2.4	0.9	13.2	Chert
19	7.2	2.4	0.8	13.3	Chert
20	7.0	2.7	0.8	13.3	Quartz
21	6.5	2.4	0.8	11.9	Chert
22	6.2	2.2	0.8	10.1	Chert
23	9.4	2.9	1.0	23.4	Chert
24	6.8	2.8	0.9	15.7	Chert
25	7.2	2.2	0.9	12.5	Quartz
26	6.8	2.5	0.7	13.0	Quartz
27	6.0	2.3	0.8	9.9	Quartz
28	8.0	2.6	1.0	17.4	Chert
29	6.4	2.5	0.8	11.5	Chert
30	5.1	2.2	0.7	6.0	Chert
31	7.6	2.6	1.0	16.6	Quartz
32	5.5	2.3	0.9	10.9	Chert
33	6.9	2.7	1.0	14.7	Quartz
34	7.1	2.5	0.8	13.6	Quartz
35	8.3	2.7	0.9	18.1	Chert
36	7.0	2.9	0.8	17.4	Chert
37	10.3	4.5	1.0	48.0	Quartz

the cache is 551.3 g. Several of the specimens appear to be made from large flakes due to their longitudinal curvature and plano-convex cross-section. This suggests a flake-core reduction strategy was employed as opposed to a biface-core strategy. However, only a few hints of detachment scars remain on four specimens (5, 15, 26, and 34). A small cortex remnant is visible on one specimen (11) (Titmus and Woods 1991:1).

They also went on to state there is evidence due to the uniformity of flaking patterns that a single knapper, possibly left handed, was responsible for the production of the cache and perhaps during a single production episode.

The Broadbents are not aware of a point type or age being assigned the cache other than probably Archaic affiliation with possible ties to Northwestern Plains. However, they feel this point type may be related to an early Archaic point type designated as a Sand Dune Side-notched by Tipps et al. (Geib and Ambler 1991:17). Even though similar in appearance, the points in the Broadbent Cache are larger (Table 1) than those at Sand Dune Cave, except for the second and third points from Sand Dune Cave Burial 2 (Geib and Ambler 1991:19). These two points have nearly the same dimensions as Broadbent point 30.

EPILOGUE

In the fall of 1991 a test excavation was conducted under the direction of Tom Scott using the Passport in Time (PIT) volunteer system. The test covered a 1 m by 2 m area to a depth of 50 cm. The first 10 cm of screening revealed the bottom half of another point. No other points were found below this depth. At 25 cm in the northeast corner of the test area a fire pit was found. No other artifacts or debitage were uncovered in context in the test area, although during the test excavation Lora discovered one more point near the northeast corner stake and one more down slope, bringing the total number of points to 39 plus one biface.

ACKNOWLEDGMENTS

I wish to thank Tom Scott, Ashley National Forest Archaeologist for providing an IMACS site form and arranging for the analysis of the cache points. Thanks to Dr. Richard Holmer of Idaho State University for examining the artifacts and a special thanks to Gene Titmus and James Wood at the Herrett Museum at the College of Southern Idaho for their analysis of the cache and providing the excellent illustrations of the artifacts. I also wish to thank Mark Stuart, Dann Russell, and Dennis Stoner of the Promontory/Tubaduka Chapter of the Utah Statewide Archaeological Society for their encouragement and assistance in writing, word processing, and computer image processing of the figures in this article.

REFERENCES CITED

Geib, Phil R., and J. Richard Ambler
1991 Sand Dune Side-Notched: An Early Archaic Projectile Point Type of the Northern Colorado Plateau. *Utah Archaeology 1991* 4(1):17–22.

Titmus, Gene L., and James C. Woods
1991 Comments on the Broadbent Cache Materials. Ms. on file, The Herrett Museum, College of Southern Idaho, Twin Falls, Idaho.

HARPOONS FROM UTAH LAKE

Ron Martin, Utah County Chapter, Utah Statewide Archaeological Society, 465 East 720 South, Spanish Fork, Utah 84660

Joel C. Janetski, Brigham Young University, Anthropology Department and Museum of Peoples and Cultures, 105 Allen Hall, Provo, Utah 84602

INTRODUCTION

Information about prehistoric fishing gear has been relatively scarce for the eastern Great Basin including Utah Valley where fishing has been described as an important activity (Janetski 1990, however, see Hunter 1991). This paper describes several bone harpoons that have been collected from archaeological sites in Utah Valley by members of the Utah County Chapter of the Utah Statewide Archaeological Society. The following section briefly describes each of the sites where the artifacts were collected as well as the harpoons from those sites.

42UT832 (PAINTED BOWL SITE)

The Painted Bowl Site is located on a small rise in the marshes at the east end of Utah Lake in Provo Bay (Figure 1). Cultural debris recovered from this site includes pottery fragments from at least one black on gray bowl and sherds from a corrugated pitcher. Projectile points collected at the site are a small corner-notched style reminiscent of Elko Corner-notched but that do not fall easily into any type. The points seem small enough to be arrow points. These

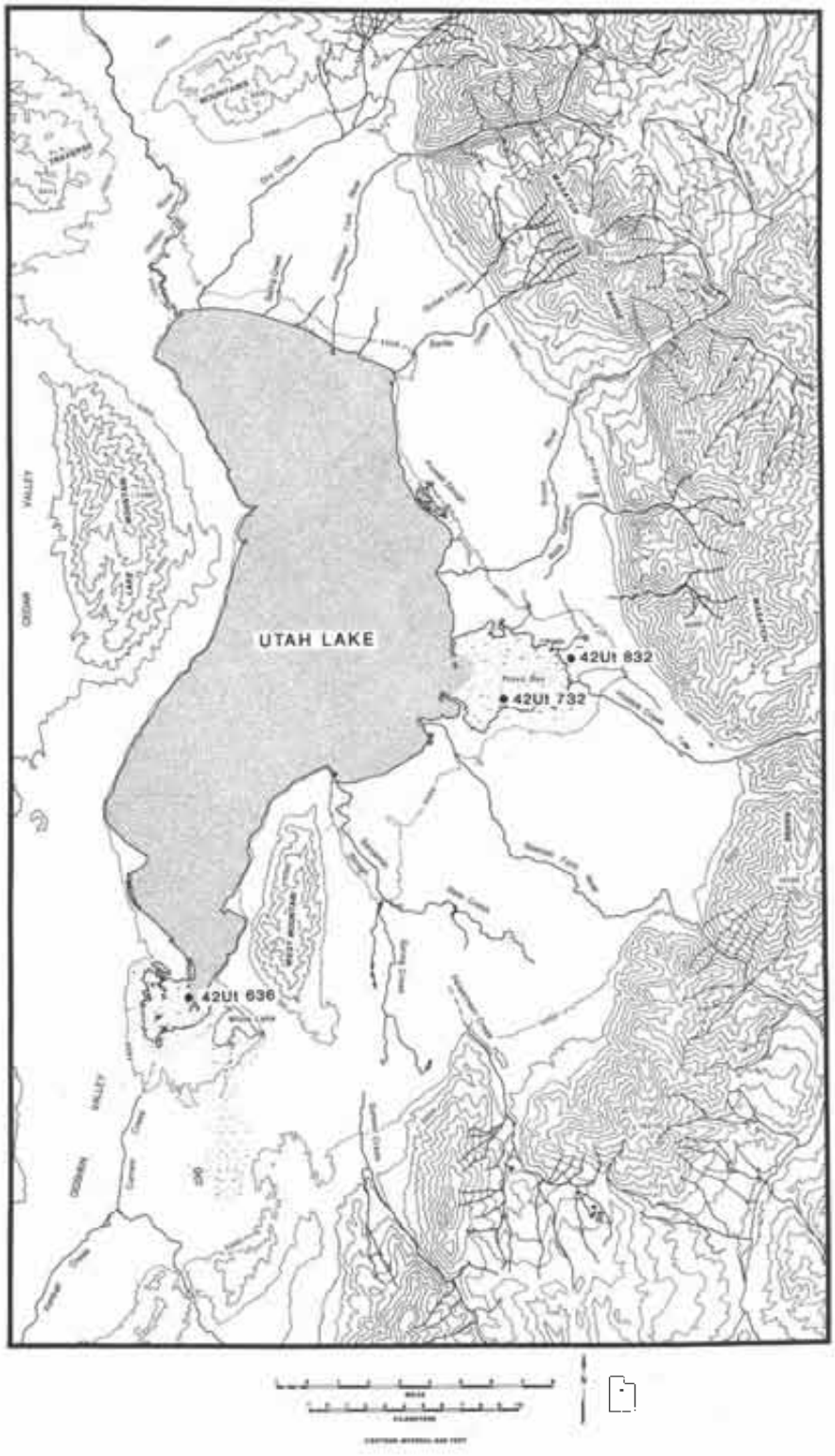


Figure 1. Archaeological sites around the shore of Utah Lake containing the harpoons discussed in the text.

artifacts suggest a Fremont occupation, although the points are somewhat enigmatic. The site has been ravaged by looters.

Two harpoons were found at the Painted Bowl site, one complete and one broken (Figure 2*a* and 2*b*). Both are made of dense bone, and both are stylistically similar. In both cases the rather large, single barb is placed at the tip of the harpoon rather than being set further back along the shaft as seen in Figure 2*i* or 2*j*. The complete harpoon (Figure 2*a*) is well polished and dark and greasy in appearance. The proximal end of the tool tapers to a blunt point. The harpoon measures 11.5 cm long and .8 cm in diameter at its widest. The barb notch is 2.5 cm from the distal end while the barb width (measured by drawing a straight line from the barb tip to the outside of the shaft and perpendicular to the shaft) is 1.4 cm.

The second harpoon (Figure 2*b*) from the Painted Bowl site is broken slightly at the tip and at the proximal end. It measures 8.8 cm long by .6 cm in diameter. The distance from the broken distal end to the barb notch is 1.8 cm. The barb width is 1.2 cm. Like the other example from this site, the harpoon has a single barb at the distal end.

42UT732 (IBIS ISLAND)

Ibis Island lies near the south shore of Utah Lake's Provo Bay on a relic beach marked by higher vegetation that parallels the modern shoreline. Primary diagnostics observed at the site are Fremont grayware ceramics and a single Rosegate projectile point. Ground stone and cracked rock are common along the beach ridge and off the ridge to the west. Vandals have seriously disturbed the site over the past three years, although much of their activity has been masked by subsequent inundations and recessions by the lake.

Three harpoons have been found at Ibis Island. All are bone, all have the barb at the distal end, and all are broken at the proximal end. The tool shown in Figure 2*c* differs from all the others in that the harpoon is made on a flat or split piece of bone rather than having a round or oval shaft. This harpoon is not well polished as are the others. The overall length is 7 cm and the width is .4 cm. The barb notch is set well back from the tip at 3.4 cm, and the barb width is 1.1 cm. The second harpoon from Ibis Island is highly polished, obliterating any manufacturing marks (Figure 2*d*). It measures 5.2 cm long and .6 cm in diameter. The barb notch is 1.4 cm from the tip and the barb width is .7 cm. The third harpoon (Figure 2*e*) from this site has the barb broken as well as the proximal end. It is somewhat longer than the others, measuring 9.4 cm long and 1 cm in diameter. The barb notch was nearly 2.5 cm back from the tip. This harpoon is also rather dark and oily in appearance.

42UT636 (GOSHEN ISLAND)

Four harpoons and one probable harpoon fragment were found at the north end of the Goshen Island site in 1989. Goshen Island lies at the south end of Utah Lake in Goshen Bay. Janetski has excavated at the site over the past couple of years (see Baker and Janetski 1992 for a summary of that work) and has dated the area where these items were found to the second century A.D. None of the harpoons are complete. The harpoons seem to be of two styles: one with the barb on the end similar to a crochet hook, and the other with the barb set back from the end. All the harpoons are made of dense, large mammal bone. All are broken at the proximal end.

Figure 2*f* is a harpoon measuring 9.5 cm long and .7 cm maximum diameter. The barb or barb notch is 2.5 cm from the distal end and the barb width is .8 cm. The harpoon has been broken twice: once in about the middle and at the proximal end. The middle section, however, was recovered, but the proximal end is still missing. As with all of these artifacts, this harpoon is highly polished, although longitudinal striations and other evidences of manufacturing are clearly visible. The area around the barb, especially just behind the notch, is quite rough from carving the notch out. The proximal end also shows some roughening.

The second harpoon from Goshen Island (Figure 2*g*) is 7.5 cm long and .7 cm maximum diameter. The barb notch is 1.3 cm from the tip. The barb notch was not determined as the tip of the barb was missing. Manufacturing marks are clearly visible along the harpoon shaft in the form of diagonal striations.

The final three harpoons from Goshen Island are shown in Figure 2*h–j*. Each of these is somewhat different from those described above. The first (Figure 2*h*) is similar to the others in that the barb is on the extreme distal end, however, the barb is small. The barb notch is .7 cm back from the tip and the barb width is .7 cm. Overall length is 6.4 cm and the diameter is .8 cm, although the harpoon is a flattened oval in cross section. The harpoon exhibits a very high polish, especially on the extreme end as though it had been heavily used. The distinctive crochet hook

