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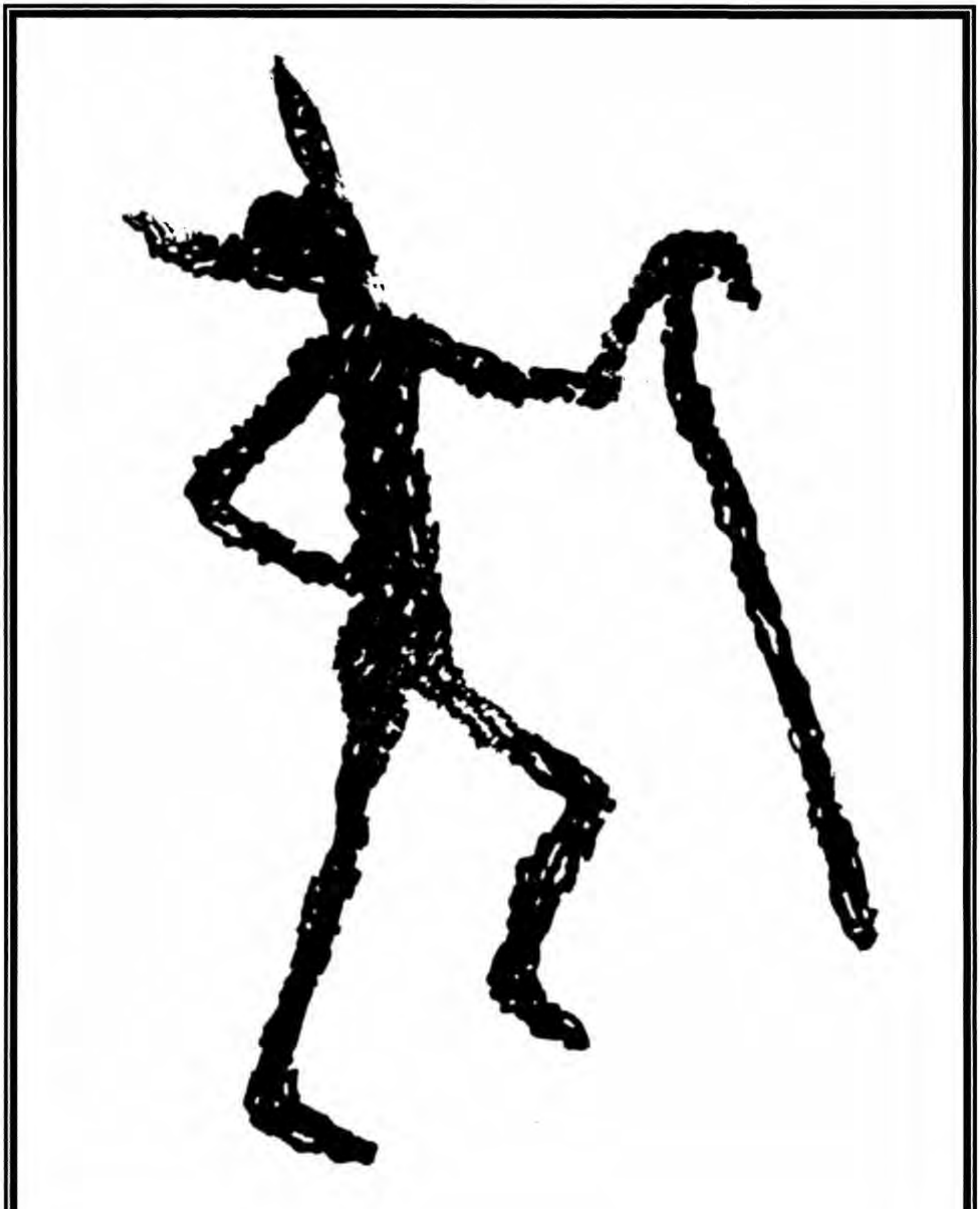

NEVADA ARCHAEOLOGICAL ASSOCIATION

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The design for the NAA logo was adapted by Robert Elston from a Garfield Flat petroglyph.

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Manuscripts submitted for publication in the *Nevada Archaeologist* should follow the style guide of *American Antiquity*, October 1992 issue. Manuscripts should be typed and double spaced throughout, including notes and bibliography, and illustrations should be camera-ready with a caption typed on a separate sheet of paper, also double spaced. Submissions from avocational as well as professionals are encouraged. Manuscripts for the 1999 issue should be submitted to: % Roberta McGonagle, 1515 3300 East #133-5, Battle Mountain, NV 89820.

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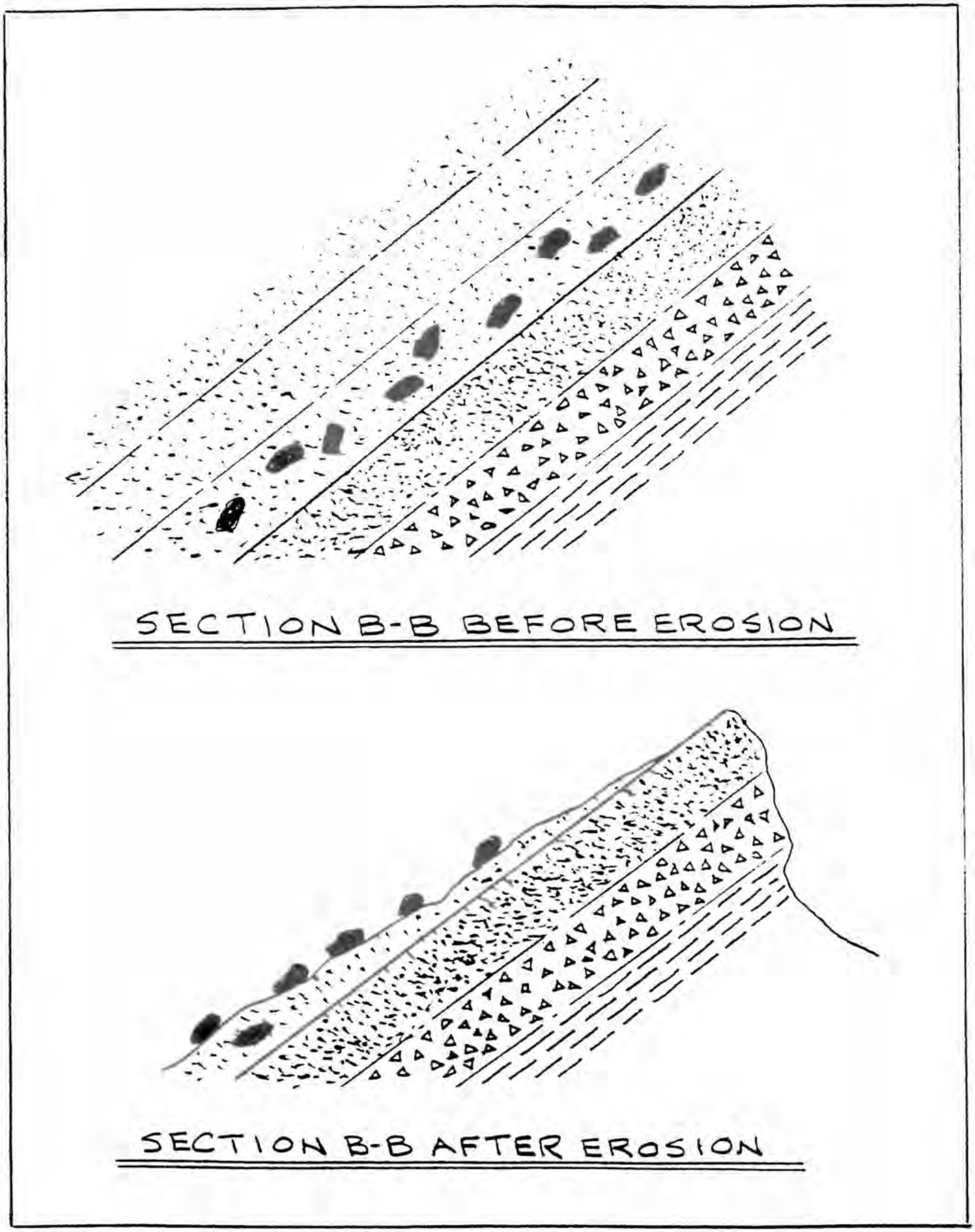

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Advocating Methods of Ground Stone Analysis

Kelli Barnes

Desert Research Institute, Las Vegas

Ground stone is found at a large percentage of prehistoric archaeological sites and has the potential to yield substantial information about prehistoric activities. However, in the past, little has been done to study it. Recently, interest in ground stone has increased. Advances in ground stone analysis, including new techniques and adaptations of methods previously used only on lithics or other types of artifacts, have yielded a wealth of new data, along with increased in ground stone studies. Mari A. Prichard-Parker (1993:1) states:

> For the most part, the published literature has focused on lithic flake tool analysis rather than ground stone analysis. Perhaps many researchers are initially enthralled by what they perceive to be the beauty and complexity of flake stone technology versus the simple technology of ground stone production, which may appear to be less aesthetically pleasing, It is also possible, as some have suggested, that the bias in the anthropological community as a whole, which tends to emphasize hunters and de-emphasize gatherers, may have influenced this perspective. Perhaps the predominance of male archaeologists prior to the 1970s led to an emphasis on hunting technologies and the depemphasis on food processing tools. These biases and perspectives may have delayed the process of understanding ground stone artifacts, their specific functions as tools and their social significance.

This lack of interest is unfortunate, since ground stone can provide a wealth of information regarding prehistoric subsistence and settlement patterns and even ritual behavior. Surely a great deal of information has been lost because of inadequate ground stone studies, however, this situation is changing rapidly. In 1993 both KIVA and Pacific Coast Archaeological Society Quarterly published journals dedicated entirely to ground stone research. The articles therein demonstrate how the use of microscopic, chemical, statistical, ethnographic and experimental work can be applied to ground stone studies. These studies provided the bulk of the material for this paper.

Terms

Ground stone terminology is frequently confusing. This is because a variety of terms are often used to describe the same type of ground stone. Also, the term ground stone is used by some to describe artifact types which may not be included under that category by others. For example: some consider stone axes which are ground as part of the manufacturing process, to be ground stone. This paper will deal only with the types that are ground as a result of use, not simply as a manufacturing technique. The following terms from Joan S. Schneider (1993:6) will be used:

Grinding stone - the lower stone platform upon which the handstone is moved and upon which reduction in the size of materials takes place. Grinding stones may have one or more flat, slightly concave, basined, or troughed working surfaces (or a combination of any of these).

Handstone - the stone, held in one or both hands, that is moved upon the grinding stone in a circular, back-and-forth, or rocking motion.

Mortar - a bowl shaped stone with a central (usually approximately circular)concavity of varying depth and diameter within which materials are pounded, crushed, or ground. Alternatively, a "hopper mortar' is used in the same way, but basketry walls are substituted for the stone walls of the mortar hole. Usually, a bottomless basket serves as a rim and is attached to the stone base with asphaltum or another type of mastic. Mortars are also commonly created in bedrock exposures.

Pestle - a cylindrical or subcylindrical stone of varying length, usually showing wear at one or both ends, used within a mortar to crush, pound, or grind materials.

