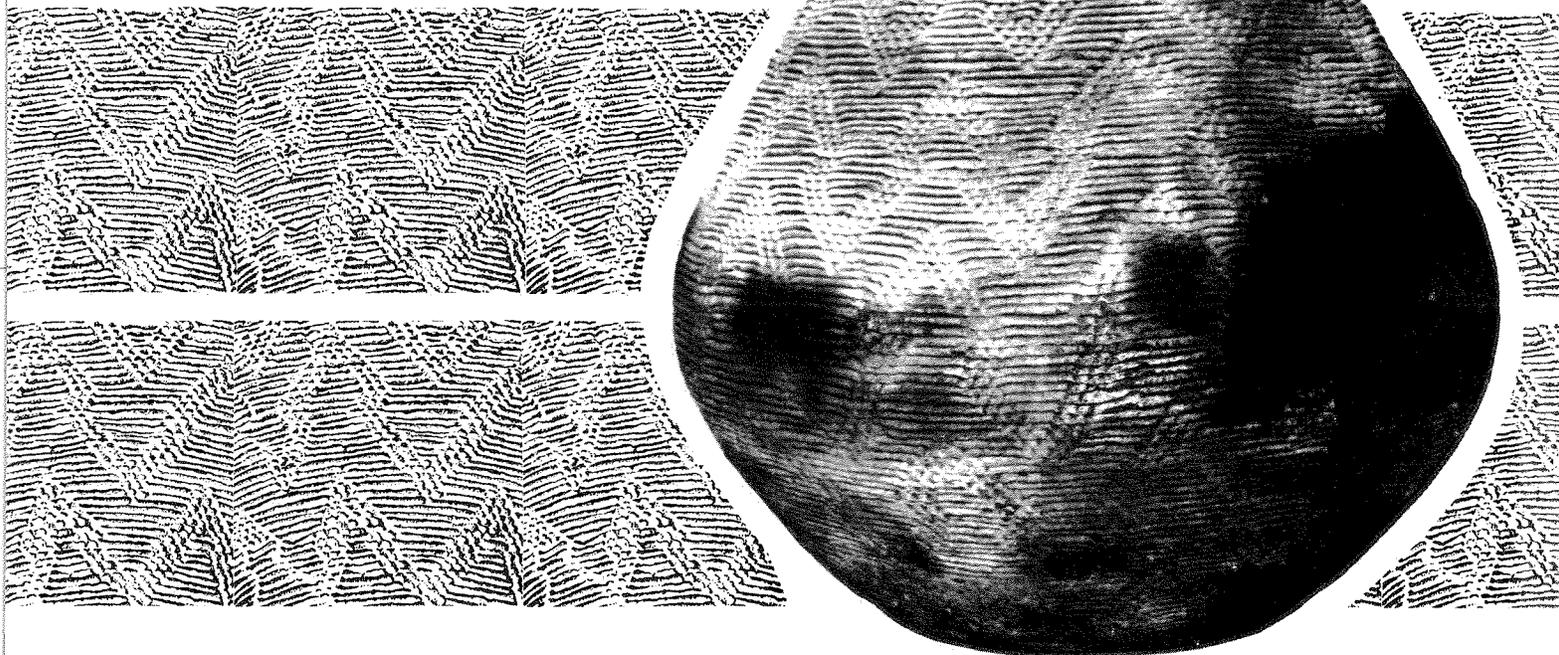


**Adaptive Storage
and Caching Behavior
in the Prehistoric Southwest**



**AN ISOLATED STORAGE VESSEL AT SITE 42SA20779
IN GLEN CANYON NATIONAL RECREATION AREA**

*National Park Service
Midwest Archeological Center*

**AN ISOLATED STORAGE VESSEL AT SITE 42SA20779
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ADAPTIVE STORAGE AND CACHING BEHAVIOR
IN THE PREHISTORIC SOUTHWEST**

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ABSTRACT

This report documents the excavation and analysis of a large, isolated ceramic vessel discovered in the spring of 1988 in the Hite Marina area of Glen Canyon National Recreation Area, Utah Project #89-NA-051N. Several college students from Western State College in Colorado (Dean Brian, Matt How, Cathy Arvey, and Mike Donaldson) were hiking in the area when Dean Brian discovered the pot. Aware of the possible significance of such a find, Matt How immediately contacted Park Archeologist Kris Kincaid and informed her of the vessel's location. Matt later returned with his family, Micky and JoNell How, when archeologists Kincaid and Ralph Hartley of the Midwest Archeological Center visited the site. An assessment of the vessel, its location and condition resulted in plans for its removal by Midwest Archeological Center personnel scheduled to work in Glen Canyon during the summer of 1988. The How family returned again with archeologists to help excavate the pot from site 42SA20779 on June 23, 1988.