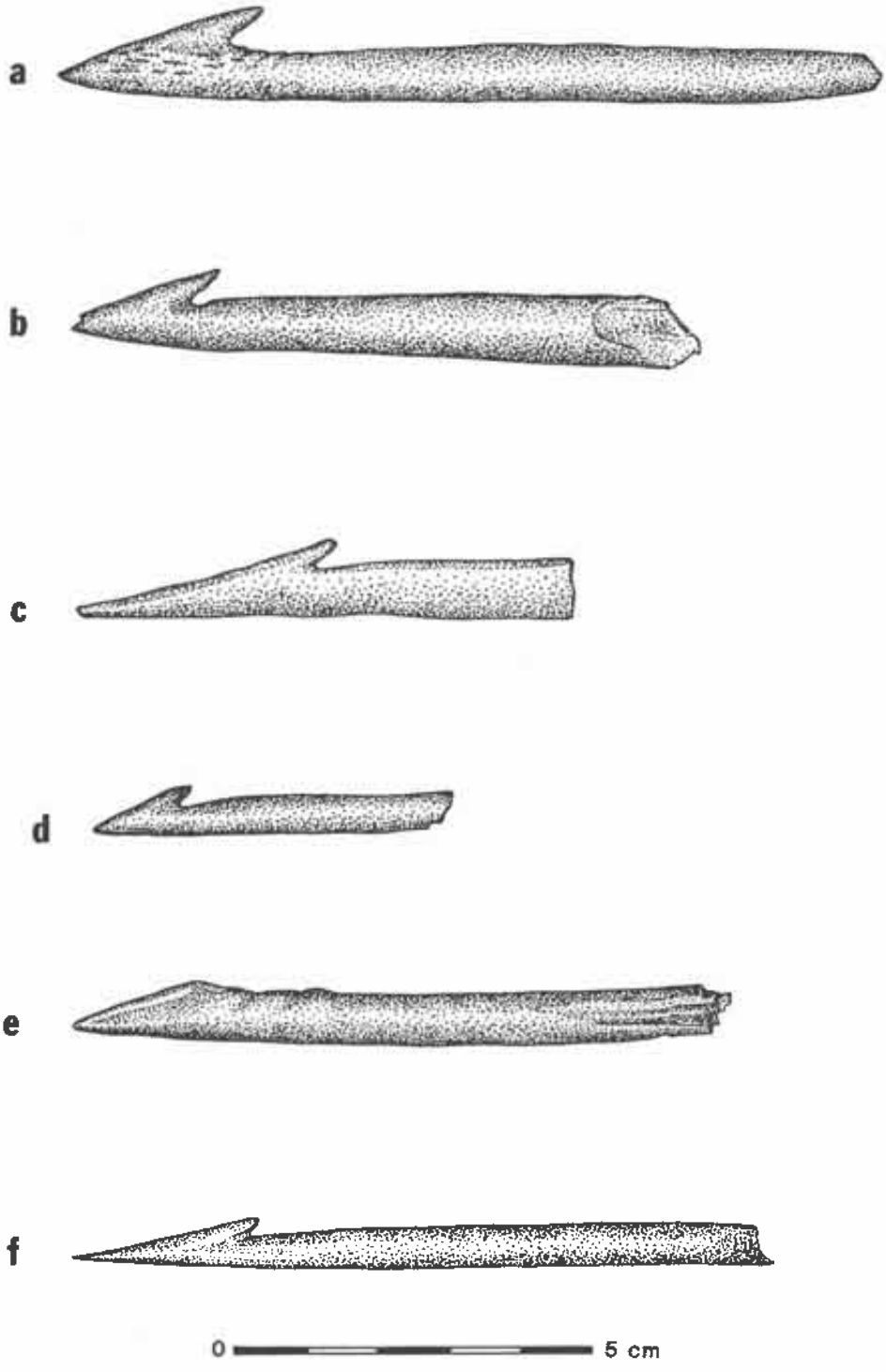


Figure 2. Harpoons from the Utah Lake area: *a–b*, 42 Ut832; *c–e*, 42Ut732; *f*, 42Ut636.

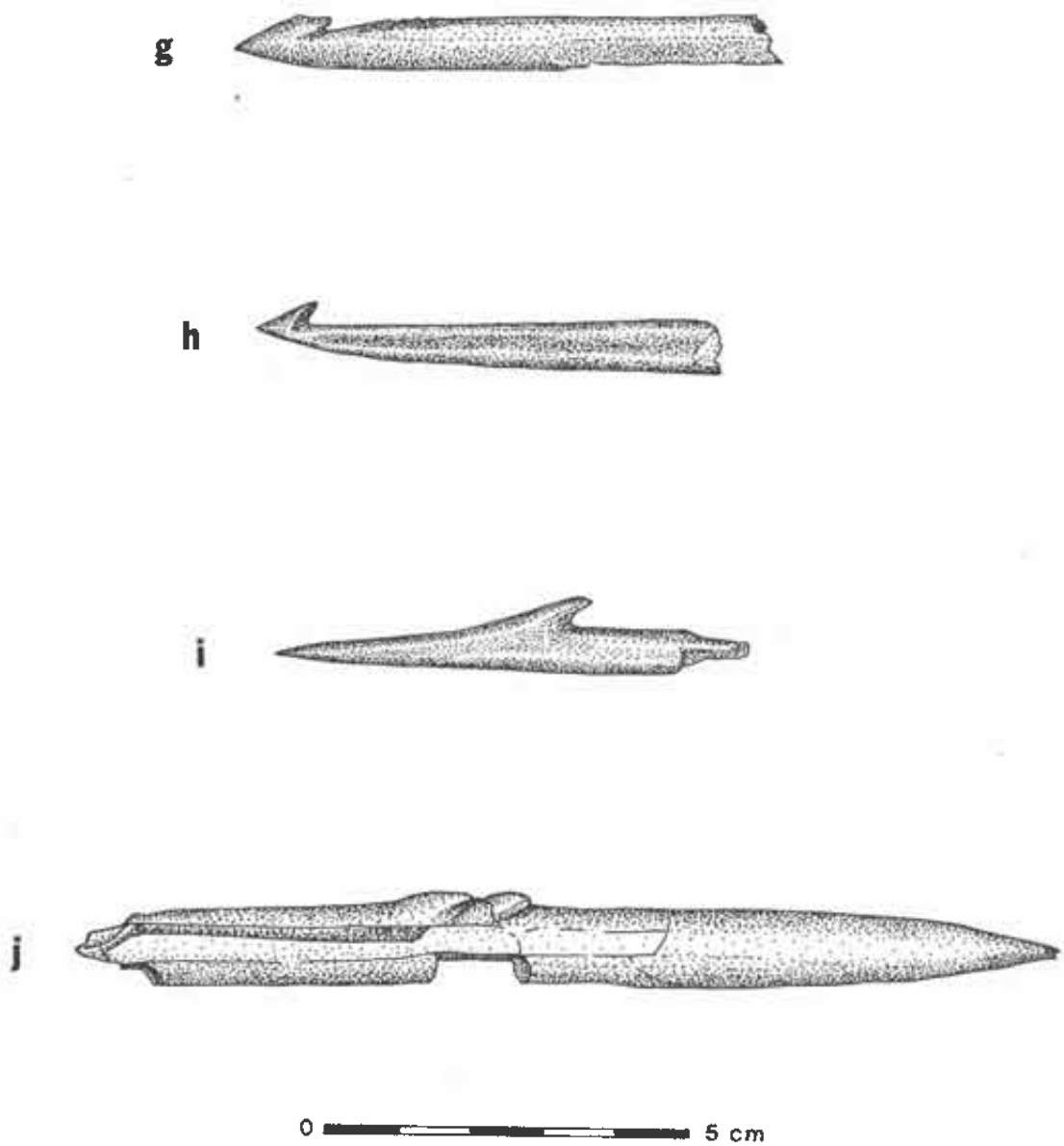


Figure 2. (Continued) Harpoons from the Utah Lake area: *g–h*, 42Ut636.

style tip along with the high polish may suggest some function other than a harpoon (a net weaving tool?), although determining function without the proximal end is problematic.

The second harpoon in Figure 2*i* is different from the others in that the barb is set well back (4 cm) from the end distal end. The harpoon is well polished and the shaft has been carefully rounded to its present shape. Shaping marks perpendicular to the long axis are clearly visible the entire length of the harpoon shaft. The proximal end is broken off, but the existing portion measures 6.4 cm long and .5 cm in diameter.

The final tool (Figure 2*j*) is a probable harpoon, but, if it is, it also is unique in this assemblage in that it

appears to have two barbs and apparently consists of the proximal rather than the distal end of the harpoon. The probable barbs do not appear to have been quite finished even though the tool is highly polished along its existing length. The complete end is tapered to a point but does not appear to have been the distal end as the barbs are pointing in the wrong direction. Also, the tool shows some slight discoloration for about 4.2 cm from the complete end. Perhaps this end was socketed into a shaft extension. If this is the proximal end, the barbs are set exceptionally far back (at least 5 cm) from the distal end as there is little tapering at that end of the artifact. Because of these unanswered questions, the function of the tool remains uncertain. The tool was reconstructed from several fragments and measures 13.3 cm long and 1.3 cm at its maximum width. Barb width is 1.3 cm. It has been made from a large mammal metapodial and is rather oval in cross section.

SUMMARY

The above descriptions of harpoons from the Utah Lake area provides additional information about fishing gear from the Utah Lake area. If the surface artifacts from Ut732 and Ut832 are reliable indicators, the harpoons from those two sites are Fremont in age while those from the north end of Goshen Island are Late Archaic. Interestingly, the only documented harpoons thus far from the Utah Valley are from Woodard Mound (Richens 1983), which is a few miles south of the Goshen Island site. The harpoons from Woodard resemble closely the harpoon in Figure 2*i* from Goshen Island. No harpoons have been found to date from Late Prehistoric sites.

REFERENCES CITED

Baker, Colleen J., and Joel C. Janetski
1992 *Archaeological Survey of the Utah Lake Shore, 1988 and 1991*. Museum of Peoples and Cultures Technical Series No. 92-1. Brigham Young University, Provo, Utah.

Hunter, Rick J.
1991 Archaeological Evidence of Prehistoric Fishing at Utah Lake. *Utah Archaeology 1991* 4(1):44–54.

Janetski, Joel C.
1990 Utah Lake: Its Role in the Prehistory of Utah Valley. *Utah Historical Quarterly* 58(1):4-31.

Richens, Lane D.
1983 *Woodard Mound: Excavations at a Fremont Site in Goshen Valley, Utah County, Utah 1980-1981*. Unpublished Master's thesis, Department of Anthropology, Brigham Young University, Provo, Utah.

AN OBSIDIAN CACHE FROM THE GREAT SALT LAKE WETLANDS, WEBER COUNTY, UTAH

Ann Cornell, Promontory/Tubaduka Chapter, Utah Statewide Archaeological Society, 1624 24th Street, Ogden, Utah 84401-3002

Mark E. Stuart, Promontory/Tubaduka Chapter, Utah Statewide Archaeological Society, 2054 East 6550 South, Ogden, Utah 84405

Steven R. Simms, Utah State University, Department of Sociology, Social Work, and Anthropology, Logan, Utah 84322-0730

INTRODUCTION

A cache of 88 primary and secondary obsidian flakes was excavated from a small subsurface pit at a Late Prehistoric site near the edge of the Great Salt Lake north west of Ogden, Utah. The site was discovered by the two lead authors and excavated by them during investigations sponsored by Utah State University. Here we describe the site context, excavation findings, lab analysis, and chemical sourcing of the obsidian. Information on similar caches is also provided, and the implications for interpreting past life in the Great Salt Lake marshes are briefly discussed.

SITE SETTING

Site 42Wb326 rests on a natural levee between two intermittent channels of Third Salt Creek, a terminal drainage on the Weber and Ogden river deltas (Figure 1). The site was recorded and filed with the Antiquities Section, Division of State History, Salt Lake City. At an elevation of 4,206 ft and well onto the lake bed of the Great Salt Lake, these drainages have been dissected into complex braided and anastomosing patterns. Virtually stripped of vegetation and largely filled in with sediments during

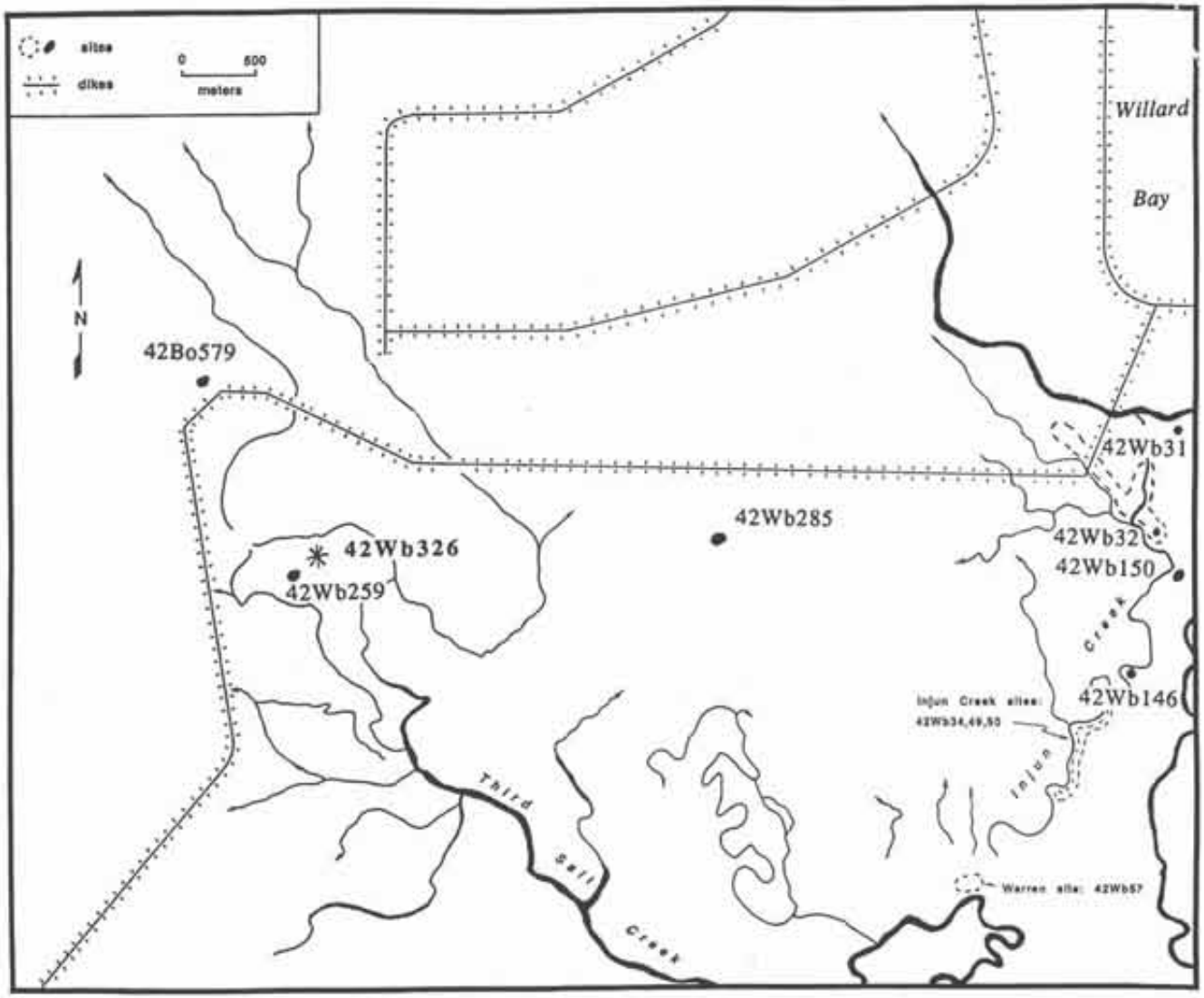


Figure 1. Location of obsidian cache at site 42Wb326 and other sites in the vicinity with caches. Area is near Willard Bay about 15 miles northwest of Ogden, Utah.

Figure 2. Looking north across site 42Wb326 showing the obsidian cache in center. The Wellsville Mountains are in the background.

Figure 3. Cross section of the obsidian cache.