In this paper the terms "metate" or "grinding slab" may be replaced for "grinding stone" and "mano" may be used instead of "handstone." There is a multitude of other names used to describe types of ground stone but these will not be considered here.

Types of Analysis

Ground stone can be studied in terms of its physical attributes, which include material of manufacture, morphological characteristics, wear patterns, etc.; residues on its surface including the remains of processed materials and/or natural accumulations; and its contextual relationship in regards to other artifacts and natural features such as mesquite groves or water sources.

Physical Characteristics

Physical characteristics of grinding implements include material of manufacture (sandstone, vesicular basalt, etc.); the type, size and shape of the tool; and the amount of use wear and intentional modification, such as shaping or resharpening. Analysis of these attributes permits several types of studies.

Maudlin (1993:318-328) states that the area of grinding tools, especially manos, increases in response to increasing agricultural dependence. He believes that this increase in mano size (the use of a longer two-hand mano instead of the smaller one-hand version) allows processing to be accomplished more quickly thus "Mano area is related to processing rates and may, therefore, measure the importance of agriculture at a location." His methods included ethnographic, experimental, and archaeological research.

Others have developed similar findings. Fratt and Biancaniello (1993:388) state:

> Two-hand manos and trough metates are generally considered to be functionally specified tools specialized for efficient corn grinding. Their improved efficiency, resulting from a larger effective grinding surface and a greater capacity for withstanding larger amounts of force applied during grinding, is accomplished at the expense of increased production effort related to more standardized tool size and shape. In contrast, one-hand manos and basin metates are thought to be generalized grinding tools suitable for processing several different kinds of materials. Although their effective grinding surfaces are small compared to two-hand manos and trough metates, one-hand manos and basin metates also require less production effort.

Fratt and Biancaniello (1993) examined different types of sandstone from the Homol'ovi III site in Arizona and found that "hardness, induration, the degree to which surfaces can be roughened to improve grinding, and aesthetics apparently influenced selection of raw materials used to make ground stone artifacts." Material sourcing is also possible, as is demonstrated by Bostwick and Burton (1993) who applied it to basalt ground stone at Hohokam sites. By tracing the source of artifact material it is possible to examine travel and trade routes. Material type and other physical attributes, such as amount of wear, shape and size, may be used to compare differences in ground stone from different sites, regions or through time. They also may be used to determine how the artifacts were used, how long they may have been used and what they were used for.

Replication studies have been done to determine rates and type of wear as affected by tool stone type, grinding method, the type of material ground, the affects of repecking or cleaning the grinding surface and how different attributes influence the time it takes to grind a certain amount of a given material. (see Prichard-Parker and Reid 1993; Adams 1993; Maudlin 1993). Knowledge of wear patterns etc. can then be applied to the study of prehistoric ground stone. A good example of this type of study was performed by Schneider (1992) who examined a ground stone quarry and production site. Artifact and material types were examined in an attempt to reconstruct the behavior represented by the site and to determine how ground stone was mined and manufactured.

Residues

Although ground stone is commonly associated with plant processing, it also had many other prehistoric and ethnographic uses such as hide processing, pigment processing, grinding of clay and temper and grinding of small mammals, lizards, fish, insects or bones. There are now several techniques used to detect the function of ground stone by examining residues present on its surface.

Blood residue studies are a fairly new and controversial way of accomplishing this. This method was first applied in archaeology to studies of chipped stone artifacts such as projectile points. It has now been demonstrated that the method may also be useful to ground stone studies. Yohe et al. (1991:661) state, "By the use of biochemical and immunological methods the presence of blood can be detected and the species of origin can be identified. This information can be used in the reconstruction of prehistoric subsistence patterns, human-land relationships, and possibly in the identification of task-specific artifacts."

Yohe et al. tested grinding implements from two sites in California using a method called crossover elecrtophoresis (CIEP) which is used by forensic researchers "to identify 'stains of unknown origin'" (1991:661). Four of the artifacts tested positive for rodent proteins (mouse or rat), two from each site. Soil samples taken from the sites did not test positive for proteins. Downs and Lowenstein (1995) provide a warning against relying too heavily on these tests which are not always accurate. They indicate the tests need to be studied for accuracy but report some successes using the techniques, including the one done by Yohe et al. (1991).

"Pigment residues on stone (as opposed to other residues) have high archaeological visibility" (Schneider 1993:13). Using artifacts from the Homol'ovi III site researchers studied pigments on ground stone surfaces. They used pigment processing experiments and microscopic analysis to determine whether pigment was a natural part of the stone or a result of processing, what type of pigment was present and whether the stone was used to grind, mix, or grind and mix the pigment (Logan and Fratt 1993). Through microscopic analysis of experimental tools it was found that slabs used to grind pigment had pigment grains that adhered to the tops of sand grains, not the sides, while stains caused by mixing ground hematite with water caused pigment to accumulate on the tops and sides of sand grains and in cracks and pits on the stone's surface. Slabs used for grinding and mixing showed a combination of these characteristics. There were visible differences between different types of pigment. It was also found that:

> Naturally occurring hematite is evenly distributed across the entire surface of the sandstone and clumps of pigment appear to take the place of sand grains rather than adhere to or accumulate between the sand grains. There are usually several other layers of hematite in the cross-section and grains of hematite are usually evenly dispersed throughout the sandstone along with quartz and other mineral constituents (Logan and Fratt 1993:421).

Ground stone was also sometimes decorated with pigment. This is demonstrated by the presence of designs on ground stone or the presence of pigment on non-ground surfaces of ground stone when it is not (or scarcely) found on ground areas (Prichard-Parker 1993).

Plant phytoliths or pollen, which are fairly indestructable materials, may also be found on grinding surfaces. These can be examined microscopically to determine the family of plants that was ground. Soil samples from the site must also be tested to be sure the presence is a result of food processing rather than a natural occurrence. Additionally, organic residues, even natural ones, such as lichen that can form on a tool after it has been abandoned, may be useful for dating.

Contextual Relationships

The context in which ground stone is found can reflect both artifact and site function. It is important to take location and relation to other artifacts into account; i.e., whether the ground stone is found at a pueblo or near a mesquite grove; with a variety of other tools or with a burial; or the relative numbers of manos to metates at a site.

Mari A. Prichard-Parker (1993) describes a metate cache from California where some of the metates were ritually painted or destroyed (a.k.a. "killed") and placed on their sides next to one another. This type of behavior, or the placement of ground stone with burials, demonstrates the ideological importance of ground stone prehistorically.

These types of studies are not mutually exclusive. The best studies usually employ a variety of techniques. For example, in Nelson and Lippmeir's (1993:286) study "Grinding-Tool Design as Conditioned by Land Use Pattern" the authors state: "Because grinding tools commonly remain on sites, their anticipated reuse signals anticipated reuse of the places where they occur." They go on to say that information about how frequently or regularly sites were visited may also be inferred by the distribution of ground stone. They compared the grinding assemblages of rock shelters, which they expect to have been reused "fortuitously," with architectural sites that were "regularly reused" and concluded that "In the sample from the regularly reoccupied architectural sites, manos and metates are made from more durable stone, metates are more often shaped, manos are more standardized in form, and circular and rectangular shaped manos are longer than in samples from the rockshelters" (Nelson and Lippmeir 1993:301). Patterns of wear and breakage from the sites were also studied. This is an example of using morphological characteristics, material type and context to gain insight into the ways that sites were used.

Schlanger (1991) found differences in assemblages from archetectural sites which were burned after final occupation and those which were not suggesting that there was scavenging of ground stone from the non-burned sites where the artifacts would have been more accessible. She states "Stone grinding tools are convenient artifacts to use in an analysis of the patterned, systematic relations between the contents of various archaeological recovery contexts because the use and discard behaviors associated with these tools are so well documented" (Schlanger 1991:471). Also, "Given a set of sites with comprehensive, controlled excavations, and a well-founded model of artifact use and discard, we can distinguish between differences that carry functional meanings, differences that are a consequence of occupation practices, and differences that relate to abandonment patterns and post abondonment access" (Schlanger 1991:471). To determine this she used statistical analysis of one and two-hand manos and trough metates from different parts of sites (house, midden, etc.) and compared burned and non-burned sites.

Summary

In order to gain the full range of information available from ground stone it is necessary to apply a wide range of testing. Physical characteristics, residues and context all must be studied. Some of the methods now being used to analyze ground stone need further testing and refinement but even now they are providing a wealth of information that, until recently, went virtually unstudied. In the past, ground stone often went unrecognized, unrecorded, or uncollected at sites. Collected ground stone was often thoroughly washed, removing residue that might now be useful. Research and reports focusing on these artifacts was rare. The attention now being paid to ground stone is long overdue. However, a standardization of terms and a more rigid method of classifying its types are needed. With these methods, ground stone can be as useful as other artifacts in answering questions about the past.

References Cited

Adams, Jenny L.
1993 Mechanisms of Wear on Ground Stone Surfaces. *Pacific Coast Archaeological Society Quarterly* 29(4):61-74.

Bostwick, Todd W., and James H. Burton
1993 A Study in Sourcing Hohokam Basalt Ground Stone Implements. *KIVA* 58:357-373.

Downs, Elinor F. and Jerold M Lowenstein
1995 Identification of Blood Proteins: a Cautionary Note. *Journal of Archaeological Science* 22:11-16.

Fratt, Lee, and Maggie Biancaniello
1993 Homol'ovi III Ground Stone in the Raw: A study of the Local Sandstone Used to Make Ground Stone Artifacts. *KIVA* 58:373-392.

Logan, Erik N., and Lee Fratt
1993 Pigment Processing at Homol'ovi III: A Preliminary Study. *KIVA* 58:415-428.

Maudlin, Raymond
1993 The Relationship Between Ground Stone and Agricultural Intensification in Western New Mexico. *KIVA* 58:317-330.

Nelson, Margaret C. and Heidi Lippmeier
1993 Grinding Tool Design as Conditioned by Land-use Pattern. *American Antiquity* 58:266-305.

Prichard-Parker, Mari A.
1993 An Unusual Metate Cache from Holmet, California. *Pacific Coast Archaeological Society Quarterly* 29(4):22-34.

Prichard-Parker, Mari A. and Dawn M. Reid
1993 Metate Re-Roughening: Results of a Hammerstone Replication Study. *Pacific Coast Archaeological Society Quarterly* 29(4):51-60.

Schlanger, Sarah H.
1991 On Manos, Metates, and the History or Site Occupations. *American Antiquity* 56:460-474.

Schneider, Joan S.
1992 Antelope Hill: A Cultural Resources Inventory and Inquiry into Prehistoric Ground Stone Quarrying Behavior along the Lower Gila River, Yuma County, Arizona. Statistical Reaearch, Tucson, Arizona.

Schneider, Joan S.
1993 Milling Implements: Biases and Problems in their Use as Indicators of Prehistoric Behavior and Paleoenvironment. *Pacific Coast Archaeological Society Quarterly* 29(4):6-21.

Schroth, Adella
1993 Two Milling stone Material Caches from Southern Coastal California. *Pacific Coast Archaeological Society Quarterly* 29(4):35-50.