Such isolated artifacts have often been ignored by archeologists because they were thought to provide little insight into the patterns of aboriginal life. Conversely, analysis of this vessel was conducted within a framework which allows the vessel to be placed within a context of adaptive storage and caching behavior for the prehistoric Southwest. These results are achieved by careful examination of the vessel itself, the environmental context in which it was found, and the materials found in association with the vessel during excavation. In addition, a review of the literature concerning similar cache sites and ethnographic accounts of caching behavior, as well as adaptive behavior theory, allow construction of an explanatory framework within which this site, 42SA20779, and similar sites can be interpreted.

ACKNOWLEDGEMENTS

Without the commitment of Matt How, his family, and friends to the preservation of this important archeological feature, an important aspect of prehistoric behavior could have been lost. Others who contributed to the efforts of recovering the pot include Park Archeologist Kris Kincaid, Park Ranger Glen Gossard who videotaped the excavation for future interpretation, and Hite Subdistrict Ranger Pat Quinn who provided transportation, inspiration and general project sup-

port. Ralph Hartley of the Midwest Archeological Center provided project direction and organization and Doug Scott, also of the Center, helped obtain the pollen wash sample and other pollen analysis. Steve Dominguez of the Center did the faunal analysis and Linda Scott Cummings provided floral/pollen analysis. Analyses by these authors have been incorporated into text discussions and are included in separate appendices.

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INTRODUCTION

One might argue that the prehistory of the American Southwest has been written primarily from the perspective of ceramicists and art historians. A number of archeologists would suggest that studies of prehistoric ceramics have dominated previous investigations of Southwest prehistory.

For example, Woodbury and Zubrow (1979:53) state,

The introduction of pottery making to the Southwest has probably been overemphasized by archaeologists because of its importance to them, as a basis for their study of prehistory. It can be made in varying ways, each detail culturally determined, that it is an ideal clue to determining the spatial and temporal relationships among its makers, as a means of constructing basic culture-historic frameworks by which other data from the past may be placed in context. It has played a major role in the relative dating of archaeological sites and in defining regional and local sub-cultural units. Therefore, it has received attention as an archaeological tool of investigation far beyond its importance as an aspect of prehistoric technology, economics, or even art.

Prehistorians throughout this century have concentrated on the "objectification" of mental templates that were thought to have governed the manufacture and decoration of aboriginal ceramic vessels. Morphological and decorative variation in such ceramics has been utilized as a material correlate or empirical index of cultural distance. Despite this socio-cultural emphasis, archeologists have devoted little attention to the contexts in which vessel shape, color, surface treatment, patterns, and use served to convey information regarding genetic distance and/or local and regional socio-economic and socio-political affiliation(s). There are notable exceptions to this generalization (e.g., Plog 1980).

Technological characteristics of prehistoric ceramics have been examined and described in detail in the American Southwest; yet, such analyses have been primarily designed, as Woodbury and Zubrow (1979) have pointed out, to define more than 900 pottery types. Discussions of the underlying functional bases for ceramic vessel construction, composition, formal variation, and use life have recently become the focus of a number of significant studies (e.g., Braun 1980; Nelson 1981, 1985; Smith 1983, 1985, 1988a, 1988b).

Unlike Woodbury and Zubrow (1979), the authors of this report

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maintain that archeologists have yet to realize the potential of prehistoric ceramics from a behavioral and adaptive perspective for the American Southwest in particular and the world in general. The systematic excavation and analysis of the corrugated vessel from site 42SA20779, the review of similar archeological features, and consideration of adaptive behavior theory allows for the development of a preliminary interpretive framework of adaptive caching behavior for prehistoric Southwestern contexts such as those in the Glen Canyon area.

In the following sections, the methods of recovery and analysis of the vessel are discussed as well as the environmental context of the site. A cultural chronology for the area

surrounding the site is also reviewed to help place the site in a time/space continuum. Results of analysis of site 42SA20779 are followed by a discussion of adaptive behavioral theory, similar archeological sites, and ethnohistoric accounts of caching behavior. Using all of these data, a preliminary framework of prehistoric caching behavior is presented as a possible interpretive scenario for the Hite vessel cache.

PROJECT LOCATION AND SITE DESCRIPTION

Site 42SA20779 is located in a tributary of Farley Canyon in the Hite Marina area of Glen Canyon National Recreation Area. Farley Canyon is a rather broad and relatively shallow intermittent drainage that flows southwest from Browns Rim to the Colorado River. The mouth of Farley Canyon is about 4.5 miles south-southwest of the Hite Marina located in the north-central portion of Glen Canyon National Recreation Area. Site 42SA20779 is located about 1/2-mile up an unnamed side canyon that drains south into Farley Canyon (Figure 1). The mouth of this side canyon is approximately one mile northeast of where Farley Canyon joins the Colorado River. Site 42SA20779 is on an outcrop of rocks forming a ledge and associated terrace approximately 15 meters above the canyon floor (Figure 2). The site consists entirely of one partially buried, large, corrugated ceramic vessel located in a narrow crevice along the ledge (Figures 3 and 4). No other features are associated with the pot and very few material remains were found in association with it.