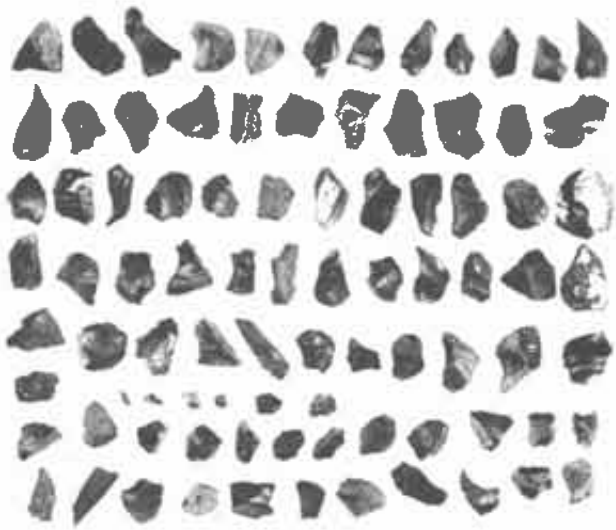


Figure 4. Flakes recovered from the cache.

the major transgression of the Great Salt Lake peaking in 1987, the faint channels on this otherwise featureless landscape are the only reminders of a vast complex of slow-flowing water, ponds, and marshes that once existed in the area.

At the time of discovery in July 1990, the site was barren of vegetation and badly eroded because of fluctuating water levels of the Great Salt Lake (Figure 2). The ground surface had deflated over the 30 m by 70 m area of the site, leaving lag deposits of camp rock, Late Prehistoric ceramics, chipped stone, and bone fragments near the north end of the site. Near the south end of the site was a small mound of similar-sized obsidian flakes within a dark, circular stain. Using a pin flag, a probe during the survey found that the pile of obsidian flakes extended below the ground surface, indicating the presence of a cache in a small subsurface pit.

EXCAVATION

Upon first encounter the obsidian cache appeared as a faint subcircular stain 42–50 cm in diameter with a mound of similar-sized primary and secondary flakes averaging about 3.5 cm x 5 cm in size (Figure 2). It appeared that 2 to 3 cm of surrounding fill had eroded from the cache through wind erosion between the time the site was first recorded and when it was excavated in June 1991.

Excavation began by opening a 1 m by 1 m unit, sectioning the pit containing the flakes and removing the south half in arbitrary 5 cm levels to establish natural stratigraphy (Figure 3). Later the northern half of the pit was removed working from the established profile through the feature. The resulting fill was in fact homogeneous and comprised of clayey loam with a faint orange tinge and containing small charcoal flecks and fragments of freshwater clam shell (*Anodonta californiensis*). The obsidian flakes extended to a depth of 7 cm and were stacked in at least three distinct layers. Mixed in with the obsidian was a small, round quartzite pebble. The obsidian layers were underlain by tan, sandy loam that extended to a depth of 8 cm. Under this were orange silts comprising sterile subsoil in this area. While sediment texture and color indicated the limits of the pit, a clear fracture line between the pit fill and surrounding sterile sediments could not be defined. Further, deflation of the ground surface had eroded away the upper portion and hence the level of origin of the pit. The homogeneous nature of the fill and the layering of obsidian flakes does, however, indicate this was a cache. The pit may have been excavated for some other purpose and allowed to stand open long enough

Table 1. Prehistoric Sites in the Vicinity with Caches

Site Number	Affiliation	Cache Type
42Wb31	Late Prehistoric	Pile of ca. 50 chert and chalcedony flakes
42Wb32	Late Prehistoric/Fremont	Subsurface pit containing a cache of ca. 100 obsidian flakes and preforms
42Wb146	Fremont	Feature containing 3 matching, two-handed manos
42Wb150	Late Prehistoric	Vandalized feature containing cache of white and yellow quartzite flakes
42Wb259	Late Prehistoric	Pit cache of ground stone balls, vee-edge cobbles and 2 two-handed manos
42Wb285	Late Prehistoric	Subsurface pit containing cache of 6 two-handed manos
42Bo579	Fremont	Subsurface pit containing cache of a quartzite mortar, slab metate, pestle, stone ball and 3 two-handed manos

for the tan, sandy sediments to accumulate in the bottom. The obsidian flakes were then cached and covered with the orange-tinted, clayey loam fill obtained from the site and containing charcoal flecks.

ANALYSIS

The 88 flakes of obsidian recovered from the cache weighed over 5 pounds (Figure 4). Visual inspection identified three variants of obsidian with the most common being clear black, followed by clear black with faint gray banding. A single piece of red and black mahogany obsidian was also recovered. Fifty of the flakes are primary and 38 are secondary, the latter are similar sized but containing no remnants of cortex as found on the primary flakes. The flakes range in size from 1.7–7.5 cm long, from 1.0–6.3 cm wide, and from 0.5–2.9 cm thick, but most measure near the means of 5 cm long x 3.6 cm wide x 1.3 cm thick. All of the flakes had been bifacially flaked preparatory to further reduction.

Three flakes representing the maximum range of visual variation were sent to A & G Analysis, Provo, Utah, for chemical characterization using X ray fluorescence and for matching to known obsidian sources. All three samples come from a source about 17 miles north by northwest of Malad, Idaho, approximately 60 miles north of the cache at 42Wb326.

COMPARISONS AND DISCUSSION

Careful management of toolstone is a characteristic of sites in the Great Salt Lake marshes and seems to intensify with greater distance from the Wasatch Mountains (Simms et al. 1991). Other caches of toolstone and tools are known from the vicinity and are described in Table 1 (also Figure 1). Further, the cache reported here is but one example of the many uses of abundant subsurface pit features found on many prehistoric sites in the Great Salt Lake wetlands. The use of these pits for food storage, hearths, dumps, baking, burials, and in this case, toolstone caching indicate planning depth on the part of the inhabitants. Planning depth highlights the recurrent nature of marsh use and suggests use was frequently intermittent. Planning depth also emphasizes the systematic movements of people, a far cry from the stereotype of aimlessly wandering hunter-gatherers, inexorably engaged in a nomadic struggle for existence. In fact, the Great Salt Lake marshes were, during both Fremont and Late Prehistoric times, a strategically planned element of the subsistence and settlement system. This is exemplified by the obsidian cache reported here, a place where a carefully prepared set of tool blanks was layered in a pit and hidden for a future use after a 60 mile trip from their place of origin. Perhaps the small, round quartzite pebble found among the flakes conveyed an

expression of power relevant to the caching and the intended future use. We will never know the reason why the person who created this cache never retrieved it, but through their misfortune we can glimpse a feeling for their life.

REFERENCES CITED

Simms, Steven R., Carol J. Loveland, and Mark E. Stuart
1991 *Prehistoric Human Skeletal Remains and the Prehistory of the Great Salt Lake Wetlands.* Utah State University, Logan. Report submitted to the Utah Department of Natural Resources and the Utah Division of State History, Salt Lake City.

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY, LIST OF REPORTS WITH 1991 PROJECT NUMBER

Evelyn Seelinger, Preservation Section, Division of State History, 300 Rio Grande, Salt Lake City, Utah 84101-1182

Kevin T. Jones, Antiquities Section, Division of State History, 300 Rio Grande, Salt Lake City, Utah 84101-1182

INTRODUCTION

All organizations who conduct archaeological projects in the state are obliged to: (1) obtain a project number from the Antiquities Section, Division of State History and (2) submit a report on the work done.

The following is a list of reports received by the Antiquities Section, for projects with 1991 project numbers. These reports are on file, and are available to qualified researchers.

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
BE	Survey	Dames & Moore	G. Woodall	U-42 Reroute, Sprd 4, Mineral Mts etc.	U-91-DH-243b,s
BE	Survey	USFS-Fishlake	C. Kesler	Strawberry-Betensen ATV Trail	U-91-FS-361f
BE	Survey	USFS-Fishlake	R. Leonard	Little Cottonwood Campground Expansion	U-91-FS-362f
BE	Survey	USFS-Fishlake	R. Leonard	Grizzly Ridge ATV Trail	U-91-FS-363f
BE	Survey	USFS-Fishlake	J. DeYoung	Peterson Flat Salvage	U-91-FS-420f
BE	Survey	USFS-Fishlake	J. DeYoung	Straight Creek Aspen Timber Sale	U-91-FS-440f
BE	Survey	USFS-Fishlake	R. Leonard	Indian Creek Timber Sale	U-91-FS-613f
BE	Survey	USFS-Fishlake	M. Cartwright	Phelps Dodge Exploration Project	U-91-FS-666f
BE	Survey	USFS-Fishlake	R. Leonard	Indian Creek Ore Crusher	U-91-FS-789f
BE	Survey	USFS-Fishlake	R. Leonard	Beaver City Power Project	U-91-FS-790b,f

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
BE	Survey	USFS-Fishlake	C. Kesler	Aurora Minerals Mary B Claims	U-91-FS-809f
BE/PI	Survey	USFS-Fishlake	M. Cartwright	National Guard Bivouac Sites	U-91-FS-027f
BE/PI	Survey	USFS-Fishlake	R. Leonard	Gunsight Flat Aspen Timber Sale	U-91-FS-612f
BO	Survey	BLM-Salt Lake	N. Shearin	North Lucin Guzzler	U-91-BL-258b
BO	Survey	BLM-Salt Lake	D. Christensen	Barson Mining Notice	U-91-BL-269b
BO	Survey	BLM-Salt Lake	D. Christensen	Potawotami Pipeline	U-91-BL-270b
BO	Survey	BLM-Salt Lake	D. Christensen	Sanders Exchange	U-91-BL-382b
BO	Survey	BLM-Salt Lake	D. Christensen	Lower Wildcat Pipeline	U-91-BL-387b
BO	Survey	BLM-Salt Lake	D. Christensen	Coleman Right of Way (#54149)	U-91-BL-418b
BO	Survey	BLM-Salt Lake	J. Vosskuhler	Kennecott Exploration	U-91-BL-471b
BO	Survey	BLM-Salt Lake	J. Vosskuhler	Rusty Rock, Grouse Creek Mts.	U-91-BL-583b
BO	Survey	BLM-Salt Lake	J. Vosskuhler	Enterprise Millsite vic. Rosette & Park Valley	U-91-BL-584b
BO	Survey	BLM-Salt Lake	J. Vosskuhler	LDS Fence, NE of Red Knolls Spring	U-91-BL-592b
BO	Survey	BLM-Salt Lake	S. Larralde	Mineral Mountain Exploration Drilling	U-91-BL-642b
BO	Survey	USFS-Sawtooth	R. Harper	Linn Creek Prescribed Burn	U-91-FS-032f
BO	Survey	USFS-Sawtooth	R. Harper	Utah State Land Exchange	U-91-FS-033f
BO	Survey	Sagebrush	M. Polk	Brigham City Airport Facility Locations	U-91-SJ-151s
BO	Survey	Sagebrush	M. Polk	2 Pits & Dike, WMA Public Shooting Grounds	U-91-SJ-169s
BO	Survey	Sagebrush	M. Polk	Road Upgrading in Tremonton	U-91-SJ-694s
BO	Survey	Weber State Univ.	B. Arkush	Srvy-Raft River/Black Pine Div, Sawtooth NF	U-91-WC-688f
BO/TO	Survey	BLM-Salt Lake	S. Smith	Delle Limestone Project	U-91-BL-054b
CA	Survey	USFS-Wasatch/Cache	T. Scott	Baxter Sawmill Timber Sale	U-91-FS-334f
CA	Survey	USFS-Wasatch/Cache	T. Scott	Roundup II Timber Sale	U-91-FS-335f

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
CA	Survey	Metcalf	J. Scott	2 Wells & Road, South of Emma Park	U-91-MM-479b
CB	Survey	Alpine	R. Rood	Matt's Summit State A-1 Well and Access	U-91-A1-527b,p,s
CB	Survey	Alpine	R. Greubel	Matt's Summit Wells and Access Roads	U-91-A1-803p,s
CB	Survey	Abajo	J. Montgomery	UDOT County Road at West Price	U-91-AS-149p
CB	Survey	BLM-Price	R. Matheny	Ninemile Canyon 1991 Survey	U-91-BL-661b,p
CB	Survey	Metcalf	J. Scott	9 Wells, vic. Willow Creek North of Price	U-91-MM-194b
CB	Survey	Nielson Cons.	A. Nielson	Transmountain Well near Wellington	U-91-NP-205b
CB	Survey	Nielson Cons.	A. Nielson	Soldier Creek Drill Location at 42Cb527	U-91-NP-412b
DA	Survey	AERC	R. Hauck	Pipeline vic. Conner Basin & Birch Spr. Draw	U-91-AF-353s
DA	Survey	OPA-BYU	R. Talbot	Bureau of Reclamation Pineview Reservoir Dam	U-91-BC-414f,w
DA	Survey	Dames & Moore	E. Bassett	Reroute U-01, Spread 2, East of Bountiful	U-91-DH-239f,p
DA	Survey	USFS-Ashley	B. Loosle	Death Valley Guzzlers	U-91-FS-343f
DA	Survey	USFS-Ashley	B. Loosle	Cedar Springs Pinyon Juniper Removal	U-91-FS-347f
DA	Survey	USFS-Ashley	B. Loosle	Mustang Ridge Power Line	U-91-FS-396f
DA	Survey	USFS-Ashley	B. Loosle	Deer Lodge Fire Proofing	U-91-FS-472f
DA	Survey	USFS-Ashley	B. Loosle	Road Shed/Burnt Creek Timber Sale	U-91-FS-473f
DA	Survey	USFS-Ashley	B. Loosle	Mahogany/Lodgepole Timber Salvage	U-91-FS-594f
DA	Survey	USFS-Ashley	B. Loosle	Bear Park EIS	U-91-FS-682f
DA	Survey	West. Wyo. Coll.	J. Pastor	Antelope Hollow Well 44-17	U-91-WK-287p,s
DA/UN	Survey	USFS-Ashley	B. Loosle	Last Chance Sales	U-91-FS-474f
DC	Survey	AERC	R. Hauck	Ute Tribal 2-24A3 & 5-19A2, Monarch Ridge	U-91-AF-407i