Yohe, Robert M., II, Margaret E. Newman, and Joan S. Schneider
1991 Immunological Identification of Small Mammal Proteins on Aboriginal Milling Equipment. *American Antiquity* 56(4):659-666.

A Historic Station Site on the Wadsworth/Columbus Freight Route

William C. Davis

Historic sites come in varied sizes and configurations. Such sites had their own reasons for existing: their unique and individual functions serving early day human needs. Mining camps served as habitation sites; mill sites as work areas; stage stops and remount stations for rest, food, drink and fresh horses; way stations for temporary stops on long freight hauls. Construction camp sites, and others, could be named also. The majority of these historic sites had names, but not all, however. If a water well of no major importance existed on a back country route the maps of the day would simply indicate "well." An isolate building might only be noted as "house." If an obscure "way station" was not connected with the name of some prominent operator or topographical feature, for instance, then an early day map might opt to simply designate the site as "Station" with an accompanying "dot" for its general location. Bear in mind that, with many early maps, the word "general" is truly a concept to be reckoned with! Today we 'GPS' within a meter or so. Early maps sometimes vary in miles between points and true locations. This being the case, it appears that the historic site under consideration pretty much fits into the above, latter, category of not being precisely located.

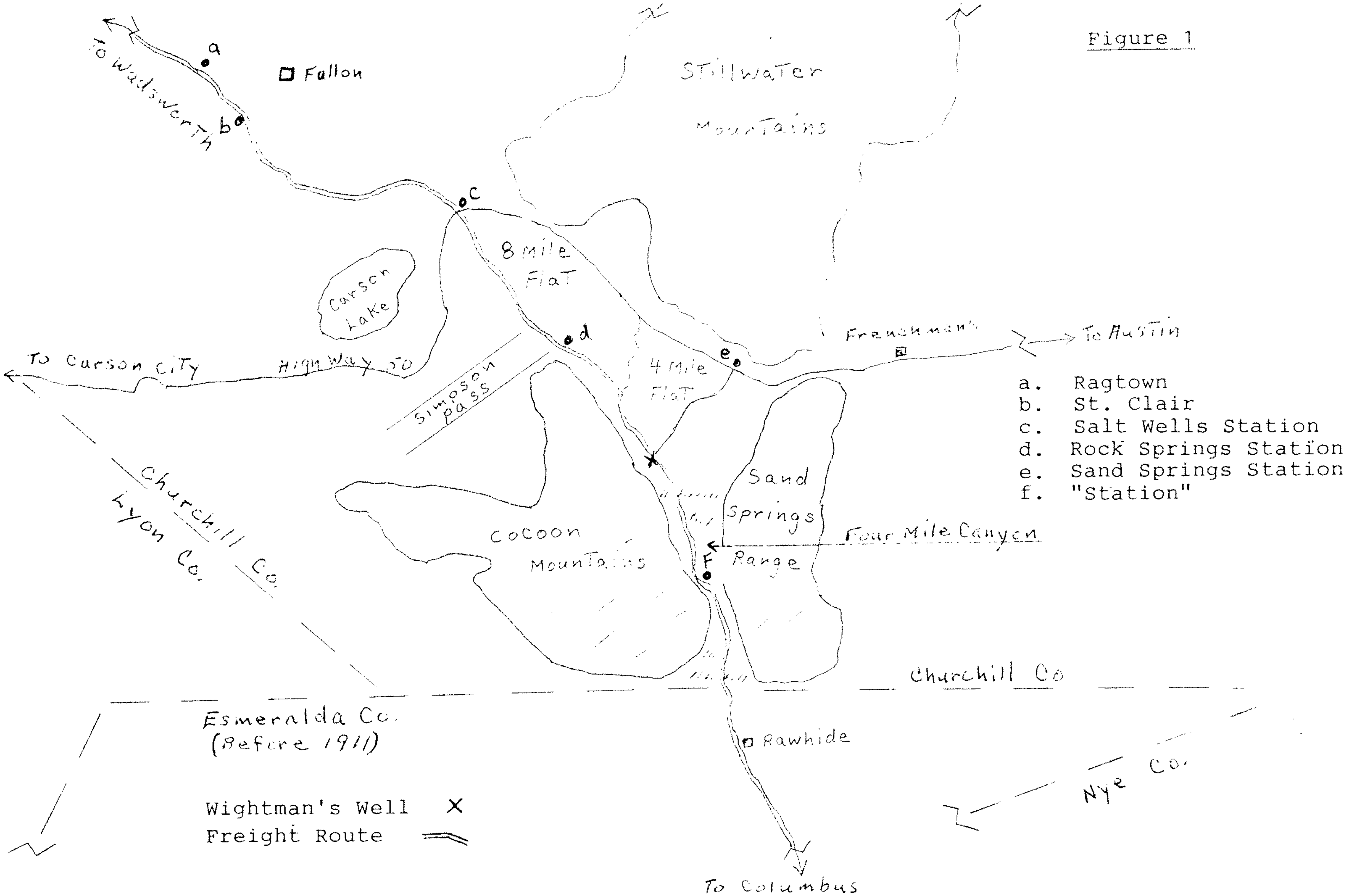
This particular historic site is a "way station" in Four Mile Canyon, located at the general intersection of the Sand Springs Range and the Cocoon Mountains in southern Churchill County (Figure 1). It is situated on a segment of the old Wadsworth/Columbus Freight route which operated from 1873 until 1882. The section of freight road passing through Churchill County probably measured about 65 miles or so (considering early day meanders) from the county line just west of Hazen to the county line just south of the end of Four Mile Canyon, a few miles before entering Rawhide territory.

Four Mile Canyon is, not surprisingly, about 4 miles in length. Our "Station" site is located more or less midway up the canyon. It is situated upon a terrace comprising less than an acre of land which is reasonably level and is protected by the hill rising up from the west flank. The dirt road and the hill converge at the south or upper end of the site. The same basic situation occurs at the north or lower end of the site.

There were a number of named stations along the length of the Wadsworth/Columbus Freight Route. Across the county of Churchill were: Hazen, St. Clair, Salt Wells and Rock Springs (McLane 1982). Rock Springs apparently being the last recognized stop until Dead Horse Wells some 20 miles further on in the valley beyond Rawhide. This would make a fairly long haul up the canyon and over the summit. From the summit it would then have been an easy downhill pull to Dead Horse Wells. This little "Station" would surely have served a very useful function for travelers in this desolate environment.

As with more than a few historic sites this "Station" site probably has a longer and more involved history than might appear at first glance. The freight road in question, came out of Wadsworth through the old Ragtown Pass and into the St. Clair District south of present day Fallon. From this point

Figure 1



Wadsworth/Columbus Freight Route ** Churchill County Portion

WCB.

the route continued easterly to Salt Wells Station and thence south to Rock Springs at Simpson Pass. From here it trended back to the east along the Cocoon Mountains to another "well" for a distance of about 12 miles or so. There are maps which also call this well "Rock Springs!" It would appear that this second well would either be the current (1998) Wightman's Well or that it would have been somewhere in the near vicinity. At any rate, it is very close to this point that the freight route again headed in a southerly direction and up into Four Mile Canyon. From here the road starts to gain elevation as well as following the bottom of this narrow canyon all the way to the top of the vicinity of the county line and the Rawhide Flats area.

Thus far the history of the way station has been in terms of the 1873/1882 Wadsworth/Columbus Freight Route. Now it is necessary to jump forward about twenty years or so to the next phase of the history of the original freight route. Shortly after the turn of the century, the area entered its second big mining boom, an exploration and mining phase.

At the same time, one must remember that these freight/traffic routes do not simply disappear! They tend to continue to be used, sometimes for decades, although perhaps the traffic and its functions may be of a different nature. Such seems to be the case with the route on which our "Station" was located. Team and wagon traffic was still being utilized in the '20s and '30s while cars and trucks were beginning to play a much greater role in the transportation of both passengers and supplies. So, in the early 1900s, we have both teams and wagons and solid rubber tire trucks on our old freight road and the "Station" probably continued to be travelers' stop of some importance. Around 1908 another branch route dropped off to the south from the old Sand Springs Station at Sand Mountain. This is on current Highway 50 east of Fallon. The route originated in the mining boom days as a short cut-off for the early and difficult road here which would later become known as the Lincoln Highway and eventually, the current Interstate Highway 50. This cut-off intersected the old Wadsworth/Columbus freight Route in the aforementioned Wightman's Well area and then continued on up into Four Mile Canyon and on to points south.

The important point is that these roads are still in existence and still in use today (1998). There are officials of the current Kennecott/Rawhide Mining operations who utilize this road as a short cut to the current Rawhide mining project. Cattlemen use the road extensively and prospecting and exploration is conducted areawise from this route.

Measuring from the Sand Springs Station area south to the well and thence up into the canyon, at 9.0 miles is a granite rock face on the right. On the rock face is the inscription: J. Sherry 1911 written in an old red, lead based paint. At approximately one more mile ahead the "Station" terrace is found on the right side of the dirt road. The site has been pot-holed and picked over for years yet the remaining artifactual debris exhibits strong and convincing links to turn of century use and habitation. There are no standing structures. There are rock alignments or possible foundations. Wire and cut nails are noted as is window glass, ceramics and milled lumber. A number of kerosene cans are on site. Water keg hoops and bottle bases and finishes are also present. A somewhat lengthy chronology is noted for the tin can inventory: sanitary cans, hole in cap, hole in top, an array of milk cans, lap side seam, soldered, cans and sardine cans. There are glass bottle sherds exhibiting bubbles (pre-1917) and cork closure finishes. A faint outline of the original wagon road seems visible, traversing the site in a lengthwise fashion on the east side of the site.

Mr. Ed Gibbs of Fallon (now deceased) once served as a deputy sheriff in the area. At a much earlier point in time, Ed drove a truck hauling supplies and mine timbers to the Rawhide area. I believe that he said it was for the early day KENT COMPANY of Fallon. Ed drove his supply truck over the old freight road to Rawhide for a number of years in the 1920s/1930s (personal communication about 1960).

There is yet another consideration regarding the importance of the "Station" and its location. In earlier times it was sometimes the case that even a gallon or so of water could well make or break one's day. Certainly teams needed rest and water, especially on an up-canyon pull. So too, did the early cars and trucks. Cooling systems were not pressurized and indeed it was the practice, at times, to run an engine without its radiator cap, depending upon circumstances! Early engines needed, and used, large quantities of water, consistently. A gallon or two of water acquired at the "Station" could well determine whether one reached Rawhide or not! A strategically placed station really did make all the difference in the world to early day travelers and, no doubt, must have even saved lives in certain circumstances.

In summation, the historic station site in Four Mile Canyon is somewhat of a historic treasure, able to speak to us from the distant past, letting us in on a portion of the story concerning the lives of the earlier people, should we care to look and listen.

The "Station" site should be enshrined, at least on paper and in our memories...

Reference Cited

McLane, Alvin
1982 Historic Themes. In Cultural Resource Overview, Carson City District, West-Central Nevada edited by Lorran S.A. Pendleton, Alvin R. McLane and David Hurst Thomas, pp. 151-184. Cultural Resource Series No. 5, Bureau of Land Management, Carson City.