There are several sites recorded within a two-mile radius of site 42SA20779 including sites 42SA3957 and 42SA3958 to the east of Farley Canyon and sites 42SA20, 21, 22, 23, and 300 at the mouth of White Canyon just downstream from the mouth of Farley Canyon along the Colorado River (see Figure 1). The sites east of Farley Canyon are described as quarry sites while the other sites mentioned above are large habitation sites with several associated structures. These sites are on ledges along the canyon walls of the Colorado and on the mesa rims above. Site 42SA23 consists of three storage cists located a short distance up White Canyon away from the habitation areas. All of the sites at the mouth of White Canyon are currently inundated by Lake Powell, with the possible exception of 42SA23.

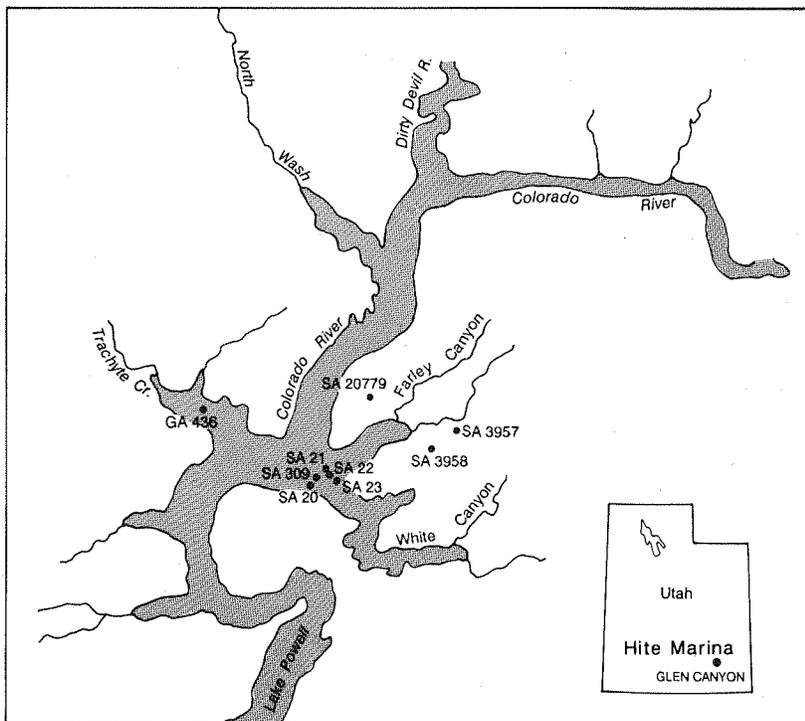


Figure 1. Project and site location.



Figure 2. View of site 42SA20779 on rock ledge.



Figure 3. Crevice location of the vessel at site 42SA20779.



Figure 4. Close up of vessel in crevice at 42SA20779.

ENVIRONMENT AND BACKGROUND

In general, the environmental context of site 42SA20779 does not appear to be uniquely different from other arid canyon contexts. However, to investigate prehistoric land use and adaptation to the canyon environs, not only the ecology of the site itself but also the surrounding areas must be considered. Movement of prehistoric peoples across the landscape was determined by not only the quantity but the quality of such resources as food, water, lithic resources, soil for plant domestication (if applicable), and suitable habitation locations. The following section reviews the environmental context of site 42SA20779 and the surrounding area and gives consideration to several resources that may have influenced aboriginal land use. The importance of other nearby archaeological sites and regional cultural chronology is also discussed.

Environment

Site 42SA20779 is located in the Inner Canyonlands of the Colorado Plateau in Southeastern Utah. This area is characterized by deeply cut canyons and mesas dissected by extensive systems of erosional channels. The site is in a tributary of Farley Canyon which cuts down through the Moenkopi Formation. The Moenkopi Formation in this drainage is characterized by exposed faces and ledges of reddish brown mudstone, siltstone, and fine

grained sandstone. Where the side canyon meets Farley Canyon the channel has eroded through the Moenkopi Formation and exposed the White Rim Sandstone member of the Cutler Formation so representative of the White Canyon just to the south. Only the Moenkopi Formation is visible in the lower section of Farley Canyon, however, as the Cutler Formation has been inundated by the Lake Powell Reservoir. The best climatic information for the Farley Canyon area comes from that collected by Bremer and Geib (1987) for the Orange Cliffs Tar Sands area to the north. Measurements from Hite and surrounding areas indicate that at lower elevations average annual precipitation is about five to six inches and temperatures range from generally above 32 degrees F to a maximum reaching over 100 degrees F. The mean annual temperature for these low lying areas is around 60 degrees F with about 180 frost free days per growing season (Bremer and Geib 1987).