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
DC	Survey	AERC	R. Hauck	Smith Units 2-7C5 & 2-18C5, Saleratus Wash	U-91-AF-429p
DC	Survey	AERC	R. Hauck	Smith Unit No. 2-6C5, Saleratus Wash	U-91-AF-480p
DC	Survey	AERC	R. Hauck	Ute Tribal Well 2-18A-2, Monarch Bench	U-91-AF-677i
DC	Survey	ARCON	G. Norman	North Arcadia Road Construction & Repair	U-91-AK-153i,p
DC	Survey	ARCON	G. Norman	Altonah Water Pipeline, Yellowstone Canyon	U-91-AK-170f,i
DC	Survey	BLM-Vernal	B. Phillips	Castle Peak Guzzler	U-91-BL-841b
DC	Survey	USFS-Ashley	B. Loosle	West Fork White Rocks Trailhead Upgrade	U-91-FS-345f
DC	Survey	USFS-Ashley	B. Loosle	Gardner Mill II Timber Sale	U-91-FS-348f
DC	Survey	USFS-Ashley	B. Loosle	West Fork Farm Creek Timber Sale	U-91-FS-349f
DC	Survey	USFS-Ashley	B. Loosle	South Little Joe Timber Sale	U-91-FS-593f
DC	Survey	USFS-Wasatch/Cache	M. Shaver	Proposed Murdock Mountain Timber Sale	U-91-FS-609f
DC	Survey	USFS-Ashley	B. Loosle	North Bennion Timber Sale	U-91-FS-639f
DC	Survey	USFS-Ashley	B. Loosle	South Bennion II Timber Sale	U-91-FS-640f
DC	Survey	USFS-Ashley	B. Loosle	South Little Joe Circle Timber Sale	U-91-FS-641f
DC	Survey	Grand River Ins.	C. Conner	Cochran Resources 31-29	U-91-GB-102i
DC	Survey	Metcalf	J. Scott	Coastal Drill Sites, NW Uinta Basin	U-91-MM-518i
DC	Survey	Metcalf	J. Scott	Flow Line to Ute Well #2-35A3	U-91-MM-608i
DC	Survey	Sagebrush	M. Polk	Five Ute Tribal Wells, Brundage Canyon	U-91-SJ-052i
DC	Survey	Sagebrush	M. Polk	Coyote Basin Transmission Line	U-91-SJ-105i
DC	Survey	Sagebrush	A. Polk	Moon Lake Power Line Segment Near Bluebell	U-91-SJ-236i
DC/UN	Survey	AERC	Beaty/Hauck	2 Horseshoe Bend Locations	U-91-AF-780b,i

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
DC/UN	Survey	Sagebrush	M. Polk	Four Wells near Pariette Draw	U-91-SJ-099b
DC/UN	Survey	Sagebrush	M. Polk	Four Wells & Access South of Pariette Draw	U-91-SJ-298b
DV	Survey	AERC	R. Beaty	South Weber Sewer Collection & Trunkline	U-91-AF-121p
DV	Survey	Dames & Moore	C. Inoway	Inf. Realignment 119.5-121.6, E of North SLC	U-91-DH-421f,p,s
DV/MO	Survey	Dames & Moore	K. Moslak	Access Rd 111.0, Skyline/Morgan & Davis Co.	U-91-DH-438f
DV/WB	Survey	Sagebrush	M. Polk	US 89 From Uintah to Farmington	U-91-SJ-260p,s
EM	Survey	AERC	R. Hauck	Coal Well vic. Horse Canyon on East Mountain	U-91-AF-406f
EM	Test	AERC	R. Hauck	Arch Excav., Rilda Cny Locale of Huntington Cny	U-91-AF-634p
EM	Survey	AERC	R. Hauck	Class II Eval of Sample Units vic. East Mt.	U-91-AF-781f
EM	Survey	ARCON	G. Norman	Buckmaster Draw Access Rd & Dump Site	U-91-AK-845b
EM	Survey	Abajo	M. Bond	I-70 & SR24 Interchange S of Buckmaster Draw	U-91-AS-416b,s
EM	Survey	Abajo	W. Davis	I-70 Sinbad Materials Site	U-91-AS-689b
EM	Survey	Abajo	W. Davis	I-70 Salt Wash Materials Site	U-91-AS-690b
EM	Survey	OPA-BYU	D. Southworth	Cyprus Plateau Mohrland Mine Project	U-91-BC-354p
EM	Survey	OPA-BYU	D. Southworth	Rock Quarries & Stockpiles, Huntington Canyon	U-91-BC-798s
EM	Survey	BLM-Price	B. Miller	Last Chance Mine, Last Chance Wash	U-91-BL-657b
EM	Survey	USFS-Manti/LaSal	E. Stoker	Swales Watershed Treatmnt/The Cap Timber Sale	U-91-FS-043f
EM	Survey	USFS-Manti/LaSal	D. Harber	North Horn TV Tower Access Road	U-91-FS-248f
EM	Survey	USFS-Manti/LaSal	D. Harber	Lowry Water Fish Structure	U-91-FS-358f

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
EM	Survey	USFS-Manti/LaSal	Blackshear/Brown	Addend to Hole Trail/Dry Wash Wildlife Imprvmt	U-91-FS-510f
EM	Survey	USFS-Manti/LaSal	B. Blackshear	Lowry Water Fish Habitat Improvement	U-91-FS-511f
EM	Survey	USFS-Manti/LaSal	D. Harber	Horn Mountain Debris Basins	U-91-FS-586f
EM	Survey	Nielson Cons.	A. Nielson	Morland Mine Road Upgrade vic. Cedar Creek	U-91-NP-097b,p
EM	Survey	Sagebrush	M. Polk	Ten Drill Locations Near Mohrland	U-91-SJ-281f,p
EM/SP	Survey	AERC	R. Hauck	Prehist Occupations in the Trail Mt Locality	U-91-AF-481f
EM/SP	Survey	USFS-Manti/LaSal	B. Blackshear	Miller's Flat Road Truck Turnaround Const.	U-91-FS-683f
GA	Survey	Alpine	C. Graham	Bryce Junction Materials Source	U-91-A1-127b
GA	Survey	BLM-Kanab	D. McFadden	Red Canyon Wash Gravel Site	U-91-BL-015b
GA	Survey	BLM-Kanab	D. McFadden	Escalante River Trailhead	U-91-BL-482b
GA	Survey	BLM-Kanab	D. McFadden	USGS Drill Holes	U-91-BL-483b
GA	Survey	BLM-Kanab	D. McFadden	Tropic Culinary Water System	U-91-BL-484b
GA	Survey	BLM-Kanab	D. McFadden	Guzzler Near Rock Canyon	U-91-BL-485b
GA	Survey	BLM-Kanab	D. McFadden	South Canyon Fence	U-91-BL-486b
GA	Survey	BLM-Kanab	D. McFadden	Gravel Division Fenceline	U-91-BL-487b
GA	Survey	BLM-Kanab	D. McFadden	Jackass Spring	U-91-BL-488b
GA	Survey	BLM-Kanab	D. McFadden	Wagon Box Saddle Reservoir	U-91-BL-489b
GA	Survey	BLM-Kanab	D. McFadden	Garkane Powerline R/W	U-91-BL-490b
GA	Survey	BLM-Kanab	D. McFadden	Little Valley Road Reservoir	U-91-BL-491b
GA	Survey	BLM-Kanab	D. McFadden	Twenty Mile Reservoir #1	U-91-BL-492b
GA	Survey	BLM-Kanab	D. McFadden	Ox Spring Development	U-91-BL-493b
GA	Survey	BLM-Kanab	D. McFadden	Horse Canyon Check Dams	U-91-BL-494b
GA	Survey	BLM-Kanab	D. McFadden	Silver Spring Development	U-91-BL-495b
GA	Survey	BLM-Kanab	D. McFadden	Twenty Mile Wash Reservoir #2	U-91-BL-496b

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
GA	Survey	BLM-Kanab	D. McFadden	West Seeding	U-91-BL-497b
GA	Survey	BLM-Kanab	D. McFadden	Alvey Wash Road Realignment	U-91-BL-498b
GA	Survey	BLM-Kanab	D. McFadden	Stair Canyon Pipeline Extension	U-91-BL-499b
GA	Survey	BLM-Kanab	D. McFadden	Early Weed Reservoir	U-91-BL-850b
GA	Survey	USFS-Dixie	M. Jacklin	Gravel Locations Casto Road	U-91-FS-116b
GA	Survey	USFS-Dixie	W. Houston	Sagehen Hollow Guzzler	U-91-FS-263f
GA	Survey	USFS-Dixie	M. Jacklin	Dog Lake Timber Sale	U-91-FS-340f
GA	Survey	USFS-Dixie	M. Jacklin	Winnemucca Flat Study	U-91-FS-341f
GA	Survey	USFS-Dixie	M. Jacklin	Wightman Bench Thinning	U-91-FS-631f
GA	Survey	USFS-Dixie	M. Jacklin	Coyote Hollow Timber Sale Update	U-91-FS-646f
GA	Survey	USFS-Dixie	M. Jacklin	Tippets Valley Timber Sale (Update)	U-91-FS-647f
GA	Survey	USFS-Dixie	M. Jacklin	Burro Flat Timber Sale	U-91-FS-816f
GA	Survey	USFS-Dixie	M. Jacklin	Ruby's Inn/Bryce Canyon Development	U-91-FS-817f
GA	Survey	USFS-Dixie	M. Jacklin	Dry Canyon Trough	U-91-FS-818f
GA	Monitor	NPS-Glen Canyon	C. Kincaid	Monitor/Mainten.-Defiance House/Widow's Ledge	U-91-NA-329n
GA/PI	Survey	Nielson Cons.	A. Nielson	Rhyco Material Borrow	U-91-NP-183p
GR	Survey	AERC	R. Hauck	County Rd Realignments, vic. Little Canyon	U-91-AF-207b
GR	Survey	Abajo	J. Montgomery	UDOT SR 279 Rock Disposal	U-91-AS-053b,p
GR	Survey	Abajo	W. Davis	Western Gas, Big Flat/Dubinky Pipeline	U-91-AS-216b,p,s
GR	Survey	Abajo	J. Montgomery	SR 128 Cattleguard nr White's Rnch E of Moab	U-91-AS-380b,s
GR	Survey	Abajo	W. Davis	WGR Pipeline, Klondike Flat to Cedar Ridge	U-91-AS-460b,p,s
GR	Survey	BLM-Grand	J. Howard	Little Canyon Well Pad and Access Road	U-91-BL-034b
GR	Survey	BLM-Grand	J. Howard	Kokopelli Trail Camp Sites	U-91-BL-134b

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
GR	Survey	BLM-Grand	J. Howard	Mat Martin Point Rock Ponds	U-91-BL-135b
GR	Survey	BLM-Grand	J. Howard	Hal Canyon Rock Pond	U-91-BL-136b
GR	Survey	BLM-Grand	J. Howard	Big Flat Corral	U-91-BL-137b
GR	Survey	BLM-Grand	J. Howard	Negro Bill Canyon Gap Fences	U-91-BL-144b
GR	Survey	BLM-Grand	J. Howard	Art's Pasture Flagstone Site	U-91-BL-152b
GR	Survey	BLM-Grand	J. Howard	Big Chief Big Horn Sheep Water Guzzler	U-91-BL-186b,s
GR	Survey	BLM-Grand	J. Howard	Colorado River Campsites	U-91-BL-242b
GR	Survey	BLM-Grand	J. Howard	Bryson Canyon Gas Field Reservoirs	U-91-BL-310b
GR	Survey	BLM-Grand	J. Howard	Blue Hills Flagstone Site	U-91-BL-311b
GR	Survey	BLM-Grand	J. Howard	Film Permit for Peugeot, Mill Crk/Ken's Lake	U-91-BL-386b
GR	Survey	BLM-Grand	J. Howard	Scharf Mesa Reservoirs	U-91-BL-401b
GR	Survey	BLM-Grand	J. Howard	Castle Rock Hyundai Commercial	U-91-BL-425b
GR	Survey	BLM-Grand	J. Howard	Steamboat Mesa Camp Site	U-91-BL-459b
GR	Survey	BLM-Grand	J. Howard	Red Wash Lexus Commercial/Pyramid Butte Permt	U-91-BL-477b
GR	Survey	BLM-Grand	J. Howard	Cisco Boat Take-out Development	U-91-BL-819b
GR	Survey	BLM-Grand	J. Howard	Salt Wash Reservoir	U-91-BL-820b
GR	Survey	USFS-Manti/LaSal	S. McDonald	Meador Cabin Evaluation	U-91-FS-074f
GR	Survey	Grand River Ins.	C. Conner	Four Wells, S & M Production, Agate Oil Field	U-91-GB-040b
GR	Survey	Grand River Ins.	C. Conner	3 Wells for Lone Mt., San Arroyo Gas Field	U-91-GB-068b
GR	Survey	Grand River Ins.	C. Conner	Opal Prospect Seis Lines vic. Mineral Canyon	U-91-GB-192b
GR	Survey	Grand River Ins.	C. Conner	Knoll Prspct, Head of Labyrinth Cny Tributary	U-91-GB-231b
GR	Survey	Grand River Ins.	C. Conner	1991 Kane Spring Prospect Seis Lines	U-91-GB-232b,s

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
GR	Survey	Grand River Ins.	C. Conner	Bar-X Unit #19 Well, Bar X Gas Field	U-91-GB-784b
GR	Survey	Grand River Ins.	C. Conner	Pipeline to Coors Fed. No. 1-13, Moab Canyon	U-91-GB-827b
GR	Survey	La Plata	S. Fuller	33-4H Mineral Canyon Federal Well & Access Rd	U-91-LA-199b
GR	Survey	NPS-Canyonlands	P. Flanigan	Rocky Mesa Fenceline	U-91-NA-213n
GR	Survey	NPS-Canyonlands	N. Coulam	Telephone Installation in Arches	U-91-NA-847n
GR	Survey	P-III	G. Popek	Kane Springs Fed #19-1 Well, Big Flat	U-91-PD-109b
GR	Survey	P-III	B. Tipps	Five Wells and Access, vic. Kane Springs	U-91-PD-241b,s
GR	Survey	Senco-Phenix	J. Senulis	Green River Federal Well, Deadman Point Mesa	U-91-SC-204b
GR	Survey	Senco-Phenix	J. Senulis	1-12 Tenmile Well & Rd, Tenmile Point Mesa	U-91-SC-214b
GR	Survey	Senco-Phenix	J. Senulis	Smoot State 1-16H vic. White Wash/Green River	U-91-SC-326s
GR	Survey	Senco-Phenix	J. Senulis	1-11 Ten Mile on Tenmile Point Mesa	U-91-SC-457b
GR	Survey	Grand River Ins.	C. Conner	Pipeline to Federal 20-R, Grand Valley	U-91-SC-458b,p
IN	Survey	Abajo	J. Montgomery	UP&L Ainsworth and Floyd Powerlines	U-91-AS-072b,p
IN	Survey	Abajo	K. Montgomery	SR 14 vic Cedar Cny Landslide, btwn MP 0.6/8.5	U-91-AS-309b,p,s
IN	Survey	Abajo	K. Montgomery	UDOT SR 143 Road Improvement, Parowan Canyon	U-91-AS-378b,p
IN	Survey	Abajo	K. Montgomery	UDOT Lunt Park Rest Area Pipeline & Sewer	U-91-AS-379b
IN	Survey	Dames & Moore	D. Larson	Rerte U-58, Sprd 5, E Edge Escalante Desert	U-91-DH-003p
IN	Survey	Dames & Moore	D. Larson	Reroute U-27, Spread 5, Black Mountains	U-91-DH-004b,p,s
IN	Survey	USFS-Dixie	M. Jacklin	Butler Spring Fence	U-91-FS-120f