The Cane Man Petroglyph, Esmeralda County, Nevada

Alvin R. McLane

Abstract

The Cane Man Hill site contains a 1.5-m-high boulder with seven extraordinary, variously positioned anthropomorphs. The central figure is a horned human walking with a shoulder-high cane. Immediately to the right is another cane-carrying figure. Humans with cane petroglyphs appear to be unrecorded elsewhere in Nevada, though they are found in other Southwest states.

Canes, hooked sticks and crookneck staffs are some of the terms used to describe these curved features. Hooked sticks are of two lengths. The hip-high ones were used for pulling lizards and animals from burrows and taller, shoulder- length ones were objects of great power. This paper discusses crookneck staffs described in the early ethnographic literature, those images found in rock art and the recent description of canes found in archaeological contexts.

Introduction

The Cane Man Hill site (BLM CrNV64-53-90) contains a meter-high boulder with seven variously positioned anthropomorphs (Figure 1). The central element is a horned human figure walking with a high cane. Humans with cane petroglyphs appears to be unrecorded elsewhere in Nevada though they are found in other Southwest states. The Cane Man is one of numerous pecked rock art panels located on Tertiary rhyolite flow rock faces and boulders along the south and southeast base of Cane Man Hill. Additional panels are located higher on a bench and are found in two drainages. The petroglyph district consists of 16 known loci extending north and south for about two kilometers (1.23 mi.). Two stacked rock geoglyphs, also, have been found among the petroglyphs.

Figure 1. Photograph of the Cane Man Petroglyph boulder.

The existence of petroglyphs in this part of Nevada was noted while searching records at the Nevada State Museum. Here was found a letter written by Ms. Page Edwards, sent to Don Tuohy in 1971, describing some of the petroglyphs observed in the district. The site was relocated during May 1988 when the Cane Man was found. Subsequent trips have turned up additional panels. This site is located within a large area where there are additional petroglyphs, rock shelters and burials, the extent and importance of which is only now being realized.

Cane Man Hill is an isolated land mass 4.34 km (2.7 mi.) long and 1.93 km (1.2 mi.) wide. The highest point is 1701 m (5,581 ft.) rising 335 m (1,100 ft.) above its base. Most of the hill is composed of Pliocene (Tertiary) rhyolite flows, upon which the petroglyphs are pecked. The north end of the hill is made up of Tertiary rhyolitic airfall tuff with an outcrop of Pliocene or Pleistocene basalt (Albers and Stewart 1972, Plate I). This district is arid with vegetation characteristic the Great Basin southern desert shrubs and an intermingling of the dryer Mojave Desert plants. The foothill vegetation consists of cholla, sagebrush species, rabbitbrush, four-wing saltbush, hopsage and desert thorn. The saltier valley soils hold vegetation consisting of four-wing saltbush, greasewood, rabbitbrush and seep weed.

The central cane man figure is 30 cm high and faces as if moving from left to right, as are most all of the other anthropomorphs. The human figures discussed here start at the top of the boulder and are numbered consecutively (Figure 2). (1) At the top is an image that may or may not be an anthropomorph. The pecking is now not clear enough to determine the exact image of the form. However, in the next row below are four well-delineated human forms. (2) The figure at the far left appears to be running in full stride with an atlatl about to be flung with the right hand. (3) Below and touching the above figure is a firmly standing individual in a frontal view facing slightly right. (4) The next individual is the Cane Man. He is a horned individual and proudly walks to the right with one knee and both elbows bent. One hand rests nonchalantly on the hip; the crook is held forward in a walking position. (5) The person to the right is spread-legged with a cane is held aloft. (6) In the third row is the frontal view of an individual holding a stick-like object skyward in the left hand. (7) The next figure is the largest individual of them all. He faces right, is slightly bent and is holding a circle in each hand - or is each hand stylized by a circle? (8) Between this individual's legs is a small, front-facing human, whose image fades off the rock at the hips. This last figure was covered by soil when the site was first visited and someone subsequently dug at the base of the rock to expose the anthropomorph.

This paper is presented relative to hooked sticks in Nevada and the Southwest (Figure 3) and trying to determine their significance to the Cane Man Hill motifs. In this endeavor a search was made in the early literature and to accounts in the ethnographic and archaeological records. As far as known, the Cane Man petroglyph site is the only one in Nevada depicting humans with a cane. It seems unknown from California where Laird (1976, 1984) discusses the shaman's crook of the Chemehuevi. The literature reveals that this rock image is known from sites in southern Utah, Arizona, Colorado and New Mexico.

Early References to Hooked Sticks

While among the Chemehuevis (the southernmost subgroup of the Southern Paiute) on February 26, 1776, Francisco Garcés states that "They all carried a crook besides their weapons." Editor Coues calls this instrument *alcayato*, a hook or crook, "the hooked stick which these and many other Indians habitually carried for the purpose of pulling rats, gophers, and other small game out of their holes. This instrument was about

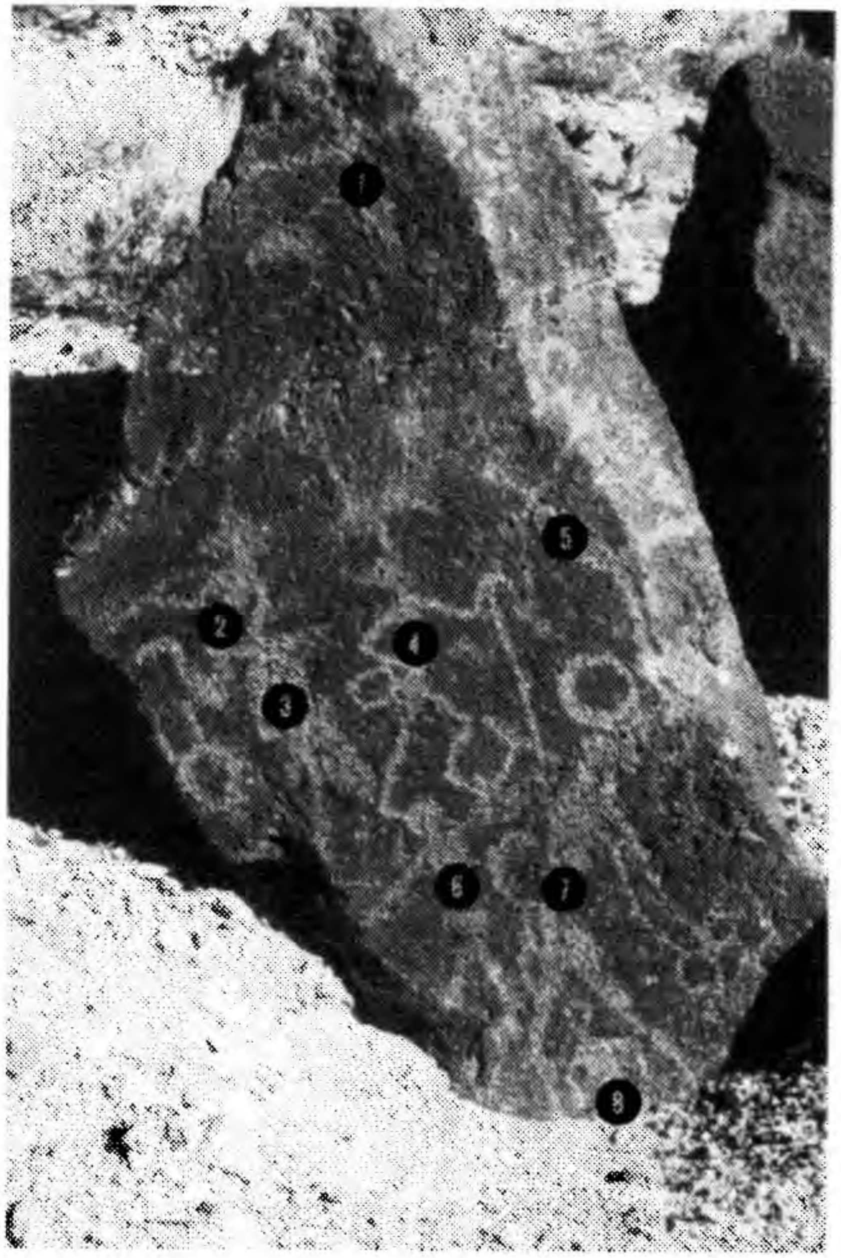


Figure 2. Numbered anthropomorphic sequence of the Cane Man boulder.

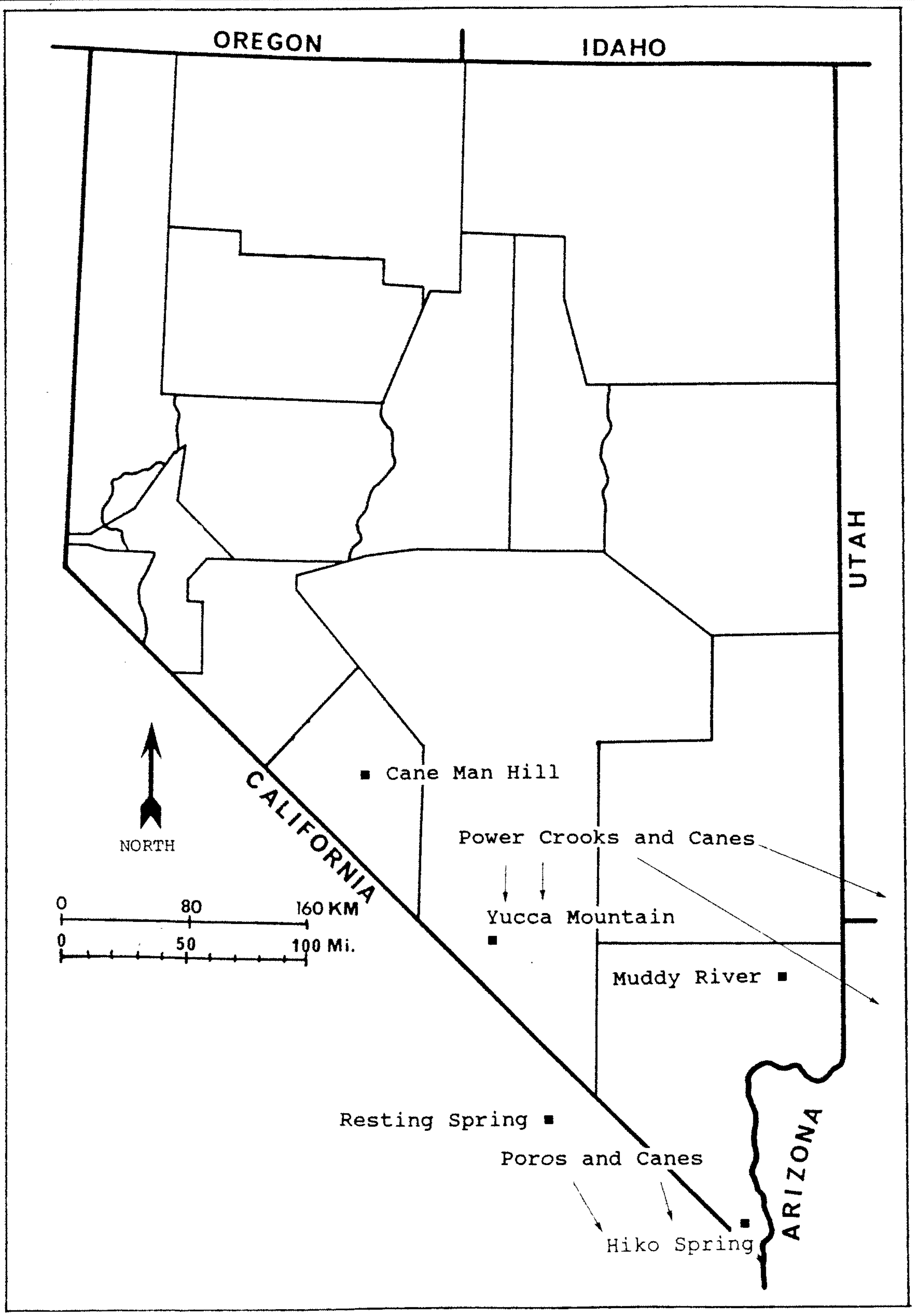


Figure 3. Location of the Cane Man Site and hooked sticks in Nevada.

the size of an ordinary walking-stick" (Coues 1900:225-226).