The vegetation of the immediate site area is very sparse. Red Moenkopi Formation Sandstone forms a cove enclosing the entire site area in rock which accounts for the limited vegetation. Below the cove ledge is a short, steep talus with only a few saltbrush and grasses. The surrounding canyon vegetation is typical of low elevation intermittent drainages in the arid southwest. It consists of widely

ENVIRONMENT AND BACKGROUND

spaced, low growing brush and grass species (Figure 5). Several species noted during the field project and additional species common to the area are listed in Table 1. Pollen and other botanical samples taken on site are the only direct analysis that can be made of the paleoenvironment as it relates to the period or periods of site use. However, other paleoenvironmental studies indicate that there was probably little difference between the environment as it is observed today and the environment as it existed over several thousand years ago (Bremer and Geib 1987).

About two miles southwest of the site area is a starkly different environment. Before inundation by Lake Powell a broad strip of river bottom land followed the Colorado River on the east bank where Farley Canyon and White Canyon join the Colorado. The lush vegetation of this riparian community prior to inundation by the reservoir can be seen in Figure 6, to the west (left side of photo) of site 42SA309. In fact, this area once supported not only prehistoric communities (see next section), but modern communities as well. The Colorado flood plain was wide enough in this section of the canyon to support a road on either side of the Colorado, a landing strip, the Hite Ferry crossing, and about 24 buildings.

Other nearby resources of potential interest to prehistoric peoples using the area include a possible water source at the mouth of the tributary as it joins Farley Canyon, where the Moenkopi and Cutler Formations were

exposed. Bremer and Geib (1987) report seeps and springs at the contact between the Moenkopi and Cutler Formations in the Orange Cliffs Tar Sands Triangle Area to the north of Farley Canyon. Lithic resources may also have been available a short distance to the southeast of the site where gravel deposits are exposed on a terrace above Farley and White canyons. These deposits contain chert and quartzite cobbles and may be associated with the location of site 42SA3957 reported by Kay (1974) as a large quarry site.

Previous Archeological Research

Investigation of archeological sites in the area of Farley and White Canyons began over a century ago. In the 1860s John Wesley Powell made his infamous trip down the Colorado River. During this trip he observed several prehistoric ruins including those at the mouth of White Canyon. He described these ruins in his account of the river journey (Powell 1895). In the late 1920s, the 7th Bernheimer Expedition traveled up the Colorado to the mouth of White Canyon and followed White Canyon into the Natural Bridges area. Although they observed several ruins further up the White Canyon, they apparently did not stop at the ruins that Powell had discovered at the mouth of the canyon (Bernheimer 1929). However, a few years later, in 1932, Steward recorded the site that Powell had originally observed at the mouth of White Canyon as Site Number 2, now 42SA309 (Steward 1941). Stew-

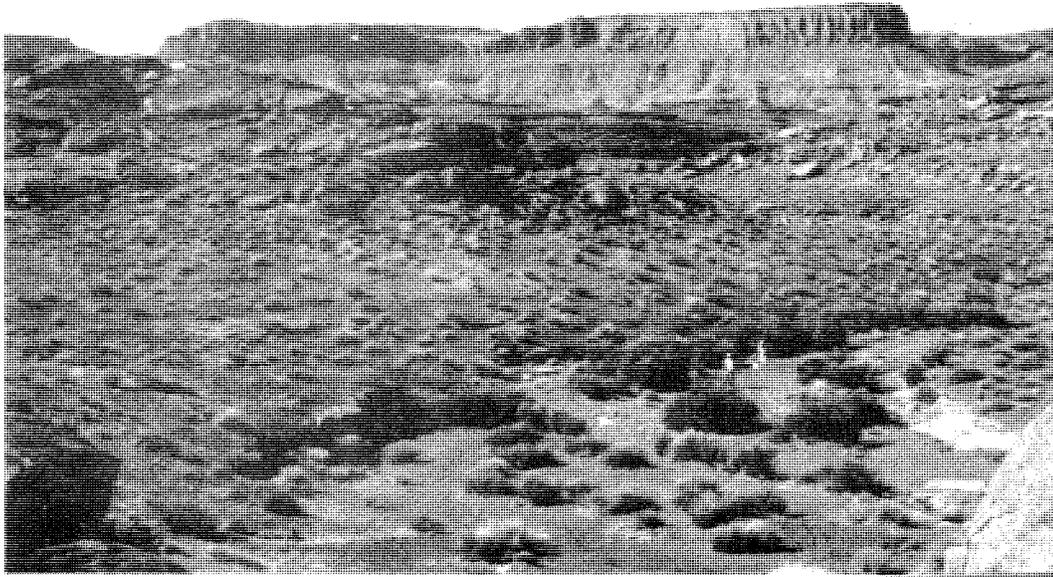


Figure 5. Looking downstream from site 42SA20779 at sparse vegetation in the drainage below.