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
IN	Survey	USFS-Dixie	W. Houston	Deer Haven Pipeline and Trough	U-91-FS-262f
IN	Survey	USFS-Dixie	M. Jacklin	Deer Haven Development	U-91-FS-629f
IN	Survey	Intersearch	R. Thompson	Red Creek Canyon Water Pipe Line	U-91-IG-200b,s
IN	Survey	Nielson Cons.	A. Nielson	Mt Fuel Wecco Plant to Kern River Pipeline	U-91-NP-338b,p
IN	Survey	Nielson Cons.	A. Nielson	Mountain Fuel Newcastle Pipeline	U-91-NP-413f
IN	Survey	Nielson Cons.	A. Nielson	UP&L to Dixie Forest Summer Homes, Brian Head	U-91-NP-424f,p
JB	Survey	BLM-Fillmore	N. Shearin	Inspiration Mine	U-91-BL-339b
JB	Survey	BLM-Fillmore	N. Shearin	New Cyanide Pad	U-91-BL-372b
JB	Survey	BLM-Fillmore	N. Shearin	Keg Spring Pipeline	U-91-BL-449b
JB	Survey	BLM-Fillmore	N. Shearin	Kimball Creek Burn	U-91-BL-450b
JB	Survey	BLM-Fillmore	N. Shearin	Callao Pasture	U-91-BL-451b
JB	Survey	BLM-Fillmore	N. Shearin	Holden Mine	U-91-BL-521b
JB	Survey	BLM-Fillmore	N. Shearin	Middle Sage Fire	U-91-BL-574b
JB	Survey	BLM-Fillmore	N. Shearin	Rockwell Fire	U-91-BL-575b
JB	Survey	BLM-Fillmore	N. Shearin	Lime Spring Fence	U-91-BL-577b
JB	Survey	BLM-Fillmore	N. Shearin	Red Cedar Exclosure	U-91-BL-578b
JB	Survey	BLM-Fillmore	N. Shearin	Honeycomb Guzzler	U-91-BL-579b
JB	Survey	BLM-Fillmore	N. Shearin	Window Rock Guzzler	U-91-BL-580b
JB	Survey	BLM-Fillmore	N. Shearin	Tom's Creek Road Change	U-91-BL-674b
JB	Survey	BLM-Fillmore	N. Shearin	Matthews Land Exchange	U-91-BL-675b
JB	Survey	BLM-Fillmore	N. Shearin	Red Knoll Material Mineral Sale	U-91-BL-832b
JB	Survey	Dames & Moore	Moslak/Woodall	Reroute U-13, Sprd 4, Small Cny of Dog Valley	U-91-DH-244b,p
JB	Survey	Dames & Moore	Moslak/Woodall	Reroute U-41, Sprd 4, Middle Fork Sage Valley	U-91-DH-245b,p,s
JB	Survey	Dames & Moore	G. Woodall	Infield Realign 222.7-223.0, Sevier R. Valley	U-91-DH-251p

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
JB	Survey	Dames & Moore	G. Woodall	Reroute U-33, Spread 4, Little Valley	U-91-DH-252b
JB	Survey	USFS-Manti/LaSal	S. McDonald	Security 1-4 Mining Claims	U-91-FS-249f
JB/UT	Survey	Nielson Cons.	A. Nielson	Nephi City Gasline on State Lands	U-91-NP-066s
KA	Survey	BLM-Kanab	D. McFadden	New Paria Road Right-of-Way	U-91-BL-016b
KA	Survey	BLM-Kanab	D. McFadden	Dry Wash Plow and Seed and Fence	U-91-BL-017b
KA	Survey	BLM-Kanab	D. McFadden	East Fork Access Road Right-of-Way	U-91-BL-018b
KA	Survey	BLM-Kanab	D. McFadden	Big Sink Guzzler	U-91-BL-019b
KA	Survey	BLM-Kanab	D. McFadden	White Sage Guzzler	U-91-BL-020b
KA	Survey	BLM-Kanab	D. McFadden	North Five Mile Mountain Guzzler	U-91-BL-021b
KA	Survey	BLM-Kanab	D. McFadden	Sink Valley Kanab Creek Fence	U-91-BL-022b
KA	Survey	BLM-Kanab	D. McFadden	House Rock Burn and Seeding	U-91-BL-500b
KA	Survey	BLM-Kanab	D. McFadden	North & South Crawford Reservoirs	U-91-BL-501b
KA	Survey	BLM-Kanab	D. McFadden	Sink Valley Burnt Shale Pit	U-91-BL-502b
KA	Survey	BLM-Kanab	D. McFadden	Coyote Valley Catchment	U-91-BL-503b
KA	Survey	BLM-Kanab	D. McFadden	Gunsight Reservoir	U-91-BL-504b
KA	Survey	BLM-Kanab	D. McFadden	Cookie Seep Reservoir	U-91-BL-505b
KA	Survey	BLM-Kanab	D. McFadden	Kanab City Powerline	U-91-BL-506b
KA	Survey	BLM-Kanab	D. McFadden	North Steep Trails Fence	U-91-BL-507b
KA	Survey	BLM-Kanab	D. McFadden	Pine Hollow Catchment	U-91-BL-848b
KA	Survey	BLM-Kanab	D. McFadden	Lydia's Canyon Road Improvement	U-91-BL-849b
KA	Survey	BLM-Kanab	D. McFadden	Telegraph Flat Catchment	U-91-BL-851b
KA	Survey	USFS-Dixie	M. Jacklin	Carroll Land Exchange	U-91-FS-375f
KA	Survey	USFS-Dixie	M. Jacklin	Navajo Pipeline	U-91-FS-433f
KA	Survey	USFS-Dixie	M. Jacklin	Crawford Creek Timber Sale	U-91-FS-630f

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
KA	Survey	USFS-Dixie	M. Jacklin	Ice Caves Timber Sale Update	U-91-FS-645f
KA	Survey	NPS-Glen Canyon	C. Kincaid	CAT 997 Access for Dangling Rope Ramp	U-91-NA-001n
KA	Survey	NPS-Glen Canyon	C. Kincaid	Bullfrog Orientation and Medical Center	U-91-NA-002n
KA	Survey	NPS-Glen Canyon	C. Kincaid	Bullfrog Visitors Center Access	U-91-NA-800n
KA/WS	Survey	NPS-MWAC/Zion	D. Scott	Clear Creek & Coop Creek Bridges & Tunnel	U-91-NA-077n
MD	Survey	OPA-BYU	S. Baker	Cove Fort Water Project	U-91-BC-601i
MD	Survey	BLM-Fillmore	N. Shearin	Mud Springs Exclosure	U-91-BL-319b
MD	Survey	BLM-Fillmore	N. Shearin	Cedar Wash Tank	U-91-BL-393b
MD	Survey	BLM-Fillmore	N. Shearin	Boob Canyon Tank	U-91-BL-394b
MD	Survey	BLM-Fillmore	N. Shearin	Rock Canyon Tank	U-91-BL-395b
MD	Survey	BLM-Fillmore	N. Shearin	Skunk Springs Pipeline	U-91-BL-403b
MD	Survey	BLM-Fillmore	N. Shearin	Jensen Spring Fence	U-91-BL-404b
MD	Survey	BLM-Fillmore	N. Shearin	Big Hollow Burn	U-91-BL-445b
MD	Survey	BLM-Fillmore	N. Shearin	Tabernacle Hill Fence	U-91-BL-446b
MD	Survey	BLM-Fillmore	N. Shearin	South Sheepmen's Prospect	U-91-BL-447b
MD	Survey	BLM-Fillmore	N. Shearin	Gandy Pipeline	U-91-BL-448b
MD	Survey	BLM-Fillmore	N. Shearin	Clearlake Protection Fence	U-91-BL-468b
MD	Survey	BLM-Fillmore	N. Shearin	Mud Lake Pipeline	U-91-BL-469b
MD	Survey	BLM-Fillmore	N. Shearin	Sevier River Riparian Project	U-91-BL-470b
MD	Survey	BLM-Fillmore	N. Shearin	Pony Express Pipeline	U-91-BL-522b
MD	Survey	BLM-Fillmore	N. Shearin	Gandy Salt Marsh Fence	U-91-BL-576b
MD	Survey	BLM-Fillmore	N. Shearin	Canal Pasture Burn	U-91-BL-581b
MD	Survey	BLM-Fillmore	N. Shearin	Mountain Home Spring Pipeline	U-91-BL-672b
MD	Survey	BLM-Fillmore	N. Shearin	Sugarloaf ATV race	U-91-BL-673b
MD	Survey	BLM-Fillmore	N. Shearin	Spectrum Quarry	U-91-BL-802b
MD	Survey	BLM-Fillmore	N. Shearin	Black Gold Mine	U-91-BL-833b

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
MD	Survey	Dames & Moore	K. Moslak	Reroute U-26, Spread 4, Pahvant Valley	U-91-DH-253p
MD	Survey	Dames & Moore	K. Moslak	Reroute U-55, Spread 4, E Edge Pahvant Valley	U-91-DH-254p
MD	Survey	Dames & Moore	G. Woodall	Reroute U-15, Spread 4, vic. Pahvant Valley	U-91-DH-306b
MD	Survey	Dames & Moore	W. Zukosky	Infield Realign MP 68.3-268.5 E of Gov't Pass	U-91-DH-561b,p
MD	Survey	Dames & Moore	W. Zukosky	Line Chng 221.7-222.9/223.5-224.1 Scipio Pass	U-91-DH-563b,p
MD	Survey	USFS-Fishlake	J. DeYoung	Second Creek Drift Fence Addition	U-91-FS-272f
MD	Survey	USFS-Fishlake	J. DeYoung	Maple Hollow Sawmill	U-91-FS-296f
MD	Survey	USFS-Fishlake	R. Leonard	Sunset Peak Electronics Site	U-91-FS-611f
MD	Survey	Nielson Cons.	A. Nielson	Abraham Canal Bridge/Rd, Gunnison Bend Resrvr	U-91-NP-050s
MD	Survey	Nielson Cons.	A. Nielson	S Kanosh I-15 Interchange to Kanosh Town Road	U-91-NP-051s
MO	Survey	Dames & Moore	E. Bassett	Reroute U-10, Spread 2, Red Rock Canyon	U-91-DH-240p
MO	Survey	Dames & Moore	K. Moslak	EWS for Spread 2, Tuscan Hollow/East Cny Crk	U-91-DH-370p
MO	Survey	Dames & Moore	K. Moslak	Infield Realign 104.0-104.7, S of Porterville	U-91-DH-371p
MO	Survey	Dames & Moore	E. Bassett	3 EWS/Sessions Mt, 5 Pipe Stor/SE of Portervl	U-91-DH-423p
MO	Survey	Sagebrush	M. Polk	Peterson Interchange	U-91-SJ-312s
MO/DV	Survey	Dames & Moore	K. Moslak	Original Alignment Survey '91 - 2 Segments	U-91-DH-284f,p,s
PI	Survey	USFS-Fishlake	J. DeYoung	Jones Mine	U-91-FS-402f
PI	Survey	USFS-Fishlake	R. Leonard	Box Creek Trailhead	U-91-FS-791f
PI	Survey	USFS-Fishlake	R. Leonard	Gibbs Cabin Removal	U-91-FS-829f
PI	Survey	Nielson Cons.	A. Nielson	Rhyco Detour on Circleville Bridge	U-91-NP-444p

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
PI/GA	Survey/Test	Alpine	J. Horn	Addendum to Circleville Road Widening	U-91-A1-129p
RI	Survey	BLM-Salt Lake	N. Shearin	East Woodruff Allotment	U-91-BL-145b
RI	Survey	BLM-Salt Lake	J. Vosskuhler	Lawrence Brown Clearance	U-91-BL-411b
RI/SM	Survey	Dames & Moore	C. Inoway	Wasatch Stockpile, Echo Canyon	U-91-DH-175p
SA	Survey/Test	Abajo	K. Montgomery	Inventry, Test & Eval. 42Sa21593, Hart's Draw	U-91-AS-010f
SA	Survey	Abajo	W. Davis	Contel Cedar Mesa Microwave Tower	U-91-AS-029s
SA	Survey	Abajo	W. Davis	UP&L Lines, Cajon Mesa & Sahgzie Creek	U-91-AS-119i
SA	Survey	Abajo	J. Montgomery	Cajon Mesa & Pleasant View Rd Improvement	U-91-AS-150b
SA	Survey	Abajo	K. Montgomery	Perkins Ranch-Alkali Rd, W Side of Alkali Cny	U-91-AS-246b
SA	Survey	Abajo	K. Montgomery	Perkins Ranch-Recapture Rd Improvement Proj	U-91-AS-247b
SA	Survey	Abajo	W. Howell	UP&L West Montezuma Creek Extension	U-91-AS-304i
SA	Survey	Abajo	W. Howell	UP&L Lines & Wells, Blue Hogan Wash	U-91-AS-392i
SA	Survey	Abajo	W. Davis	3 Acre Expansion of Gravel Pit S of Tank Mesa	U-91-AS-515s
SA	Survey	Abajo	D. Westfall	Heitzman Drilling Kane Sprs. Cny Fed. 1-6	U-91-AS-627b
SA	Survey	BLM-Grand	J. Howard	Hatch Point Reservoirs	U-91-BL-202b
SA	Survey	BLM-Grand	J. Howard	No Soup Rock Mining Notice	U-91-BL-475b
SA	Survey	BLM-Grand	J. Howard	Three Step Hill Drill Holes, 1991-92 Assessmt	U-91-BL-476b
SA	Survey	BLM-Grand	J. Howard	Threemile Well Material Site	U-91-BL-508b
SA	Survey	BLM-San Juan	D. Davidson	Sugarloaf Pipeline	U-91-BL-792b
SA	Survey	CASA	L. Hammack	Yellowman Gravel Pit, Montezuma Creek Area	U-91-CH-038i
SA	Survey	CASA	L. Hammack	Hatch Point Well No. 1	U-91-CH-118b
SA	Survey	CASA	L. Hammack	Gothic Mesa - 4 Wells	U-91-CH-217i