On the Old Spanish Trail, John C. Frémont, while on his second exploring expedition of the Western lands camped on the Muddy River, Nevada, on May 5, 1844, about 45 miles northeast of Las Vegas, Nevada. Here his camp was among the Las Vegas Paiute and he noted that:

> Many of these Indians had long sticks, hooked at the end, which they used in hauling out lizards, and other small animals, from their holes (Frémont 1845:267).

In 1848, after reaching the Amargosa River from the Mojave River on the Old Spanish Trail, Brewerton (1853:318), a West Point officer and landscape artist, riding with famous Mountain Man Kit Carson, remarked that he was in the Pah-Eutaw or Digger Indians territory [Las Vegas Subgroup of the Southern Paiute]. While at Resting Springs east of present-day Tecopa, California, he describes some Indians who:

> ...brought lizards with them into our camp...To obtain this description of food more readily, many of them carried with their arms a sort of hooked stick, not unlike a long cane, which they use in capturing them.

Brewerton includes a sketch of an Indian holding a lizard and a hooked stick slung against his shoulder. With the tip placed on the ground, the cane would appear to reach to the waist.

Canes in Archaeological Contexts

Prospector R.J. Penrose (1933) and partner found a crooked stick in a rock shelter on Aqueduct Mesa within what is now the Nevada Test Site during April 1933. Also noted in the cave were several pieces of grass matting and braided rawhide strips. He reports about the discovery:

> Rummaging around in one of these [caves] we unearthed a cane about four feet in length, turned over on one end similar to present day walking sticks. It must have been a tall Indian who used this one.

In 1987, a U.S. Geological Survey geologist located a rock shelter containing a crookneck staff on Shoshone Mountain also on the Nevada Test Site. Subsequent recording by Desert Research Institute archaeologists in 1993 described it as a 1.81-cm-long crooked ash staff (site 26NY8438). The distal end is whittled down, but not sharpened to a point. Also, located with the crook is a conical burden basket and a pine pitch sealed rock cache. A small willow twig from the site was radiocarbon dated at 130± 50 years B.P. Though the site is within the defined Western Shoshone territory, construction techniques of the basket suggest Southern Paiute manufacture (Buck 1994).

During January 1981 Musser-Lopez (1983) describes a crookneck stick from the Providence Mountains, San Bernardino County, California, believed to be a Chemehuevi shaman por*o*. The item was found in a rock shelter in a packrat's midden. Its length is 131 cm. The only other artifact from the shelter is a dot-in-cap, flange and solder-seamed tin can (ca. 1900).

In 1980, a crookneck wooden staff was discovered under an overhang in a drainage of Grand Gulch, San Juan County, Utah. It is an isolated find and measures 143 cm long. The mid-section, especially, is well worn. Wooden staffs of various shapes and sizes have been documented in the archaeological record of the Southwest. The Grand Gulch item is similar to the Northern Arizona basketmaker staffs, especially the one from the White Dog Cave Basketmaker burial (Shearin 1990:111, 115).

Seldomridge (1988) reports the finding of a "harvesting stick," site 26CK3936, near Hiko Spring, southern Nevada in 1988. It is a crookneck shaft found in a small rockshelter along with three arrow shafts. Wear is on the inside of the hook which is consistent with the purpose of extracting chuckwallas or rodents.

Canes in Rock Art Contexts

The Esmeralda County depictions humans with canes in rock art appear to be unique in Nevada and California. They are commonly found in rock art to the east in Arizona and Utah and on into Colorado and New Mexico. In Shearin's (1990) report on the crookneck staff from San Juan County, Utah, she discusses two nearby petroglyph panels. Three miles away is a panel located at a Pueblo II - III ruin showing fertility symbolism associated with a staff motif. Another panel six miles away shows a walking anthropomorph holding a staff with both hands.

A cane-length crook, held by one hand, is displayed in a Gila Petroglyph Style panel on South Mountains, Arizona (Schaafsma 1980:Fig. 62). In Wupatki National Monument, Arizona, a pecked panel depicts 11 humans led by a front-facing, staff-holding figure (Schaafsma, 1993:24). In the same region, Pilles (1993:9) shows another image of a figure holding a cane with both hands.

A jovial rock art image long known as a flute player and seducer of women, whose Hopi name is Kokopelli, is also a cane bearer. This figure is prominent throughout the Southwest. The flute player appeared in Anasazi rock art about A.D. 500 and had disappeared with the Hohokam about 800 years ago (Slifer and Duffield 1994:3-4). There are numerous disguises of Kokopelli in Slifer and Duffield (1994). Many rock art panels depict him with a cane. The westernmost rock art portrayal of Kokopelli occurs as a lone image in the Valley of State Park, Nevada.

Inferences

Stewart's (1941:369; 1942:315) cultural elements of the Northern Paiute and Ute-Southern Paiute Indians do not include crooked sticks. He notes that rodents were taken from burrows by twisting a stick into the skin and that a shaman's paraphernalia is a stick, without further elaboration. Fowler (1995:114) states that the hooked sticks are uniquely Mohave Desert, "specialized tools primarily correlated with southern desert [animal] resources." The Nevada Test Site crooks and the Cane Man Hill petroglyph cane images are within the transition desert vegetation north of the Mojave Desert environment.

Among the Chemehuevi shaman, Laird (1976:31) says that "His one indispensable piece of equipment was his por*o* (or poor*o*), a rod shaped like a shepherd's crook. This was an archetypal object of great power, known in many ages and to many cultures." She adds: "...it is not to be confused with Piir*i*, a crooked stick upon which an old man might lean in his infirmity." In a conversation with Ms. Laird, Musser-Lopez (1983:263) gathered information that it was perfectly logical for a shaman to trust his power staff to a packrat's nest, when he felt he was close to death. This would be a logical thing to do rather than have it burned with the rest of his possessions or pass on to untrusty hands.

Leaving a cane to survive upon the owner's impending death is analogous to an informant's story about an Indian cane that was left by a gate leading to a house in Beatty, Nevada, during the early part of this century. An elderly Indian came into town requesting a meal one evening and the straight-stick cane was found by the gate the next morning, left as an expression of appreciation (Ert Moore, personal commun. 1985). In other regions of the Southwest, though, wooden crooks have been placed with burials. In Pueblo Bonito in Chaco Canyon, New Mexico, more than 300 canes were found in a room containing a high-status burial (Slifer and Duffield 1994:146).

In connection with the staff in San Juan County, Utah, Shearin (1990:120) makes this comment: "Rock art motifs suggest a ritual function of fertility and status for the staff and historic Pueblo use of similar staffs includes both themes."

Elsewhere in Southwest rock art, the Navajo ye'i (holy person) is shown with a staff. Schaffsma (1972:33) reports that, "Both sexes may have streamers hanging from their arms and hold staffs, dance wands, or corn in their hands..." Canes also decorate Anasazi region-ceramics. Hohokam cane people are pictured on pottery from Casas Grandes, Arizona (Slifer and Duffield 1994:32).

Cane-shaped sticks have also been used in past agricultural applications by making holes to insert seeds (Shearin 1990:116-117). Crookneck staffs associated with Basketmaker burials in northern Arizona have assigned dates of A.D. 1 to 400. Ceremonial canes as a cultural item spread from the Mesoamerican area into Chaco Canyon, New Mexico, about A.D. 1000. It has been documented that later, during the Aztec Period and post-Spanish conquest, a long-distance trade association developed between the Aztec Pochteca and the Pueblo people of the American Southwest. The walking sticks, or crookneck canes, carried by these traders were held in high regard (Shearin 1990:120; Slifer and Duffield 1994:7).

In the southwest Great Basin region there appears to be two predominant sizes of cane-shaped sticks used mainly for two different purposes. Those that are hip-high, around 120 cm and less, were used for taking lizards and rodents from burrows. Those that are longer reaching head-high, from about 140 cm to 180 cm in length, were either power implements, signifying ones high status, fertility symbols or signs of a long journey.

Based on the archaeological and ethnological evidence from regions to the south and east, it is surmised that the Cane Man Hill petroglyph canes represents a long distance of travel associated with a person or persons of high status. Like the Cane Man Hill panel, the staff is generally shown in other petroglyphs carried by its mid-section, which is analogous to the worn sections found in physical specimens in archaeological contexts. The significant consistency not addressed in this paper is why are the opens crooks, invariably shown, facing away from the cane bearers in rock art images.

Acknowledgments

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References Cited

Albers, J.P. and J.H. Stewart
1972 Geology and Mineral Deposits of Esmeralda County, Nevada. *Nevada Bureau of Mines and Geology* Bulletin 78.

Brewerton, George D.
1853 A Ride with Kit Carson Through the Great American Desert and the Rocky Mountains. *Harper's New Monthly Magazine* 7(3):306-334.

Buck, Paul E.
1994 Report on Site 26NY8438, Nevada Test Site, Nye County, Nevada. Report prepared for U.S. Department of Energy by Quaternary Sciences Center, Desert Research Institute, Las Vegas, Nevada.

Coues, Elliott
1900 *On the Trail of a Spanish Pioneer. The Diary and Itinerary of Francisco Garcés...* in Two Volumes. New York, Francis P. Harper.

Fowler, Catherine S.
1995 Some Notes on Ethnographic Subsistence Systems in Mojavean Environments in the Great Basin. *Journal of Ethnobiology* 15(1).

Frémont, John C.
1845 *Report of the Exploring Expedition to the Rocky Mountains in the Year 1842, and to Oregon and North California in the Years 1843-'44.* Blair and Rives, Printers, Washington (Ho. of Rep. 28th Cong., 2nd Sess., Doc. No. 166).

Laird, Carobeth
1976 *The Chemehuevis.* Banning, Malki Museum Press.

Laird, Carobeth
1984 *Mirror and Pattern, George Laird's World of Chemehuevi Mythology.* Banning, Malki Museum Press.

Musser-Lopez, R.A.
1983 Yaa?vy's Poro: The Singular Power Object of a Chemehuevi Shaman. *Journal of California and Great Basin Anthropology* 5(1 & 2):260-264.