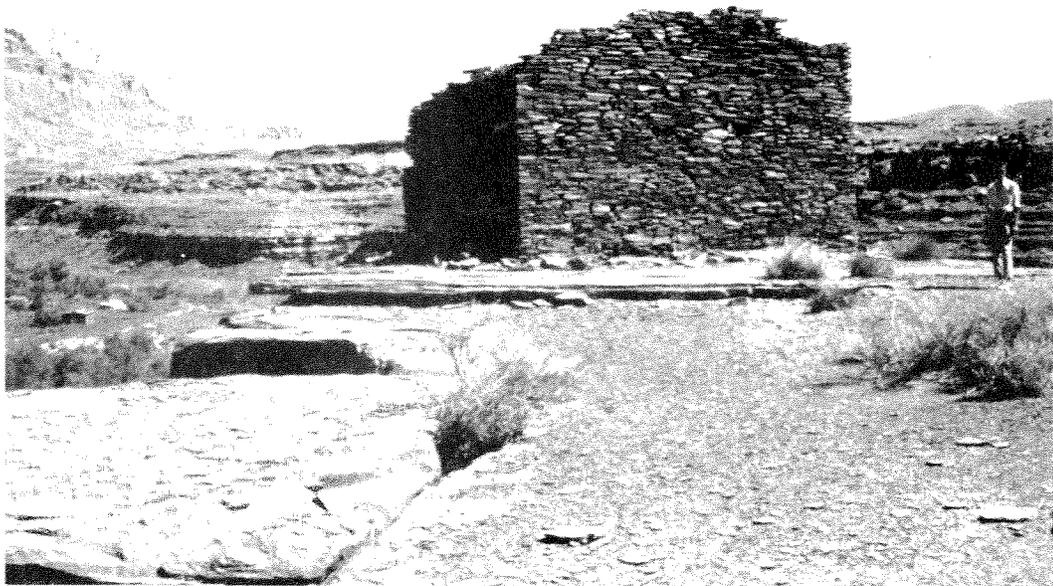


Figure 6. Site 42SA309 at the mouth of White Canyon prior to inundation by Lake Powell. Note the lush riverbottom land.

Table 1. Plant Species Observed and Other Common Species.

Family	Species	Common Name
Ephedra (Ephedraceae)	<u>Ephedra viridis</u>	Mormon Tea
Grass (Gramineae)	<u>Bromus tectorum</u>	Cheatgrass
Goosefoot (Cheonopodiaceae)	<u>Atriplex canescens</u>	Four-wing Saltbrush
	<u>Atriplex confertifolia</u>	Shadscale
	<u>Atriplex cuneata</u>	Short Saltbrush
Rose (Rosaceae)	<u>Coleogyne ramosissima</u>	Blackbrush
Cactus (Cactaceae)	<u>Opuntia</u> spp.	Prickly-pear cactus
Sunflower (Compositae or Astereae)	<u>Artemisia</u>	Sagebrush
	<u>Chrysothamnus</u>	Rabbitbrush

ENVIRONMENT AND BACKGROUND

ard's account of reconnaissance in Glen Canyon was reported through the Smithsonian Institute and represents the first professional study of the White Canyon/Farley Canyon area to be published. He meticulously documented a variety of details about Site Number 2, including the number and location of structures, features, and artifacts. He describes the site by stating

“Here are located the most extensive ruins in all of Glen Canyon. The conspicuous feature is a large house standing about 300 feet above the river on the southern side of the tributary canyon . . . The house . . . is of fair masonry, and must have had 2, possibly 3 stories, as the wall still stands at one point 15 feet 9 inches high” (Steward 1941:329).

He paid particular attention to the frequency of various types of ceramics and their relation to the structures. Given the conspicuous nature of Site Number 2, his attention to detail has provided us with important information about this site that has since disappeared.

Archeologists did not return to this part of Glen Canyon until the early 1950s. Mention of Site Number 2 and of White and Farley canyons was again bypassed by Foster (1952) during a river reconnaissance in 1952. Foster's expedition put in at Hite, then just across the river from Site Number 2, but no ruins were visited or documented until

farther downstream. Sometime during that same year, Jack Rudy recorded four sites at the mouth of White Canyon. Steward's Site Number 2 (42SA309) was designated 42SA19 by Rudy and additional ruins along the cliff to the south of Site Number 2 were recorded as 42SA20 (Rudy 1954). Two other ruins were recorded on the north side of White Canyon and three isolated storage cists were recorded in alcoves further up White Canyon. Foster apparently returned a year after his river trip to record a petroglyph site downstream from Hite at the mouth of Trachyte Canyon (Foster 1953).

During the pre-inundation surveys conducted by the University of Utah in the late 1950s, Matthews re-recorded the White Canyon Ruins (Steward's #2 and Rudy's 42SA19) as 42SA309 (Weller 1959). His mention of petroglyphs to the south of the site indicates that he included Rudy's 42SA20 as part of the 42SA309 designation.

The first archeologist to venture into Farley Canyon and document his observations was Marvin Kay in 1974. Kay surveyed part of the White Canyon and the Farley Canyon drainage basin from the Colorado River to Utah Highway 95. During this survey, two quarry sites were identified in the Farley Canyon area. Although he does not appear to have investigated the side canyon where 42SA20779 is located, he makes mention of recording the location of several “wood rat middens suitable for palynological studies . . .” (Kay 1974). His notes of

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these middens indicate he investigated alcove and crevice areas similar to that of 42SA20779.