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
SA	Survey	CASA	L. Hammack	Two Southeast McElmo Wells, S of Aneth	U-91-CH-233i
SA	Survey	CASA	L. Hammack	Kane Creek Prospect, NW End of Hatch Point	U-91-CH-268s
SA	Survey	4-Corners	C. DeFrancia	Seis Line 91-DC-5, East of Montezuma Crk Cny	U-91-FE-368b,s
SA	Survey	4-Corners	C. DeFrancia	Seis 91-GH-1 & 2, Road Cny Point/Mustang Mesa	U-91-FE-389b,s
SA	Survey	4-Corners	C. DeFrancia	Seis 91-WM-1 & 2, White Mesa/Westwater Canyon	U-91-FE-390b,s
SA	Survey	4-Corners	C. DeFrancia	Seis 91-VUL-1, Alkali Cny/Alkali Point Mesa	U-91-FE-467b,s
SA	Survey	4-Corners	C. DeFrancia	N Patterson Prosp., Monument Canyon & Creek	U-91-FE-571b,p,s
SA	Survey	4-Corners	C. DeFrancia	Seis Line vic. Montezuma Creek	U-91-FE-604b,p
SA	Survey	4-Corners	C. DeFrancia	Chuska Lightning Rock 2-E Well & Pipeline	U-91-FE-662i
SA	Survey	4-Corners	Pat Harden	Jack 31-G Well, Aneth Oil Field	U-91-FE-771i
SA	Survey	4-Corners	Pat Harden	Burrow 31-I Well & Pipeline, Aneth Oil Field	U-91-FE-772i
SA	Survey	4-Corners	Pat Harden	D.C. Anticline 35-K Well & Pipe, Aneth Oil Fd	U-91-FE-773i
SA	Survey	4-Corners	Pat Harden	Kokopelli 29-I Well & Pipeline, Aneth Oil Fld	U-91-FE-774i
SA	Survey	4-Corners	Pat Harden	Red Lake 25-B Well & Pipeline, Aneth Oil Fld	U-91-FE-775i
SA	Survey	4-Corners	Pat Harden	Lightning Rock Borrow Pit	U-91-FE-776i
SA	Survey	4-Corners	Pat Harden	Clay Hill 33-0 Pipeline Reroute	U-91-FE-777i
SA	Survey	4-Corners	Pat Harden	Box Canyon 5-F Well & Pipeline, Aneth Oil Fld	U-91-FE-793i
SA	Survey	4-Corners	C. DeFrancia	White Horse Constr. Gravel Pit W of Aneth	U-91-FE-808i
SA	Survey	4-Corners	C. DeFrancia	Chuska Angus 7E Well, Aneth Oil Field	U-91-FE-821i

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
SA	Survey	4-Corners	C. DeFrancia	Chuska North Ruins 16-K on Cajon Mesa	U-91-FE-822i
SA	Survey	4-Corners	C. DeFrancia	Chuska Anasazi 6H-2 Well, Aneth Oil Field	U-91-FE-823i
SA	Survey	4-Corners	C. DeFrancia	Runway 2-M Well & Pipeline on Cajon Mesa	U-91-FE-830i
SA	Survey	4-Corners	C. DeFrancia	Tower 1-F Well on Cajon Mesa	U-91-FE-831i
SA	Survey	USFS-Manti/LaSal	E. Stoker	Hop Creek Timber Sale	U-91-FS-024f
SA	Survey	USFS-Manti/LaSal	C. Anderson	Six-Mile Burn/Timber Sale	U-91-FS-025f
SA	Survey	USFS-Manti/LaSal	S. McDonald	Venice Denny Special Use Permit Road Constr.	U-91-FS-365f,p
SA	Survey	USFS-Manti/LaSal	S. McDonald	Pole Springs Wildlife Improvement	U-91-FS-377f
SA	Survey	USFS-Manti/LaSal	L. Hunt	City of Blanding Dam Test Drill	U-91-FS-454f
SA	Survey	USFS-Manti/LaSal	L. Hunt	North Elks II Timber Sale Addendum	U-91-FS-455f
SA	Survey	USFS-Manti/LaSal	B. Blackshear	Geyser Pass Winter Trailhead Parking	U-91-FS-679f
SA	Survey	USFS-Manti/LaSal	L. Hunt	Kigalia Slash Burn	U-91-FS-834f
SA	Survey	Grand River Ins.	C. Conner	Monticello Remedial Action Program 1991	U-91-GB-351p
SA	Survey	La Plata	F. Harden	Phillips Wells vic. Blue Hogan Wash	U-91-LA-046i
SA	Survey	La Plata	S. Fuller	22-33 Hatch Point Federal Well & Access	U-91-LA-048b
SA	Survey	La Plata	S. Fuller	Ismay Flodine Park Wells S-121 & U-127	U-91-LA-177i
SA	Survey	La Plata	S. Fuller	Mobil Oil's 5 Water Injectn Lines, White Mesa	U-91-LA-178i
SA	Survey	La Plata	L. Sesler	Lisbon Valley Seis Lines BCN-1, WC-1 & LS-2	U-91-LA-193b,p,s
SA	Survey	La Plata	M. Cavanaugh	Lisbon Valley Plant Alternate Access Road	U-91-LA-198b
SA	Survey	La Plata	S. Fuller	Well, E Edge of Alkali Pt/Upper Bradford Cny	U-91-LA-220b,s

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
SA	Survey	La Plata	S. Fuller	9 Seis Lines vic. Montezuma Canyon, 3 Parts	U-91-LA-250b,p,s
SA	Survey	La Plata	L. Sesler	Coal Bed Canyon Prospect Line No. 91-CC-03	U-91-LA-320b,p,s
SA	Survey	La Plata	S. Fuller	Shay Graben No. 1-27, East of Harts Point	U-91-LA-325b
SA	Survey	La Plata	S. Fuller	2 Global Natural Wells East of Alkali Point	U-91-LA-350b
SA	Survey	La Plata	S. Fuller	3 Seis Lines, Alkali Cny & Pt & Mustang Mesa	U-91-LA-397b,p,s
SA	Survey	La Plata	M. Cavanaugh	Western Geophys. Prospect on Hart's Point	U-91-LA-441b
SA	Survey	La Plata	S. Fuller	Pipeline, Mustang Mesa/Alkali Canyon	U-91-LA-517b
SA	Survey	La Plata	S. Fuller	Well between Big Canyon & Cottonwood Wash	U-91-LA-591s
SA	Survey	La Plata	L. Sesler	Seis Line, Alkali Cnyn & Point & Mustang Mesa	U-91-LA-599b
SA	Survey	La Plata	S. Fuller	Harts Draw Federal 12-31-H	U-91-LA-620p
SA	Survey	La Plata	F. Harden	Harts Draw Federal 22-31	U-91-LA-671p
SA	Survey	LaPlata	S. Fuller	NW Pipeline Moab #2 Meter Sta, Spanish Valley	U-91-LA-786s
SA	Survey	La Plata	S. Fuller	Black Steer 3-31 Well, Montezuma Creek Canyon	U-91-LA-787p
SA	Survey	NPS-Canyonlands	P. Flanigan	Island-in-the-Sky Entrance Station Developmt	U-91-NA-381n
SA	Survey	NPS-Canyonlands	N. Coulam	Proposed Kachina Bridge Trail	U-91-NA-384n
SA	Survey	NPS-Canyonlands	N. Coulam	Telephone Installation, Island-in-the-Sky	U-91-NA-681n
SA	Survey	Navajo Nation	Wharton/Chada	Chuska Seis Line 91P3 + Addend 2/Cajon Mesa	U-91-NK-045i,p,s
SA	Survey	Navajo Nation	J. Wharton	1991 SW Macracken Group I, nr Montezuma Creek	U-91-NK-195b,i,s
SA	Survey	Navajo Nation	J. Wharton	Chuska's 1991 SW McCracken Mesa Group II Seis	U-91-NK-196b,i,p

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
SA	Survey	Navajo Nation	J. Wharton	1991 Southwest McCracken Group III	U-91-NK-197b,p,s
SA	Survey	Powers Elev.	G. Tucker	Meridian Hatch Point Linear Project	U-91-PA-297b
SA	Survey	Senco-Phenix	J. Senulis	Kane Crk St Well, Hatch Pt over Colorado R	U-91-SC-203s
SA	Survey	Antiquities Sec.	D. Madsen	Woodlands at LaSal State Lands Sale	U-91-UC-184s
SA/CO	Survey	USFS-Manti/LaSal	Blackshear/Brown	South Paradox Stock Ponds Development	U-91-FS-512f
SA/GR	Survey	Abajo	J. Montgomery	Toyota Film Locs, Canyonlands & S of Muleshoe	U-91-AS-140b
SL	Survey	Dames & Moore	K. Lupo	Reroute U-03, Sprd 2, N Salt Lake Valley	U-91-DH-167p
SL	Survey	Dames & Moore	K. Lupo	Reroute U-03, Spread 3 vic. Brighton Canal	U-91-DH-314p,s
SL	Survey	USFS-Wasatch/Cache	T. Scott	Holladay Land Exchange	U-91-FS-058f
SL	Survey	USFS-Wasatch/Cache	M. Shaver	Little Cottonwood Interpretive Trail	U-91-FS-434f
SL	Survey	USFS-Wasatch/Cache	M. Shaver	Great Western Trail (Big Water Section)	U-91-FS-435f
SL	Survey	USFS-Wasatch/Cache	M. Shaver	Alta Shack Destruction	U-91-FS-437f
SL	Survey	Nielson Cons.	A. Nielson	SLC Airport Expansion	U-91-NP-159s
SL	Survey	Senco-Phenix	J. Senulis	Little Dell Cultural Resources Project	U-91-SC-012s
SL	Survey	Senco-Phenix	J. Senulis	Class II for Lake Park Business & Rec Park	U-91-SC-691s
SL	Survey	Sagebrush	M. Polk	Middle Alternative for West Valley Highway	U-91-SJ-061s
SL	Survey	Sagebrush	M. Polk	Road Widening for 8400 West, Magna	U-91-SJ-062s
SL	Survey	Sagebrush	M. Polk	West Valley Highway II, 12600 S to 14600 S	U-91-SJ-098s
SL	Survey	Sagebrush	M. Polk	Two Intersections on 90th South, Sandy	U-91-SJ-318s

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
SL	Survey	Sagebrush	M. Polk	Evaluation of Union Ward Bishop's Granary	U-91-SJ-369p
SL	Survey	Sagebrush	M. Polk	700 East/900 Reroute Segment, N of Sandy	U-91-SJ-520p
SM	Survey	BLM-Salt Lake	J. Vosskuhler	Silver Maple Fence	U-91-BL-430b
SM	Survey	Dames & Moore	C. Inoway	Kern River Reroute U-17 & Realignmt, Spread 2	U-91-DH-166p
SM	Survey	Dames & Moore	E. Bassett	Kern River Reroute U-28, Spread 2	U-91-DH-227p
SM	Survey	Dames & Moore	E. Bassett	Reroute U-45, Spread 2, South of Chalk Creek	U-91-DH-228p
SM	Survey	Dames & Moore	C. Inoway	Reroute U-16, South of Coalville	U-91-DH-229p
SM	Survey	Dames & Moore	K. Moslak	Reroute U-31	U-91-DH-230p
SM	Survey	Dames & Moore	C. Inoway	Reroute U-05, Spread 2, Red Rock Canyon	U-91-DH-238p
SM	Survey	Dames & Moore	K. Moslak	Infield Realignment 79.8	U-91-DH-273p
SM	Survey	Dames & Moore	K. Moslak	Infield Realignment 77.8, vic. Chalk Creek	U-91-DH-274p
SM	Survey	Dames & Moore	K. Moslak	Infield Realignment 76.3, SE of Upton	U-91-DH-275p
SM	Survey	Dames & Moore	K. Moslak	Extra Work Space 69.4, East Fork Chalk Creek	U-91-DH-276p
SM	Survey	Dames & Moore	E. Bassett	Infield Realignment A, vic. E Fork Chalk Crk	U-91-DH-277p
SM	Survey	Dames & Moore	K. Moslak	Realignment 70.7, E Fork Chalk Creek	U-91-DH-278p
SM	Survey	Dames & Moore	C. Inoway	Infield Realignment 71.9, S of Chalk Crk Cny	U-91-DH-279p
SM	Survey	Dames & Moore	K. Moslak	Infld Realign 76.1, Side Cny S Fork Chalk Crk	U-91-DH-280p
SM	Survey	Dames & Moore	K. Moslak	Infield Realignment 91.0-92.4, Red Rock Cny	U-91-DH-305p
SM	Survey	Dames & Moore	C. Inoway	Reroute U-61, Sprd 1B & 2 vic. Chalk Creek	U-91-DH-324p
SM	Survey	USFS-Wasatch/Cache	M. Shaver	Quarter Corner Lake Trailhead	U-91-FS-282f

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
SM	Survey	USFS-Wasatch/Cache	M. Shaver	Bridger Lake Campground Expansion	U-91-FS-283f
SM	Survey	USFS-Wasatch/Cache	M. Shaver	Washington Lake Campground	U-91-FS-610f
SM	Survey	Senco-Phenix	J. Senulis	2 Wells S of Gilbert Meadow, N Slope Uintas	U-91-SC-256f
SM	Survey	Sagebrush	M. Polk	Echo Creek Rehab Northeast of Emory	U-91-SJ-064s
SM	Survey	Sagebrush	A. Polk	Port of Entry, Echo Canyon	U-91-SJ-209p,s
SP	Survey	Abajo	J. Montgomery	UP&L Gunnison City Pump Powerline	U-91-AS-073b,p
SP	Survey	Abajo	J. Montgomery	Addend, Gunnison City Pump Transmission Line	U-91-AS-225b,p
SP	Survey	USFS-Manti/LaSal	D. Harber	Ferron Reservoir Borrow Site	U-91-FS-359f
SP	Survey	USFS-Manti/LaSal	J. Cunningham	Seely Creek Timber Sale	U-91-FS-399f
SP	Survey	USFS-Manti/LaSal	C. Anderson	Order Mtn Pond Recon	U-91-FS-400f
SP	Survey	USFS-Manti/LaSal	S. McDonald	Four Mile II Timber Sale	U-91-FS-428f
SP	Survey	USFS-Manti/LaSal	B. Blackshear	Spring City Tunnel Timber Sale	U-91-FS-678f
SP	Survey	USFS-Manti/LaSal	B. Blackshear	Patton Reservoir Timber Sale	U-91-FS-685f
SP	Survey	USFS-Manti/LaSal	Blackshear/Brown	Boulger/Spring Canyon Watershed Treatmnt Proj	U-91-FS-686f
SP	Survey	USFS-Manti/LaSal	D. Okerlund	Lake Hill Storage Tank	U-91-FS-835f
SP	Survey	Nielson Cons.	A. Nielson	Moroni & Fountain Green Wastewater Treatment	U-91-NP-336p,s
SP	Survey	Nielson Cons.	A. Nielson	DWR Sixmile Rehabilitation, S of Manti	U-91-NP-525s
SV	Survey	Senco-Phenix	J. Senulis	East Shingle Creek Dam Location	U-91-SC-590f
SV	Survey	USFS-Fishlake	R. Leonard	Castle Rock Campground Water System	U-91-FS-132f,s
SV	Survey	USFS-Fishlake	R. Leonard	Alma Christensen Trail Extension	U-91-FS-138f
SV	Survey	USFS-Fishlake	R. Leonard	R.J. Rickenbach Pond and Pipeline	U-91-FS-201s