Pilles, Peter J., Jr.
1993 The Sinagua, Ancient People of the Flagstaff Region, in David G. Noble (editor), *Wupatki and Walnut Canyon.* Sante Fe, Ancient City Press.

Penrose, R.J.
1933 Forty Mile Canyon District In Southern Nevada Desolate But Interesting Writer Asserts. *The American Weekly*, Sunday magazine of *San Francisco Examiner*, May 27.

Schaafsma, Polly
1980 *Indian Rock Art of the Southwest.* Albuquerque, University of New Mexico Press.

1993 Rock Art at Wupatki, in David G. Noble (editor), *Wupatki and Walnut Canyon.* Sante Fe, Ancient City Press.

Seldomridge, Jeffry S.
1988 [Archaeological Survey of Three Proposed Material Pits Along SR 163 West of Laughlin, Nevada]. Nevada Department of

Transportation Cultural Resources Report NDOT-CL030-88P.

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

Slifer, Dennis and James Duffield
1994 *Kokopelli (Flute Player Images in Rock Art)*. Santa Fe, Ancient City Press.

Stewart, Omer C.
1941 Culture Element Distributions: XIV, Northern Paiute. *Anthropological Records* 4(3).

Stewart, Omer C.
1942 Culture Element Distributions: XVIII, Ute-Southern Paiute. *Anthropological Records* 6(4).

Twisted Technology: Cordage from Pintwater Cave

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Introduction

Pintwater Cave is a large, stratified, dry cave on the west side of the Pintwater Range, near Indian Springs, Nevada (Figure 1). The Pintwater Range consists largely of dolomites and limestones of lower Paleozoic age. The cave is situated on a west facing dolomite outcrop at 4,150 ft (1,265 m). While the site is barely within the hydrographic Great Basin, vegetation is typical of Mojave Desert scrub communities. Work at Pintwater Cave was begun more than 30 years ago with the support of Herschel C. Smith, a wealthy building contractor from Los Angeles, who was interested in finding "Early Man" sites. Between October 1963 and May 1964 a group of archaeologists, directed first by Margaret Susia, and later by Charles Rozaire, conducted excavations on weekend trips to the remote site. They planned to completely excavate the site, but worry about crew safety caused the project to be shut down after only one test unit and two "pockets" were completed. The artifacts from this excavation were stored in the Los Angeles County Museum of Natural History and later in the Southwest Museum. Analysis of this assemblage was published by Buck and DuBarton (1994). The Desert Research Institute began a long term research program in and around the cave in 1993 and excavated six test units there in the winter of 1995/1996. Materials from these modern excavations, combined with those recovered more than thirty years ago, provide abundant data about Middle Archaic technology (DuBarton 1996). The assemblage is dominated by multi-component wooden dart shafts and stone dart points. Bow and arrow components and points are also found at the site, but in much smaller frequencies than the Middle Archaic materials. Radiocarbon dates have been obtained from charcoal, dart shafts, sheep dung, and packrat middens found inside the cave. Several of the packrat midden and sheep dung dates predate human occupation of the cave, but dates on material deriving from artifact bearing layers range from ca 3,500 to 9,500 radiocarbon years before present (Buck et al. 1997; Berger et al. 1965a, 1965b). The oldest date in this sequence may be questionable because it is unclear whether natural actions such as burning and packrat activities have affected the cultural layer associated with this date (Buck et al. 1997). According to correspondence stored with the materials excavated in the 1960's, a wooden dart shaft yielded a date of 6,500 B.P. However, no record of the laboratory number has been found. If this date can be verified, it may be the earliest directly dated dart in the Great Basin (Buck and DuBarton 1994).

A major goal of recent research at Pintwater Cave was to obtain data relating to subsistence practices during the poorly understood Archaic period (Buck et al. 1997:11). While the fibrous artifacts found in the cave are mostly fragmentary, they provide additional data about subsistence practices within an assemblage dominated by projectile points and wooden dart and arrow components. These analyses focused on the

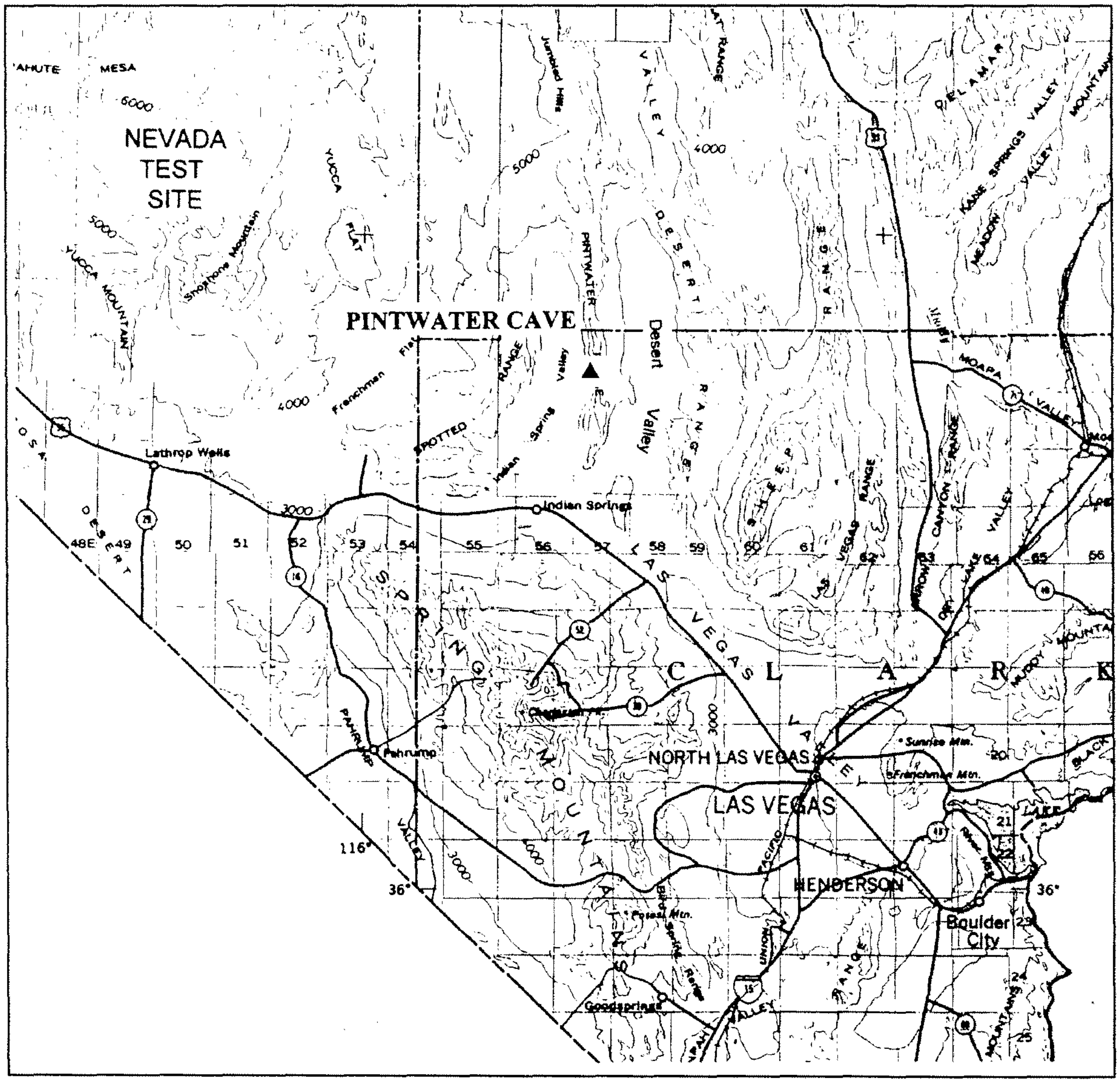

Figure 1. Location of Pintwater Cave and other topographic features in the vicinity.

material, technologic and site formation processes affecting the cordage assemblage. A tentative explanation for the function of some of the materials is also attempted.

The term "cordage" is used here as a general term for any kind of rope, string, twine or braided fibers twisted together to make the cord. Cordage had a broad range of usage in prehistoric and ethnographic Great Basin cultures (Aikens 1970; Heizer and Krieger 1959; Jennings 1957; Kelly and Fowler 1986; Wheat 1967). At Lovelock Cave, Loud and

Harrington classified cordage in three broad categories. These include: 1) rope, which is made of coarse materials like rushes or grass, 2) twine, which is made of fine vegetable fibers, and 3) braid. Rope ranges from 3 to 40 mm in diameter, while twine does not exceed 7 mm and is usually much less (Loud and Harrington 1929). Braid consists of three or more strands of braided, untwisted plant material. This classification provides a useful tool for organizing the Pintwater cordage.

This research focuses on fibrous materials found during the 1995/1996 excavations, particularly 51 pieces of twine. Although not included in this study, twenty additional cordage fragments were found during processing of soil samples. These are too fragmentary to provide any useful information. Excavation also yielded some unprocessed plant materials. Some of these may be potential sources of raw materials for cordage or other artifacts made from fibers. However, they do not appear to be the source material for the twine described here.

Raw Material

Twenty-five fragments of unprocessed yucca plants were found in Pintwater Cave and preliminary examination of the cordage assemblage suggested that yucca provided the raw material for the twine found there. Yucca leaves that have been pounded to separate the pith from the individual strands were found (Plate 1) as well as other pieces of yucca that may derive from other parts of the plant. The spongy texture of these materials may indicate that they are from the body or roots of the yucca plant. A sandal made of yucca with a similar texture was recovered in the Yucca Mountain project area on the Nevada Test Site (Pippin et al. 1982). Yucca roots also contain saponin and were widely used as a soap by many Great Basin Indians (Kelly and Fowler 1986). Various species of yucca fibers are easily available to the residents of Pintwater Cave. *Yucca schidigera* is common to rocky benches and bajadas of the eastern Mojave Desert, while *Yucca bacata* is abundant on the upper bajadas of the pinyon-juniper belt of limestone mountains (Jaeger 1979:13-20). Beatley indicates these two species are extremely abundant on the Nevada Test Site and on the southern face of the Spring Mountains (1976:269-270). Ethnobotanical studies suggest a wide range of utilitarian uses for the strong yucca fibers including string, rope and sandals (Bean and Saubel 1972; Romero 1954).

However, when the 51 twine fragments were examined microscopically it became apparent they had all been produced from the same kind of raw material and that it was not yucca. Yucca appears brown and fuzzy under magnification, yet the Pintwater specimens are all light in color, are very fine, and have smooth shafts. The twine appears to be made of either hemp (*Apocynum* sp.) or milkweed (*Asclepias* sp.) (Dave Rhode personal communication 1997) although final identification awaits expert examination. These same plant materials are found at other cave sites in the Great Basin but it is unclear if they were chosen because of their easy availability or if they were preferred because of qualities such as strength, durability or healing properties (Jennings 1957:228).