Kay's survey represents the most recent work in the immediate area of site 42SA20779. Other recent work has taken place nearby on both sides of the Colorado, including work by University of Utah crews in White Canyon during 1978 (Schroedl 1981) and the Tar Sands Orange Cliffs survey conducted in 1985 and 1986 (Geib and Bremer 1988).

Culture Chronology

Documentation of changes in the material culture in association with materials that can be dated using absolute dating techniques (e.g., radiocarbon) has allowed archeologists to assign a general time frame to variations in material culture. Using this archeological data, a broad sequence of culture history can be defined for the region that includes the Hite Project area. This chronological sequence is divided into four general periods including Paleoindian, Archaic, Anasazi, and Numic-speaking groups. This section will briefly summarize the chronological context of existing information about human prehistory and protohistory in the vicinity of site 42SA20779.

Paleoindian Period. The Paleoindian cultural tradition is generally recognized as dating from 12,000 B.P. to about 7000 B.P. and is most often divided into three subphases (Llano,

Folsom, and Plano). Evidence of this tradition in southeast Utah is scant and no stratified sites with undisputed evidence of Paleoindian occupation have been documented in the vicinity of site 42SA20779. Nevertheless, artifactual evidence from the general area does suggest that Paleoindian activity occurred in the Inner Canyonlands area of the Colorado Plateau (Hunt 1953; Gunnerson 1956; Hunt and Tanner 1960; Hicks 1975; Lindsay 1976; Hauck 1979; Black et al. 1982; Nickens 1982; Davis 1985; Davis and Brown 1986).

Archaic Period. The Archaic period (circa 8000-1500 B.P.) is generally characterized by a hunting and gathering subsistence dependent on a wide range of small game and non-domesticated plant foods. It is believed that during this period hunter-gatherers followed an annual round in response to changing resource availability, living in small, kin-related groups throughout most of the year. The Archaic phase on the Colorado Plateau has been divided into four phases by Schroedl (1976). These continuous temporal divisions (8300-1500 B.P.) are based for the most part on changes in projectile point styles and inferred population densities.

The concept of continuous aboriginal occupation and activities throughout this period has recently been challenged by Berry and Berry (1986). They note, for example, that there is currently no evidence of prehistoric activity on the southern Colorado Plateau between 5000 and

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6000 B.P. and very little evidence for activity between about 2000 and 3000 B.P. These authors argue that it was only during specific periods of increased effective moisture and proportionately greater biotic productivity that Archaic hunter-gatherers exploited this environment. They suggest that significant occupation of the Colorado Plateau began around 8500 B.P. and ceased around 6000 B.P. They argue evidence of cultural activity is again present at around 5000 B.P. with the onset of greater effective moisture and that between 3000 B.P. and about 1500 B.P. there is evidence for a fairly drastic reduction in effective moisture on the Colorado Plateau. Berry and Berry (1986) also argue that it was during this period (circa 2800-2500 B.P.) that maize agriculture was introduced in the Southwest and subsequently spread throughout the region.

Archaic deposits from Cowboy Cave near the Green River reflect these periods of occupation and apparent abandonment (Jennings 1980). The span of dates for the cave ranges from the earliest human use at about 8275 B.P. (6325 B.C.) to dates representing the introduction of maize: four samples of corn cached in two skin bags and stored in shallow pits dated between 2075 and 1555 B.P. (125 B.C. and A.D. 395) (Jennings 1980:24). Similar deposits containing corn along with Fremont and Anasazi basketry in Clydes Cavern have dated to 460 A.D. (Winter and Wylie 1974).

Anasazi/Pueblo Period. The Pueblo Period is generally divided into eight periods; three Basketmaker and five Pueblo (Jennings 1974). The Basketmaker I stage (pre A.D.) is generally associated chronologically with the Archaic period of southeastern Utah. Farming as a subsistence practice is believed to have fully developed during the Basketmaker II stage (A.D. 1 to 500). Subsistence during this period seems to have been a mix of farming, hunting, and gathering (Jennings 1978). The Basketmaker III period (A.D. 450-750) has been characterized by improved farming conditions and the addition of beans and possibly domestic turkeys as dietary items. There also appears to have been a rapid increase in population during this period (Plog 1979).

The Anasazi are believed to have depended upon food production for their diet during the Pueblo I period (A.D. 750-900) (Plog 1979). Pueblo II (A.D. 850-1100) sites on the northern Colorado Plateau indicate an expansion of the Anasazi population. However, the occupations were shorter than previous periods and people were more dispersed throughout the area (Jennings 1978). Toward the end of the Pueblo II and into the Pueblo III period Anasazi populations began to aggregate. This aggregation accounts for the large, multi-story pueblos typical of Pueblo III sites (A.D. 1100-1300). The Pueblo IV period (A.D. 1300-1700) is characterized by population concentrations in the Rio Grande Valley, Hopi Mesa, and Northeastern Arizona.