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
SV	Survey	USFS-Fishlake	J. DeYoung	Hancock Flat Road Improvement	U-91-FS-293f
SV	Survey	USFS-Fishlake	J. DeYoung	Horse Hollow Timber Sale	U-91-FS-330f
SV	Survey	USFS-Fishlake	J. DeYoung	South Last Chance Timber Sale	U-91-FS-331f
SV	Survey	USFS-Fishlake	J. DeYoung	Farnsworth Aspen Rejuvenation	U-91-FS-332f
SV	Survey	USFS-Fishlake	J. DeYoung	Nagah Timber Sale	U-91-FS-333f
SV	Survey	USFS-Fish Lake	J. DeYoung	Knight Mine Road Access	U-91-FS-385f
SV	Survey	USFS-Fishlake	J. DeYoung	Sevier Valley Mine Access	U-91-FS-398f
SV	Survey	USFS-Fishlake	J. DeYoung	Clear Creek Mine	U-91-FS-456f
SV	Survey	USFS-Fishlake	D. Oyler	Elk Camp Pipeline	U-91-FS-614f
SV	Survey	USFS-Fishlake	R. Leonard	Lakeshore Trail Extension	U-91-FS-626f
SV	Survey	USFS-Fishlake	R. Leonard	Bill Crane W/S, Taylor Flat	U-91-FS-664f
SV	Survey	USFS-Fishlake	R. Leonard	Gooseberry Great Western Trailhead	U-91-FS-665f
SV	Survey	USFS-Fishlake	R. Leonard	Lost Creek Mounds	U-91-FS-828f
SV	Survey	Nielson Cons.	A. Nielson	Sevier River Bridge at Elsinore	U-91-NP-056s
SV	Survey	Nielson Cons.	A. Nielson	Aurora Wastewater Treatment	U-91-NP-261p,s
TO	Survey	BLM-Salt Lake	D. Christensen	Hopsage Well	U-91-BL-089b
TO	Survey	BLM-Salt Lake	N. Shearin	Government Creek North Extension	U-91-BL-090b
TO	Survey	BLM-Salt Lake	N. Shearin	Winter Spring Pipeline West Fork	U-91-BL-091b
TO	Survey	BLM-Salt Lake	N. Shearin	A. Garland Desert Land Exchange	U-91-BL-092b
TO	Survey	BLM-Salt Lake	N. Shearin	North Gypsum Material Sale	U-91-BL-103b
TO	Survey	BLM-Salt Lake	D. Christensen	West Grassy Guzzler	U-91-BL-104b
TO	Survey	BLM-Salt Lake	N. Shearin	Violet Ray Mine Development	U-91-BL-182b
TO	Survey	BLM-Salt Lake	D. Christensen	Knolls 2 1991	U-91-BL-221b
TO	Survey	BLM-Salt Lake	N. Shearin	Stansbury Mountain Guzzler	U-91-BL-259b

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
TO	Survey	BLM-Salt Lake	D. Christensen	Delle Limestone Quarry	U-91-BL-327b
TO	Survey	BLM-Salt Lake	J. Vosskuhler	Ripple Valley Section	U-91-BL-419b
TO	Survey	BLM-Salt Lake	D. Christensen	Centurion Lion Hill Project	U-91-BL-426b
TO	Survey	BLM-Salt Lake	D. Christensen	Centurion Five Mile Pass Project	U-91-BL-427b
TO	Survey	BLM-Salt Lake	J. Vosskuhler	Hopsage Well 2	U-91-BL-443b
TO	Survey	BLM-Salt Lake	J. Vosskuhler	Baron Quarry	U-91-BL-516b
TO	Survey	BLM-Salt Lake	J. Vosskuhler	Anderson Claim, vic. Boulter Summit	U-91-BL-526b
TO	Survey	BLM-Salt Lake	S. Larralde	Ibapah Burn	U-91-BL-585b
TO	Survey	BLM-Salt Lake	J. Vosskuhler	Toprock, Woodman Peak	U-91-BL-587b
TO	Survey	BLM-Salt Lake	S. Larralde	Alluvial Fan/BSF Drilling	U-91-BL-643b
TO	Survey	BLM-Salt Lake	S. Larralde	Allen Claim	U-91-BL-644b
TO	Survey	BLM-Salt Lake	S. Larralde	Elizabeth Morse Claim	U-91-BL-703b
TO	Survey	BLM-Salt Lake	S. Larralde	No Choice (No Freedom) Sculpture	U-91-BL-825b
TO	Survey	Nielson Cons.	A. Nielson	Clive to Wendover Range County Rd. Upgrade	U-91-NP-695b,s
TO	Survey	Nielson Cons.	A. Nielson	USPCI Grassy Mountain Powerline	U-91-NP-697b,p,s
TO	Survey	Nielson Cons.	A. Nielson	Marble Head-Aptus to USPCI Tap Line & Substa.	U-91-NP-698b,p,s
TO	Survey	Sagebrush	M. Polk	Cosmic Ray Facility - Dugway, Camel Back Mts	U-91-SJ-824m
TO	Survey	Statistical Res	J. Homburg	EMPS Survey - White Sage Area of Dugway	U-91-SR-801m
UN	Survey	AERC	R. Hauck	Three Wells, Antelope Canyon	U-91-AF-069i
UN	Survey	AERC	G. Norman	Well 2-10HB, Horseshoe Bend	U-91-AF-070b
UN	Survey	AERC	R. Beaty	8 Wells, Wild Horse Bench & Willow Crk Canyon	U-91-AF-146b,i
UN	Survey	AERC	R. Hauck	Two Wells vic. Wild Horse Bench	U-91-AF-300b

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
UN	Survey	AERC	R. Hauck	Two Wells vic. Willow Creek	U-91-AF-355i
UN	Survey	AERC	R. Hauck	Wild Horse Bench Drill Locations	U-91-AF-405b
UN	Survey	AERC	R. Hauck	Two Wells vic. Willow Creek	U-91-AF-408i
UN	Survey	AERC	R. Hauck	Six Wild Horse Bench Well Locations	U-91-AF-572b,s
UN	Survey	AERC	R. Hauck	2 Tribal Wells, Wild Horse Bnch/Willow Crk Cy	U-91-AF-573i
UN	Survey	AERC	R. Hauck	Ten Wells in the Ouray-White River Locality	U-91-AF-635i
UN	Survey	AERC	R. Hauck	Nine Wild Horse Bench Well Locations	U-91-AF-636b,s
UN	Survey	AERC	Beaty/Hauck	Twelve Wild Horse Bench Well Locations	U-91-AF-778b
UN	Survey	AERC	R. Hauck	Two Tribal Wells, vic. Willow Creek Canyon	U-91-AF-779i
UN	Monitor	OPA-BYU	R. Talbot	Monitor 13 Gravel Test Pits North of Vernal	U-91-BC-108w
UN	Survey	BLM-Vernal	B. Phillips	Diamond Rim Wood Sale	U-91-BL-837b
UN	Survey	BLM-Vernal	B. Phillips	Island Park Guzzler	U-91-BL-838b
UN	Survey	BLM-Vernal	B. Phillips	Big Wash Guzzler	U-91-BL-839b
UN	Survey	BLM-Vernal	B. Phillips	Eight Mile Flat Guzzler	U-91-BL-840b
UN	Survey	BLM-Vernal	B. Phillips	Cottonwood Spring Guzzler	U-91-BL-842b
UN	Survey	BLM-Vernal	B. Phillips	North Halfway Hollow Guzzler	U-91-BL-843b
UN	Survey	BLM-Vernal	B. Phillips	State Selection Quantity Grant	U-91-BL-844b
UN	Survey	USFS-Ashley	B. Loosle	Oaks Park Prefelled Firewood Area	U-91-FS-342f
UN	Survey	USFS-Ashley	B. Loosle	Alma Taylor Timber Sale	U-91-FS-346f
UN	Survey	USFS-Ashley	B. Loosle	Hicks Park Timber Sale	U-91-FS-595f
UN	Survey	USFS-Ashley	B. Loosle	Coyote Timber Salvage	U-91-FS-596f
UN	Survey	USFS-Ashley	B. Loosle	Lake Park II Timber Sale	U-91-FS-597f

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
UN	Survey	USFS-Ashley	B. Loosle	Buffer, Grouse Crk, and Bill's Park Sales	U-91-FS-602f
UN	Survey	Grand River Ins.	C. Conner	ENRON - Four Wells vic Cottonwood Wash	U-91-GB-041b
UN	Survey	Grand River Ins.	C. Conner	Federal #31-29 Well for Cochrane	U-91-GB-101b
UN	Survey	Grand River Ins.	C. Conner	Enron 14 Wells	U-91-GB-191b,i
UN	Survey	Grand River Ins.	C. Conner	Four Pot-of-Gold Wells	U-91-GB-208b
UN	Survey	Grand River Ins.	C. Conner	Four Wells For Enron	U-91-GB-364b
UN	Survey	Grand River Ins.	C. Conner	8 Wells for ENRON	U-91-GB-417b,i
UN	Survey	Grand River Ins.	C. Conner	5 Wells for Warren American W of Leland Bench	U-91-GB-439i
UN	Survey	Grand River Ins.	R. Hutchins	NBU 332-8E Well & Access, vic. Natural Buttes	U-91-GB-570b
UN	Survey	Grand River Ins.	C. Conner	Enron 160 Acre Block, 9 mi. SE of Ouray	U-91-GB-588b
UN	Survey	Grand River Ins.	C. Conner	2 Seis. Lines ca. 9 mi. SE of Ouray	U-91-GB-619i,s
UN	Survey	Grand River Ins.	C. Conner	Cochrane Fed. 13-13 Well	U-91-GB-667b
UN	Survey	Grand River Ins.	C. Conner	Warren American King's Canyon 1-3 & 2-3	U-91-GB-668b
UN	Survey	Grand River Ins.	C. Conner	Old Squaw's Crossing #2-34	U-91-GB-782b
UN	Survey	Grand River Ins.	C. Conner	Kings Canyon #9-1 Well	U-91-GB-783b
UN	Survey	Grand River Ins.	C. Conner	4 Wells for ENRON, Sand Wash/White River	U-91-GB-795s
UN	Survey	Grand River Ins.	C. Conner	7 Wells and 2 Pipelines for ENRON	U-91-GB-796b
UN	Survey	Grand River Ins.	C. Conner	Kings Cny 10-1 vic Wild Horse Bench	U-91-GB-797b
UN	Survey	Grand River Ins.	C. Conner	Ten Wells for ENRON-Chapita Wells	U-91-GB-826b
UN	Survey	Grand River Ins.	C. Conner	Chipeta Well Unit #302-2	U-91-GS-313b
UN	Survey	Metcalf	J. Scott	18 Coastal Wells, vic. Bitter Creek	U-91-MM-044s
UN	Survey	Metcalf	J. Scott	14 Coastal Wells and Access	U-91-MM-055b

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
UN	Survey	Metcalf	J. Scott	3 Wells N of Bitter Creek Gas Field	U-91-MM-075s
UN	Survey	Metcalf	J. Scott	Coastal NBU #138, N of Bitter Creek Gas Field	U-91-MM-076s
UN	Survey	Metcalf	J. Scott	CIGE Well No. 148, Bitter Creek Gas Field	U-91-MM-100s
UN	Survey	Metcalf	J. Scott	CIG Uinta Basin Lateral	U-91-MM-130b,i
UN	Survey	Metcalf	J. Scott	Well & Retaining Dam, Bitter Creek Gas Field	U-91-MM-131s
UN	Survey	Metcalf	J. Scott	Coastal Well Pads, Natural Buttes	U-91-MM-139i
UN	Survey	Metcalf	J. Scott	Five Coastal Wells, Cottonwood Wash/White Rvr	U-91-MM-316b
UN	Survey	Metcalf	J. Scott	Six Coastal Well Pads, Uintah Basin	U-91-MM-367b
UN	Survey	Metcalf	J. Scott	3 Wells nr White River, Uintah & Ouray Res.	U-91-MM-383i
UN	Survey	Metcalf	Lauri Travis	Interline Pipeline, Leland Bench/Pariette Drw	U-91-MM-452i
UN	Survey	Metcalf	J. Scott	11 Coastal Wells, Uintah Basin	U-91-MM-478b,s
UN	Survey	Metcalf	J. Scott	10 Wells for Coastal	U-91-MM-607b,i,s
UN	Survey	Metcalf	J. Scott	Ten Desert Spring Well Units	U-91-MM-618b
UN	Survey	Metcalf	J. Scott	Ten Coastal Wells, Bitter Creek Gas Field	U-91-MM-707i
UN	Survey	Metcalf	J. Scott	Nine Coastal Flow Lines	U-91-MM-811i
UN	Survey	Metcalf	J. Scott	Three Coastal Well Pads S of White River	U-91-MM-812i
UN	Survey	Metcalf	J. Scott	One Desert Spring Unit	U-91-MM-813b
UN	Survey	Metcalf	J. Scott	Three Desert Spring Wells and Access	U-91-MM-814b
UN	Survey	Nielson Cons.	A. Nielson	Texaco Evacuation Creek Anode Site	U-91-NP-605b
UN	Survey	P-III	G. Popek	Deseret Springs Well Pads 20-1 & 29-1	U-91-PD-063b

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
UN	Survey	Senco-Phenix	J. Senulis	7 Pipelines on Ute Tribal Lands	U-91-SC-094i
UN	Survey	Senco-Phenix	J. Senulis	Two Pipelines, Wonsits-Wonsits Valley Oil Fld	U-91-SC-095b
UN	Survey	Senco-Phenix	J. Senulis	Red Wash #304 betwn Kennedy & Coyote Washes	U-91-SC-422s
UN	Survey	Senco-Phenix	J. Senulis	Gypsum Hill #9 Chevron Well	U-91-SC-622i
UN	Survey	Senco-Phenix	J. Senulis	Wonsits Valley Federal Unit #130	U-91-SC-623i
UN	Survey	Senco-Phenix	J. Senulis	Gypsum Hill #10 Well	U-91-SC-624i
UN	Survey	Senco-Phenix	J. Senulis	Chevron Pipeline to Wonsits Valley Fed #60	U-91-SC-625i
UN	Survey	Sagebrush	M. Polk	Greenwood Well Federal 26-1, Pleasant Valley	U-91-SJ-037b,p
UN	Survey	Sagebrush	M. Polk	3 Wildrose Wells near Pariette Draw	U-91-SJ-415b
UN	Survey	Sagebrush	M. Polk	One Well Near Pariette Draw	U-91-SJ-519b
UN	Survey	USF&W	R. Lewis	Jones Hole Snow Fence	U-91-UK-028b,p
UN	Survey	USF&W	R. Lewis	Leota Bottom	U-91-UK-705w
UN	Survey	West. Wyo. Coll.	D. Gardner	Pipeline to Well, White River Floodplain	U-91-WK-212i
UT	Survey	ARCON	G. Norman	Cedar Valley Phase 1 Ranch Development	U-91-AK-670p
UT	Survey	OPA-BYU	S. Baker	Proposed I-15 Interchange, Lehi	U-91-BC-026s
UT	Survey	BYU-Museum	C. Baker	Survey of the Utah Lake Shore, 1988 and 1991	U-91-BC-589s
UT	Survey	Dames & Moore	G. Woodall	Reroute U-48, Spread 3, Goshen Valley	U-91-DH-357p
UT	Survey	Dames & Moore	K. Moslak	Infield Realignment 198.0-199.1, Spread 3	U-91-DH-600p
UT	Survey	USFS-Uinta	C. Thompson	Provo City Land Exchange Update	U-91-FS-154f
UT	Survey	USFS-Uinta	C. Thompson	Squaw Peak Land Exchange	U-91-FS-155f