Different species of hemp are found within a wide range of elevations in washes, at disturbed sites, and near springs, while milkweed is found at mid to lower elevations along sandy washes within a broad area that includes the southern Nevada Test Site and Desert Valley located directly east of the Pintwater Range (Figure 1) (Beatley 1976:269-270). Hemp and milkweed require different processing methods than those used for yucca, which is pounded to separate the fibers. For hemp and milkweed, a retting or shredding process is used to separate long fibers from the pulpy portion of the plant. When the fibers are separated they can be spun into individual strands and twisted to make the twine. Ethnographic evidence shows that both hemp and milkweed were used by the Southern Paiute to produce two- or three-ply cordage. Large nets for hunting rabbits and burden nets were often made of such cordage (Kelly and Fowler 1986:375).

Preservation Factors

The actions of raptors and rodents upon the archaeological materials at Pintwater Cave have made interpretation difficult. Many of the cordage specimens found at the cave appear to have been digested by owls or other raptors and then defecated (Plate 2). The result is "wads" of defecated cordage that are mixed with other waste such as animal bones. Separating these materials to identify technology or diameter was not possible in all cases. Thus, only 36 of the pieces could be assigned a twisting orientation, and the ply could be assigned to only 41 specimens. There is also evidence that rodents and other animals, including humans, have turbated the soil within the cave so that materials may have been moved from their original locations.

Technology

Once separate strands of plant material are obtained, they can be twisted together to produce various kinds of twine, rope or braid. The pieces of twine found at Pintwater Cave were produced using two styles of twisting. These are commonly termed S (or right-handed) twist and Z (or left-handed) twist (Emery 1952) and can be identified from the direction in which the twisting is oriented. Emery differentiates the two styles in the following way: "A yarn or cord is S-twist if, when held in a vertical position, the spirals conform in direction of slope to the central portion of the letter 'S' and Z-twist if the spirals conform in direction of slope to the central portion of the letter 'Z' "(1952:261). These two different styles are produced when the string maker twists the strands either clockwise or counterclockwise (Plate 3). By definition, if a cord is S twisted then the individual strands are Z spun and if the cordage is Z twisted then the strands must be S spun. Margaret Wheat describes the method used by Northern Paiute to produce a fine string for nets. First a piece of Indian hemp is split and the many fibers separated. Then two bundles of fiber are separated and are twisted together using a downward motion along the leg. When these are completely twisted, they are joined to make a 2-ply cord by twisting the plies together in the opposite direction, or upward along the leg (Wheat 1967:55-95).

Because many of the specimens were so fragile, twisting pattern could be evaluated for only 36 of the 51 pieces of twine considered as part of this study (Plate 2). Of these, 29 (80%) were made using Z spun S Twist technology and seven (19%) were made using S spun Z Twist (Table 1). These percentages are similar to those discussed for Lovelock and Aetna Caves where most of the twine described is S twisted (Loud and Harrington 1929:79). The cordage recovered from Humboldt Cave also appears to be of this type, although no in depth analysis of the cordage was attempted. Heizer and Krieger state that "...their nature and variety is analogous to those of Lovelock Cave" but give no further details (1959:62). At Danger and Jukebox

Caves in Utah, both kinds of twisting are found. There, the two twists have an approximately equal distribution (Jennings 1957:230). Similar patterning typified the Hogup Cave assemblage. Of the 1,242 pieces of cordage analyzed, 575 are S-twisted and 667 are Z-twisted (Aikens 1970). At Newark Cave and the Conoway Shelter in eastern Nevada, the few fragments recovered were all S-spun and Z-twisted (Fowler 1968; Fowler et al. 1973).

of the 51 cordage fragments could be assigned a ply variable. Thirty-nine of these are two strands, while only two specimens are single strands. Thus, 95% of the identifiable fragments are of 2-ply manufacture (Table 1).

No 3-ply cords were noted. At Newark Cave and Conoway Shelter, in eastern Nevada the majority of the specimens were also 2-ply, although more precise data is lacking (Fowler 1968:25; Fowler et al.1973). At Etna Cave, Wheeler describes a similar situation where 2-ply cordage is the most common type (Wheeler1973). At Danger Cave, where 578 pieces of plant fiber cordage were analyzed, 449 (78%) were 2-ply, although 1-, 3- and 4-ply cords were also identified (Jennings 1957:234). The frequencies of 2-ply cordage are even higher at Hogup Cave (Aikens 1970). There, only 14 1-ply and 21 3-ply pieces of cordage were found during the analysis of 1242 pieces of cordage. Thus, 97% of the cordage manufactured for use by the Hogup Cave occupants is of 2-ply construction.

1 Ply	**2 Ply**	**Indeterminate**	**Total Measurable**
2 (5%)	39 (95%)	10	41 (100%)
Z Twist	**S Twist**	**Indeterminate**	**Total Measurable**
7 (19%)	29 (81%)	15	36 (100%)
Total pieces recovered			**51**

Table 1. Technological attributes of Pintwater Cave cordage fragments.

A comparison with the cordage assemblage found at Gypsum Cave, a site that shows many similarities with Pintwater Cave (Harrington 1933), indicates S and Z twist technologies may have been material dependent. There, Harrington divides the cordage according to rough material categories that include yucca, hemp, bark and cotton. The majority of the cordage made from yucca fiber is described as "two-strand right spiral" although the cordage made from *Apocynum* or Indian hemp and from cotton is predominantly one and two-strand, left spiral (Harrington 1933: 158-161).

Other technological similarities are present at many Great Basin caves. At all of the sites surveyed for this paper the two-stranded twines predominant. At Pintwater some of the specimens were too degraded to gauge, but 41

The Pintwater specimens differ from those recovered at other locations in terms of diameter measurements. More than 80% of the Lovelock Cave specimens were in the 4 to 6 mm diameter range, while most of the Pintwater specimens cluster in a range from 1 to 3 mm. Harrington provides a range of diameters of 1/16 to 1/4" for Gypsum Cave but states that the most common diameter is about 1/8" (1933:159). These measurements translate to a range of 1.5 to 6.4 mm with the most common diameter at about 3.2 mm. At Danger Cave string diameters range from < 1 mm to 7 or 8 mm, but the most common measured from 2 to 5 mm (Jennings 1957:229). These diameters correlate well with those identified for the Pintwater Cave cordage.

Six of the Pintwater cordage fragments exhibit knots. Mesh knots, slip knots, square knots, and overhand knots were identified (Plates 4 and 5). One specimen featured four knots tied in one piece of twine (Plate 5). A mesh knot and several overhand knots are tied so as to produce two loops. The knots are located so that two loops extend from a knotted junction. Similar pieces of cordage combining netting and overhand knots were found at Lovelock Cave, but no functional interpretations were attempted by the authors.

Conclusions

Explanations for the use of yucca fibers can be found within the archaeological and ethnographic data and include twine and rope manufacture and sandal construction and repair (Kelly and Fowler 1986; Romero 1954).

Consistency in the raw materials, production techniques and diameters of the cordage fragments found at Pintwater Cave suggest that most of the specimens were produced for a similar use or that they derive from only one or two specimens. All of the cordage specimens appear to be made of milkweed or Indian hemp, and most (95%) were produced using Z spun S twisted technology from 2 strands of raw material. They all fall within a diameter range of from 1 to 3 mm. Archaeological evidence from other cave sites in Nevada and Utah where more complete specimens have been found indicates that similar styles and diameters of twine were produced to make nets during a long period of prehistory. Loud and Harrington describe a large variety of netting recovered from Lovelock Cave (1929:78-91). The specimens are generally of a smaller mean diameter than the fragments recovered at Pintwater Cave. Such diameters are typical of fishing nets like those found at Lovelock Cave, while the larger diameter cords are generally used to make hair nets and rabbit nets.

Ethnographic evidence indicates that S-twisted twine of similar diameters to those recorded at the cave were used in the production of various kinds of basketry, sandals, mats, clothing, traps, and netting. However, since no fragments of basketry, sandals, mats or clothing was found at the cave it is likely that the cordage was used in hunting traps or nets. The hunting of small mammals such as jackrabbits (*Lepus californicus*) was an important aspect of ethnographic Great Basin subsistence practices and nets of more than 300 feet in length were used during rabbit drives (Fowler 1986:Fig. 8; Wheat 1967:55-59). Given the ubiquity of rabbits in the southern Great Basin they were likely a hunting staple over thousands of years.

Because of biological degradation and the fragmentary nature of the cordage specimens found in Pintwater Cave it is difficult to make inferences about how they were deposited in the cave or how they functioned within prehistoric subsistence systems. Buck has provided several alternative hypotheses, not mutually exclusive, about the formation of the artifact assemblage in the cave, but cautions that the data are not extensive enough to support any of them at this time (Buck et al.

1997). These proposed hypotheses include:
1. ceremonial use of the cave, where Native Americans visited the cave to conduct religious rituals,
2. sporadic short term use of the cave for construction and/or repair of hunting equipment,
3. a bighorn sheep kill location, where sheep were ambushed, butchered, and then returned to a main camp somewhere else,
4. use of the cave as a habitation site by family groups during repeated visits to the area.

The limited data obtained so far does not support the idea that the site was a sheep kill location or that it was a habitation site. Very few sheep bones have been found in the cave and none of these exhibit butchering marks, and the broad categories of artifacts typical of habitation sites have not been found (Buck et al. 1997:85-88). At Pintwater Cave, the presence of small fragments of cordage, many of which are burned, may be explained in terms of either of the first two hypotheses. The pieces may have been brought to the cave and intentionally burned as part of a ceremony or they may represent hunting gear that was cached in the cave for later use and then burned as a result of natural, non-cultural, actions upon the deposits. Neither of these hypotheses can be confirmed without additional data. The main value of the perishable artifacts recovered from Pintwater Cave so far lies in comparative studies. Perishable materials have been recovered from many caves in the northern and central Great Basin, but relatively few cave sites have been found in the southern Great Basin/Mojave Desert region. Comparison of the Pintwater Cave artifacts with those found at sites such as Gypsum and Newberry Caves may enable us to better understand Middle Archaic chronology, subsistence and ideology.

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References

Fowler, Don D, David B. Madsen and Eugene M. Hattori
1973 The Conoway Shelter. In The Prehistory of Southeastern Nevada. *Desert Research Institute Publications in the Social Sciences* No. 6, Reno, NV.

Heizer, R.F. and A.D. Krieger
1959 The Archaeology of Humboldt Cave: Churchill County, Nevada. *University of California Publications in American Archaeology and Ethnology* XLVII:1-189, Berkeley.

Harrington, M.R.
1933 Gypsum Cave. *Southwest Museum Papers* No. 8. Los Angeles.

Jaeger, Edmund C.
1979 *Desert Wild Flowers*. Stanford University Press, Stanford.

Jennings, J.
1957 Danger Cave. *University of Utah Anthropological Papers 27*. University of Utah Press, Salt Lake City.

Kelly, I.T. and C.S. Fowler
1986 Southern Paiute. In *Great Basin*, edited by Warren L. D'Azevedo, pp. 135-148. Handbook of North American Indians, vol. 11, William G. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Loud, L.L. and M.R. Harrington
1929 Lovelock Cave. *University of California Publications in American Archaeology and Ethnology* 25(1):1-183.

Pippin, L.C., R.L. Clerico, and R.L. Reno
1982 *An Archaeological Reconnaissance of the NNWSI Yucca Mountain Project Area, Southern Nye County, Nevada.* Desert Research Institutue Social Sciences Center Publication No. 28, Reno.