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Evidence of this late period occupation in southeastern Utah comes only from surface occurrences of tools or ceramics in areas including Arches National Park, the La Sal Mountain area, Red Rock Plateau, White Canyon, and Cedar Mesa (Hunt 1953; Lipe 1970; Lipe and Matson 1971; Hobler and Hobler 1978; Kramer n.d.). It is believed that these occurrences represent transient hunting groups and not permanent occupations (Lindsay 1976).

Ute-Paiute. Numic-speaking Ute and Paiute groups are believed to have utilized the area from at least A.D.

1250 until historic times. Ethnohistoric and ethnographic sources offer substantial evidence of Ute and southern Paiute activities in the area during the nineteenth century (Kelly 1934, 1964; Stewart 1966; Euler 1966; Kelly and Fowler 1986). Until well after contact, their subsistence pattern likely consisted of small familial bands foraging for non-domesticated plants and animals. Although historic documents often mention horticultural activities of the Paiute in some areas of southern Utah, there is little archeological evidence of such activities.

SITE ASSESSMENT AND FIELD METHODS

On June 3, 1988 Park Archeologist Chris Kincaid and Ralph Hartley, Archeologist from the Midwest Archeological Center, visited site 42SA20779 to assess the condition of the vessel described by Matt How (one of the hikers who discovered the pot) and to look for additional features or cultural materials. The large olla was found intact and partially buried with no evidence of having been moved or otherwise disturbed since it was prehistorically placed in the crevice. No other cultural materials were observed in association with the pot. In order to assure preservation of the vessel and the information potential of the site, it was determined that the site should be excavated as soon as possible.

On June 23, 1988 Kincaid returned to the site with Archeologist Anne Wolley and crew member Pat Flannigan from the Midwest Archeological Center. In addition, Matt How and his family accompanied the archeologists. Park Ranger Glen Gossard accompanied the crew to document the excavation by video. Others providing assistance included Pat Quinn (Hite Subdistrict Ranger) and Mrs. Quinn.

From the Hite Marina the crew traveled by boat south along the Colorado River to the Mouth of Farley Canyon. After entering Farley Canyon and traveling approximately one mile upstream, the crew turned north into a small cove. Equipment was carried on

foot to the site about 1/2-mile up the drainage. During the previous visit, the crevice had been covered with brush to conceal its location. After the brush was removed the crew proceeded to document the site by taking photographs, making a sketch map of the crevice and the pot, and recording other initial observations (Figure 7). The various stages of excavation were documented through photography and soil sampling which are described in the following section. Excavation was also documented on video tape.

Excavation proceeded carefully by initially removing the fill (mostly pack rat midden) north of (behind) the pot. All materials were screened through 1/4-inch mesh and recovered items were bagged according to horizontal and vertical provenience (See Appendix A). Following removal of all loose soil deposits, excavation of exterior soils was halted at the discovery of a compacted surface surrounding the vessel. At this time fill from the pot's interior was removed and screened. Soil samples were also taken from the pot fill. During removal of part of the exterior compacted surface for soil samples it was discovered that pack rat midden materials were present below the surface. Given the presence of the pack rat materials it was determined that the compaction was the result of natural processes and the remainder of the surface and fill was removed to expose the entire pot. The vessel was

SITE ASSESSMENT

lifted out of the crevice, placed in a large cardboard box, and padded with packing materials before being transported back to the boat. Limited exca-

vations below the fill on which the vessel had rested in the crevice revealed no additional cultural materials or features.

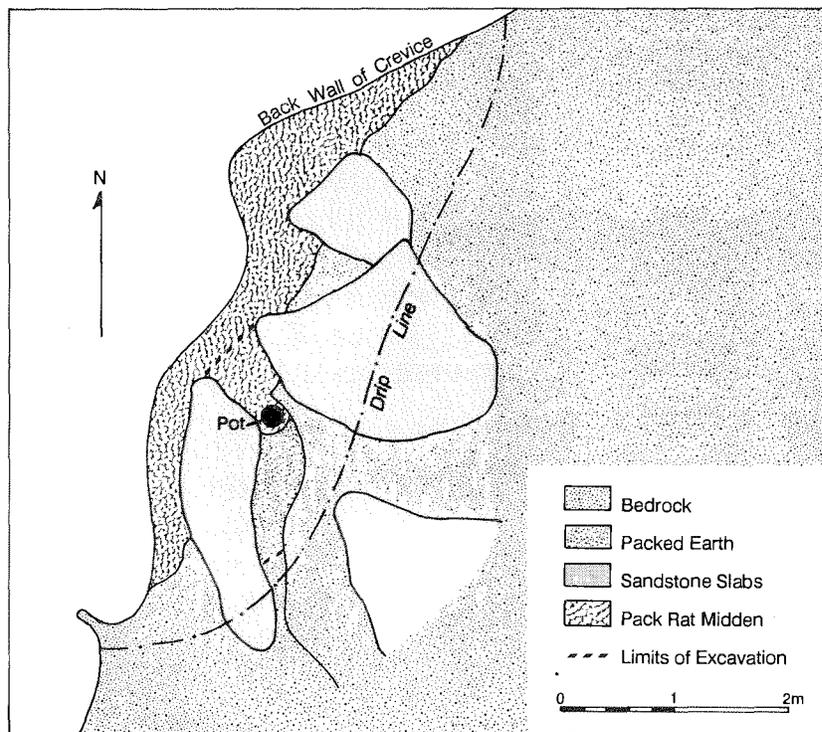


Figure 7. Plan view of site 42SA20779.