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

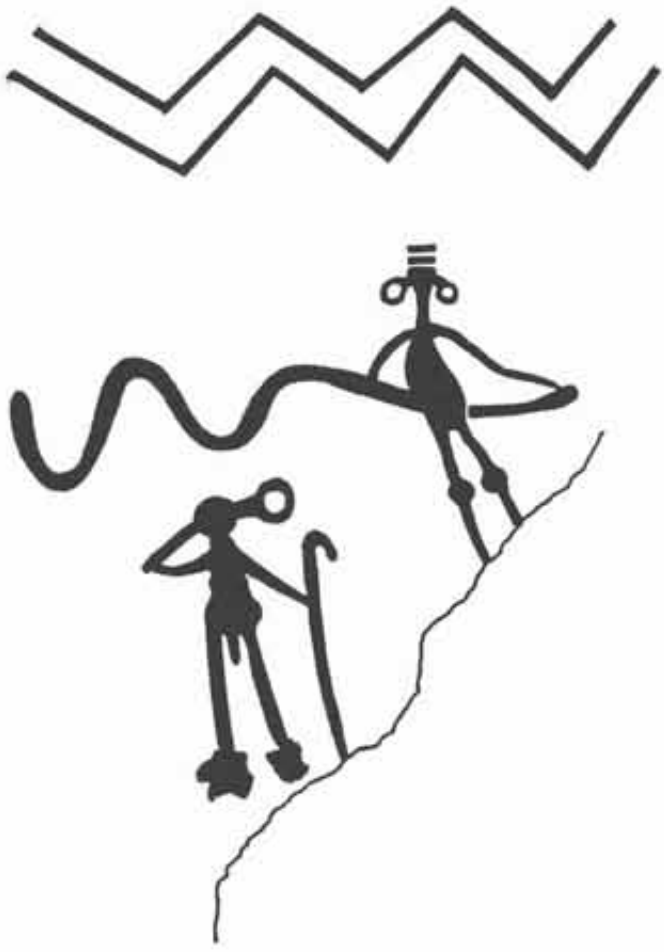
County	Activity	Organization	Field Supervisor	Project Name	Project Number
UT	Survey	USFS-Uinta	C. Thompson	Ventures Unlimited Land Exchange	U-91-FS-156f
UT	Survey	Nielson Cons.	A. Nielson	Nephi City Pipeline, NE of Santaquin	U-91-NP-223b
UT	Survey	Nielson Cons.	A. Nielson	SP Telecm Cable from Soldier Summit to Detour	U-91-NP-315s
UT	Survey	Nielson Cons.	A. Nielson	Spanish Fork-Springville Airport	U-91-NP-617s
UT	Survey	SAIC	K. Peter	Provo Airport Expansion E. A.	U-91-SB-853p,s
UT	Survey/Test	USAS-Utah Co.	R. Hansen	Pleasant Grove Old Fort Wall	U-91-US-093p(e)
UT/JB	Survey	Dames & Moore	C. Inoway	Reroute U-44 & Realignment, Kimball Creek	U-91-DH-453b,p
WA	Survey	AERC	R. Hauck	Well Site vic. Timber Canyon	U-91-AF-302f
WA	Survey	Abajo	J. & K. Montgomery	SR-9 MP 4.7-9.75, Berry Springs to Hurricane	U-91-AS-442s,p
WA	Survey	OPA-BYU	L. Richens	Current Creek Dam Pipeline	U-91-BC-621w
WA	Survey	USFS-Ashley	B. Loosle	Timber Canyon Range Improvement	U-91-FS-344f
WA	Survey	Nielson Cons.	A. Nielson	UP&L Wallsburg-Snow's Marina Undergrnd Cable	U-91-NP-303s,w
WB	Survey	OPA-BYU	D. Southworth	Lewis Grove Ogden River Access Roads	U-91-BC-524p,s
WB	Survey	Sagebrush	M. Polk	Improvmnts @ Washington Blvd/40th St, S Ogden	U-91-SJ-036s
WB	Survey	Sagebrush	M. Polk	Road Widening for 36th St, Ogden & S Ogden	U-91-SJ-039p,s
WB	Survey	Sagebrush	M. Polk	Weber Co. Safety Improvements, Pleasant View	U-91-SJ-107s
WB	Survey	Utah State Univ.	S. Simms	GSL Intake Canal	U-91-UJ-317s
WN	Survey	Alpine	C. Graham	Bicknell Materials Source	U-91-A1-128b
WN	Survey	AERC	G. Norman	Three Fences, Northern Capitol Reef NP	U-91-AF-147b,f,n
WN	Survey	AERC	R. Hauck	15 Turn-Pts in a Powerline, Capitol Reef NP	U-91-AF-846n

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
WN	Survey	NPS-Canyonlands	N. Coulam	Horseshoe Canyon Campground Development	U-91-NA-219b,n
WN	Survey	NPS-Canyonlands	N. Coulam	Telephone Installation, Maze District	U-91-NA-680n
WN	Survey	Nielson Cons.	A. Nielson	Notom Road Upgrade	U-91-NP-158b,f,s
WS	Survey	Abajo	D. Westfall	UDOT I-15 Middleton to Snowfield	U-91-AS-112b,s,p
WS	Survey	BYU-OPA	S. Baker	Tenneco Goldstrike II, Bull Valley Mountains	U-91-BC-466b
WS	Survey	BLM-Cedar City	D. Christensen	Mohave County Communication Site (Scrub)	U-91-BL-699b
WS	Survey	Dames & Moore	D. Larson	Rerte U-36, Sprd 5, Mtn. Meadows/Holt Cny	U-91-DH-005b,f,p
WS	Survey	Dames & Moore	D. Larson	Segment E-124, Southeast of Mountain Meadows	U-91-DH-006p
WS	Survey	Dames & Moore	D. Larson	Reroute U-38, Sprds 5 & 6, vic. Long Ridge	U-91-DH-007b,f
WS	Survey	Dames & Moore	D. Larson	Reroute U-40, Spread 6, vic. Jackson Wash	U-91-DH-008b,s
WS	Survey	Dames & Moore	D. Larson	Rerte U-39, Sprd 6, Miner's Cny/Jackson Wash	U-91-DH-009b,p
WS	Survey	USFS-Dixie	M. Jacklin	Big Mountain Electronic Site	U-91-FS-115f
WS	Survey	USFS-Dixie	A. Bate	Hardscrabble Wildlife Guzzler	U-91-FS-431f
WS	Survey	USFS-Dixie	M. Jacklin	D-1 Spring Developments	U-91-FS-432f
WS	Survey	USFS-Dixie	M. Jacklin	Truman Exchange NW of Pinto	U-91-FS-628f
WS	Stabilize	USFS-Dixie	M. Jacklin	Leeds Creek Kiln Stabilization	U-91-FS-836f
WS	Survey	Intersearch	R. Thompson	Sunset Blvd. Widening Project	U-91-IG-011s
WS	Survey	Intersearch	R. Thompson	State Lands Sale, Hurricane	U-91-IG-148s
WS	Survey	Intersearch	R. Thompson	State Land Sale-80 Ac W of Vermillion Cliffs	U-91-IG-307s
WS	Survey	Intersearch	B. Walling	Covington Land Sale	U-91-IG-308s
WS	Survey	NPS-Zion	J. Burns	Currant Creek Fence Survey	U-91-NA-352n

ANTIQUITIES SECTION, UTAH DIVISION OF STATE HISTORY
1991 PROJECT REPORTS RECEIVED

County	Activity	Organization	Field Supervisor	Project Name	Project Number
WS	Survey	Nielson Cons.	A. Nielson	New Harmony Town Culinary Water System	U-91-NP-067s
WS	Survey	Nielson Cons.	A. Nielson	UAMPS Alt Lines vic. St. George & Middleton	U-91-NP-224p,s
WS	Survey	Nielson Cons.	A. Nielson	UAMPS Central to St. George Sub. Access, Etc.	U-91-NP-299b,f,p
WS	Survey	Nielson Cons.	A. Nielson	Mt. Fuel Central to Veyo Natural Gas Pipeline	U-91-NP-337p,s
WS	Survey	Nielson Cons.	A. Nielson	Feller Rock Quarry Road, W Washington Co.	U-91-NP-569b,s
WS	Survey	Nielson Cons.	A. Nielson	UAMPS Rerte on Central to St. George 138 KV	U-91-NP-606b,p
WS	Survey	Nielson Cons.	A. Nielson	UAMPS Kane Wash Access Road Relocation	U-91-NP-663b
WS	Survey	Nielson Cons.	A. Nielson	St George Virgin R Bridge Construction Areas	U-91-NP-785p
WS	Survey	Nielson Cons.	A. Nielson	Quail Crk/Virgin R Bridge Borrow & Stag Areas	U-91-NP-788p
WS/AZ	Survey	Intersearch	B. Walling	Dixie-Escalante Powerline	U-91-IG-669b,s
MULTI	Survey	AERC	R. Hauck	Arch Eval, vic. Winter Quarters in CB, EM & SP	U-91-AF-638f
MULTI	Survey	Dames & Moore	K. Heath	Salt Lake, Tintic, Elberta & Lynndyl Stckpile	U-91-DH-071p
MULTI	Survey	Weber State/USU	B. Arkush	1991 Survey of USAF Lands in Utah	U-91-WC-687m
MULTI	Survey	Woods Canyon	L. Honeycutt	Amended 1992 Mainline Expansn in GR, RI & SA	U-91-WN-799p,s



REVIEWS

Slide Showmanship, by Elinor Stecker. AMPHOTO, New York City. 1987. 144 pages, illustrations. $27.50 hard cover.

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

Whether it be Pecos or Great Basin conference or just a USAS chapter meeting, audience reaction tells the tale of the slide show presentation.

There is the concluding polite applause, sort of an "I'm glad that's over," as the audience hastily departs. And there is the stand-up, hand-clapping, followed by profound questions from the audience that gathers around the presenter with verbal appreciation of, "Hey that was a great show."

Author Stecker has written for many newspapers and magazines, for professional photography journals, has a monthly column in *Meetings and Conventions* magazine, and is an associate editor of *Popular Photography* magazine. This, her second book, is the mentor *magna cum laude* for anyone planning and presenting a slide show.

In nontechnical terms, Stecker moves the reader from taking interesting slides through the editing, organizing, and effective narration to a guaranteed successful presentation.

The section on editing and organizing, for example, covers logic, meaning, visual flow to avoid jarring jumps from bright to dim, from horizontals to verticals, and how to use a storyboard and planning cards to put it together.

She covers many amateur-adaptable professional tricks of improving the slides with sandwiches, shaped masks for split-screen impact, multiple exposures, cropping and retouching. An index of suppliers is included, for example, Wess Plastic, Inc., 70 Commerce Drive, Hauppauge, New York, 11788-3936, whose free catalog of masks and equipment can turn amateur into pro.

The pacing of slides on the screen, the pacing and content of narration, and the length of presentations for various subjects and various audiences are all part of Stecker's regimen for infusing a slide presentation with creativity and originality.

The book makes simple the mechanics of music, synchronizing slide/tape presentations, and even arranging two-projector and multi-projector presentations using the more professional programmers and dissolvers.

Some manuals tell you what you should do to improve your slide shows; this book tells and **shows** you how. It may subliminally take the reader back to the show-and-tell of early school days, but it is a most effective way of teaching and learning.

Slide show presenters should read this book, then get their personal applause meters in action to see the improvement.

Encyclopedia of Native American Tribes, by Carl Waldman. Facts on File Publications, New York City. 1988. 293 pages, 250 illustrations. $35.00 clothbound.

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

This is a wonderful general reference volume covering more than 150 Native American tribes from Abnaki to Zuni. Organized alphabetically, it includes prehistoric peoples and civilizations as well.

While the emphasis is on North American people, the text recognizes the connection and influences of Mesoamerican cultures including the Aztec, Maya, and Olmec tribes north of the United States and Mexico border.

The nontechnical text summarizes the historical record of tribal locations, migrations, contacts with whites, wars, the integration of various tribes, and the extinction of others. It includes Indian lifeways, means of subsistence, houses, boats, tools, clothing, art, legends, and rituals. Eleven maps and 250 detailed, original color illustrations enhance the text.

Of particular interest is a listing of culture areas, tribes of Native American peoples, and their language families. It provides clues to the movement and association of various tribal peoples but also provides some puzzles. The Penutian language family, predominant in the California and Northwest Coast culture areas, as well as the Plateau culture area, appears elsewhere only as the far-removed Zuni.

It is noted that there were more than 2,000 languages in all of the Americans, with about 300 in North America. However, there were many dialects. The Algonquian language had many dialects although vocabulary, grammar, and pronunciation were common. Yet the dialects provided enough differential that people speaking one dialect might have to use sign language to communicate with another Algonquian.

Origins of tribal names are also fascinating. The name Navajo is a Pueblo Indian word referring to an area of southwest land; the name *Apaches de Navajo*, to distinguish them from the Apaches was given by the Spanish, and the Navajo called themselves *Dine* meaning the people who lived in the homeland of *Dinetah.*

Many tribes called themselves, in their dialects, simply variations on "the people" (Miwok); "yellow earth people" (Sac); "downstream people" (Quapaw); "great hills people" (Seneca); and "desert people" (Toho-no-o-otam). The Arapaho called themselves "our people," and the Cherokee summed it all up with "real people."

The book contains an excellent Glossary for the novice Indian aficionado who may not know the difference between sachem and shaman, between parfleche and babiche, or between bannerstone and stone-boiling.

Finally, it contains a lengthy section on Further Reading, separated into categories from prehistoric, art and artifacts, travel, and even children's books.

The art work by Molly Braun, wife of author Carl Waldman, is colorful and adds an interpretation to the text.

The book, although handsome, is more than a cocktail table decoration. It invites rereading simply because it is written in a thoroughly pleasant and understandable style.

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.

Subscriptions are available through membership in either USAS or UPAC or annual subscriptions. Individual issues are available through selected retail outlets throughout the state. These include the Utah Division of State History Bookstore, the Museum of Peoples and Cultures Publications Department, Fremont Indian State Park, and Edge of the Cedars Museum.

UPAC members send manuscripts to:

Kevin Jones, editor for UPAC
Antiquities Section
Utah Division of State History
300 Rio Grande
Salt Lake City, UT 84101-1182

USAS members send manuscripts to:

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

UTAH ARCHAEOLOGY 1992

CONTENTS

ARTICLES

REPORTS

NOTES

REVIEWS