Romero, John Bruno
1954 *The Botanical Lore of the California Indians with Sidelights on Historical Incidents in California.* Vantage Press, Inc. New York.

Stoffle, R.W., Michael J. Evans, David B. Halmo, Molly E. Dufort, and Brian K. Fulfrost
1994 *Native American Cultural Resources on Pahute and Rainier Mesas, Nevada Test Site*. Desert Research Institute Technical Report No. 84.

Wheat, Margaret M.
1967 *Survival Arts of the Primitive Paiutes*. University of Nevada Press, Reno, NV.

Wheeler, S.M.
1973 The Archaeology of Etna Cave. Don D. Fowler ed. *Desert Research Institute Publications in the Social Sciences* No. 7, Reno, NV.

Zigmond, Maurice L.
1941 *Ethnobotanical Studies Among California and Great Basin Shoshoneans*. Unpublished Ph. D. Dissertation. Yale University, New Haven, CN.

Plate 1. Pounded yucca leaves found during excavation.

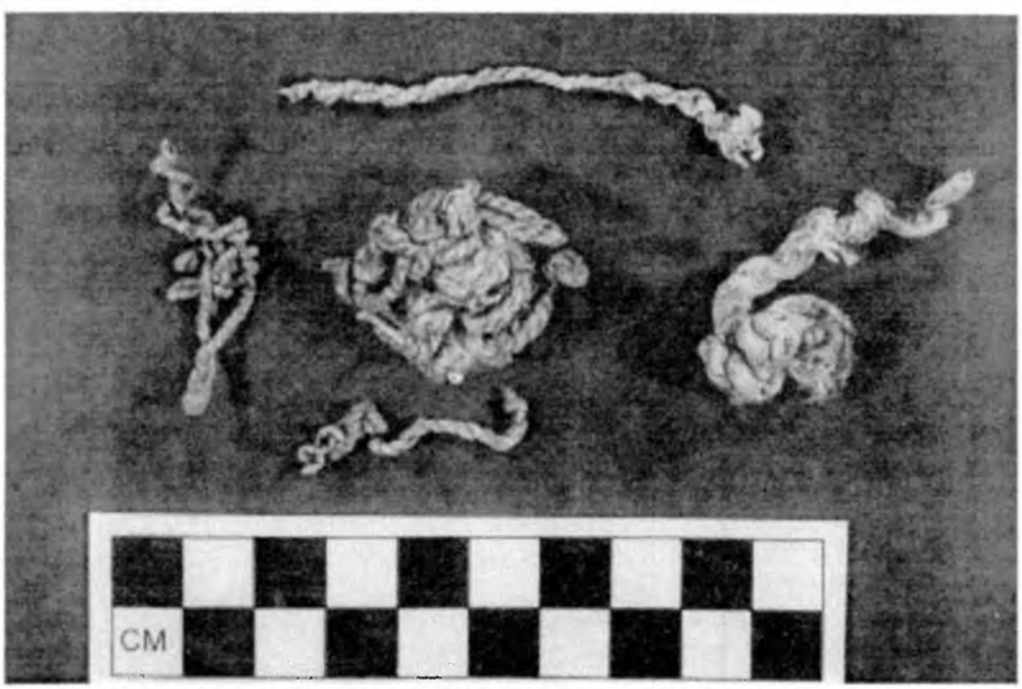

Plate 2. Pieces of twine found in the cave. Some have been digested by raptors.

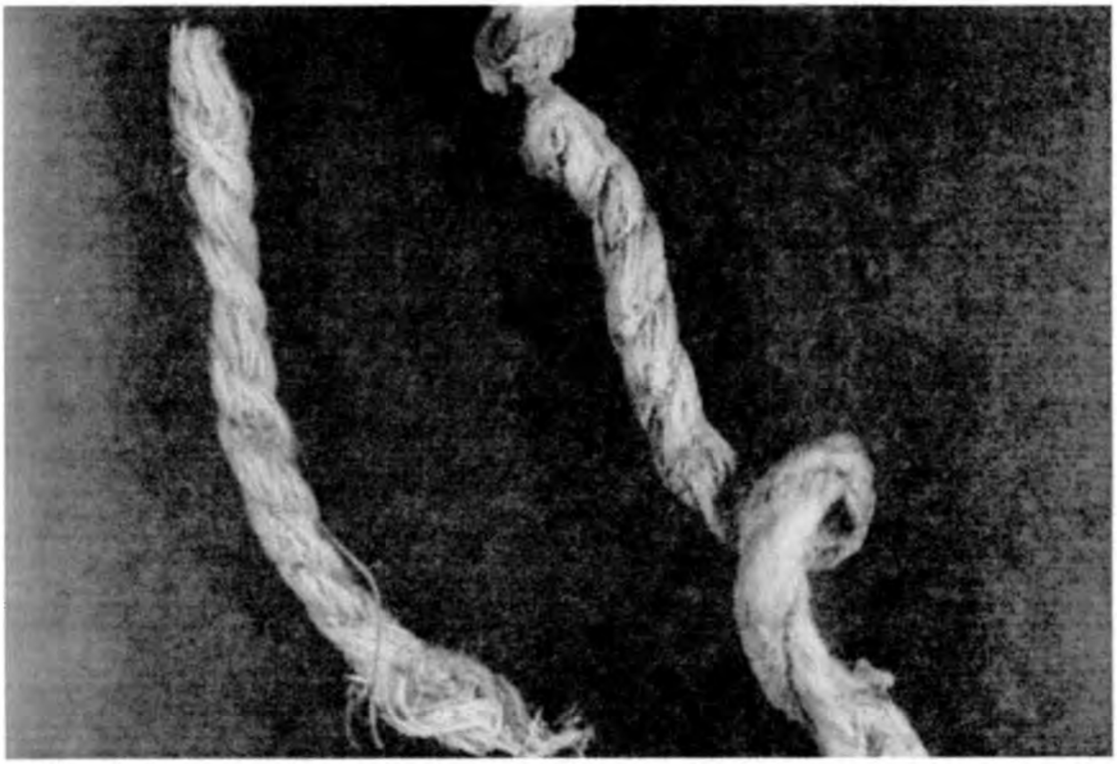

Plate 3. S and Z twisted twine fragments from Pintwater Cave.

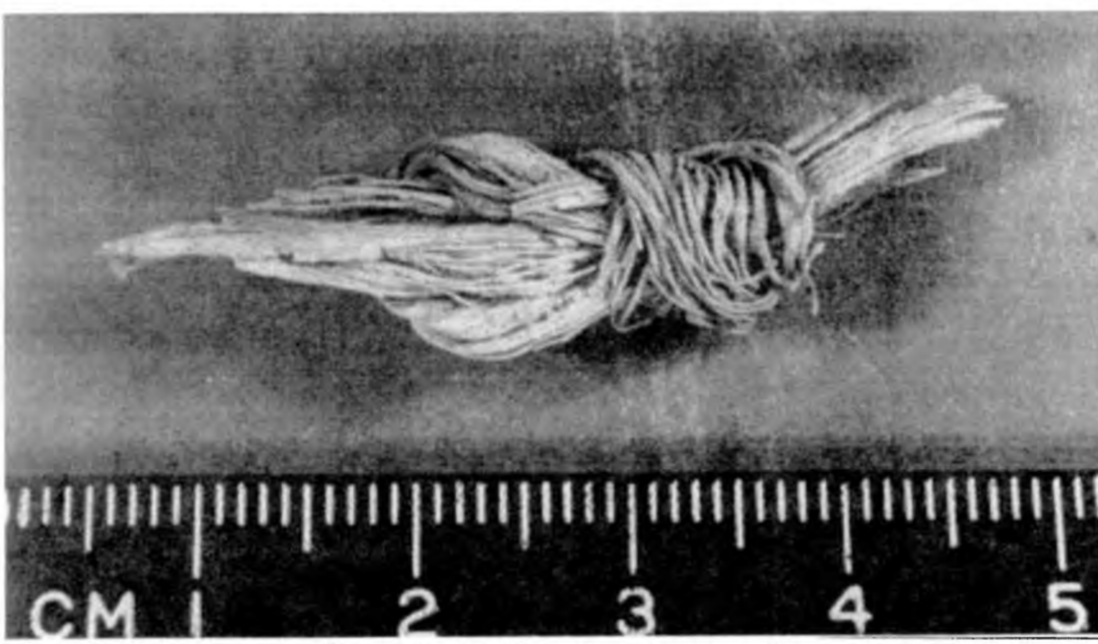

Figure 4. Overhand knot in yucca fiber.

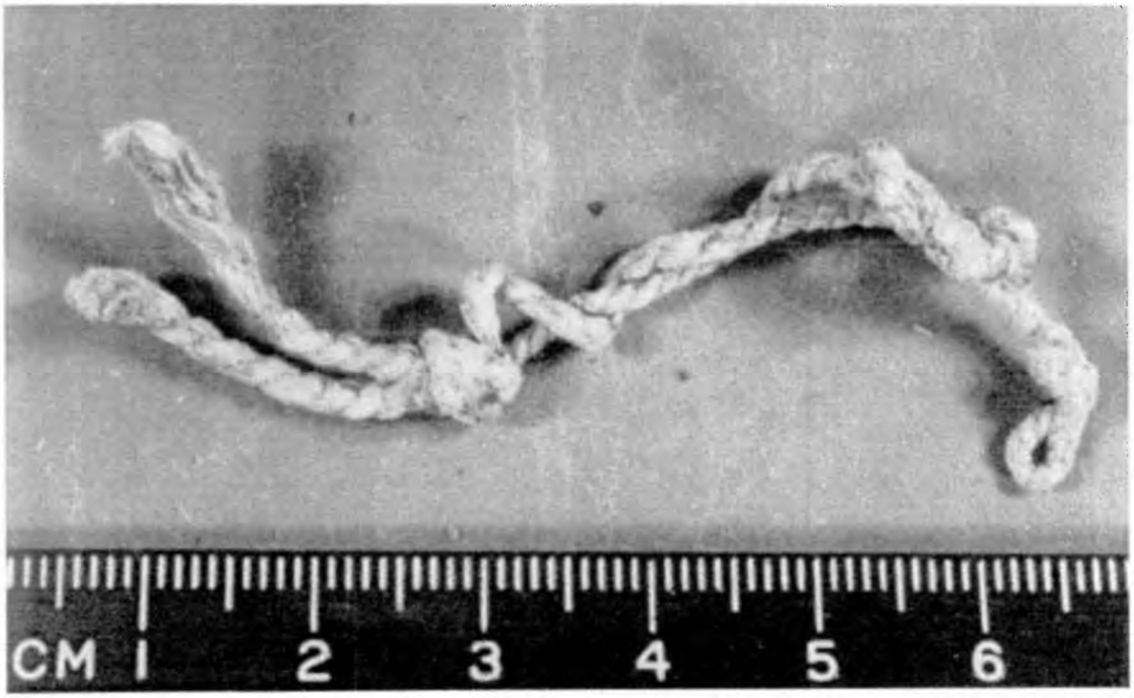

Figure 5. Mesh knot and overhand knots tied to produce loops.