RESULTS OF INVESTIGATIONS

Excavation of the vessel at 42SA20779 resulted in the recovery of a variety of materials. These materials, as well as the pot and its location, have been analyzed and are discussed in this section. Materials recovered include the corrugated vessel, floral and faunal materials, and several coprolites (non-human). Floral materials include pollen and macrofloral specimens.

Feature Description

The site consists entirely of one feature that has been interpreted as a cached storage vessel (Figure 8). One large, decorated, corrugated olla was placed upright in the crevice. The olla may have had a lid. It is difficult to assess what may have been originally stored in the vessel due to extensive disturbance of the content, and possibly even the context of the pot, by pack rat activity. Figure 9 shows the extent of the pack rat midden around and behind the vessel. The vessel is believed to be the only in situ element of the feature. All of the associated material remains are believed to have been displaced by pack rat activity. Once loose midden materials were removed during excavations, a compacted surface was encountered which, at first, was believed to be cultural (Figure 10). The surface appeared to have been a result of packing soil around the pot to hold it upright and in place. However, below and intermixed with this com-

pact surface were more pack rat deposits leading to the conclusion that the compaction of soil had resulted from natural processes. As this surface was removed, several large slabs were uncovered leaning between the base of the pot and the crevice walls (Figure 11). These slabs were likely placed at the base of the pot to protect it and hold it upright since the base of the pot is round. It is also possible that one of the slabs served as a lid for the vessel at one time, although none of the slabs appeared to have been shaped. Two small slabs were found near the base in front of the pot and one larger slab was found at the base behind.

Ceramics

One large, decorated, corrugated olla was recovered from the site (Figure 12). The vessel has been classified as a PII-PIII period Mesa Verde Corrugated (Dean Wilson, personal communication, 1988) and compares with a PII period type from Alkali Ridge which was reported by Brew (1946:Figure 155h). He describes this type as a "Mesa Verde Corrugated with indentation design." The PII-PIII designation of the vessel dates it to between circa A.D. 850 and A.D. 1300. Although indentation of coils was a common practice in PII-PIII pottery making, this type of patterned indentation design appears to occur less frequently than complete indentation of corrugated coils or indentation of

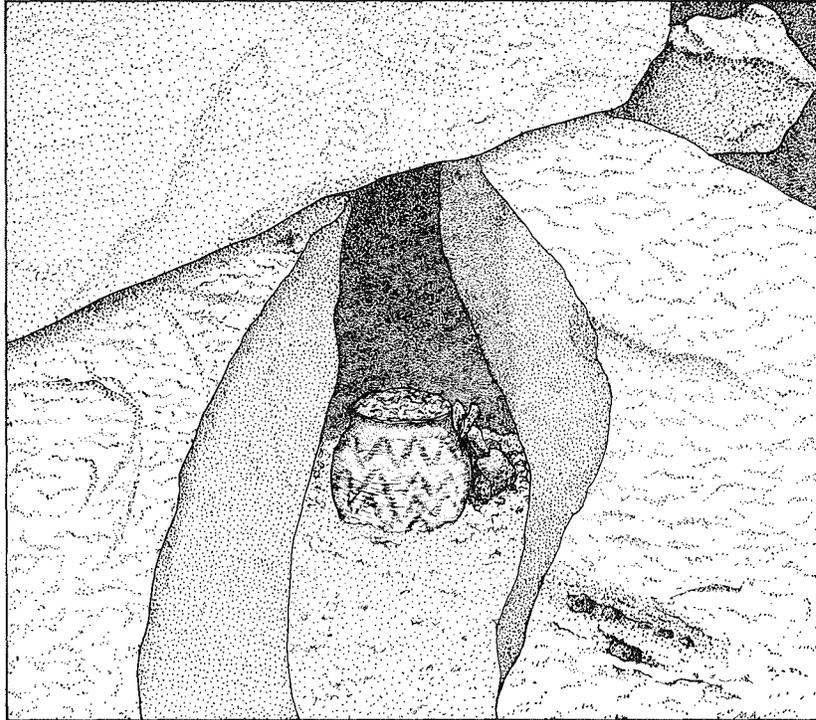


Figure 8. Sketch of pot feature, view looking northeast.



Figure 9. Extensive pack rat midden behind and surrounding the vessel at 42SA20779.



Figure 10. Compact surface discovered during excavation.



Figure 11. Slabs discovered in situ at the base of the vessel.



Figure 12. Mesa Verde corrugated vessel from 42SA20779.

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alternating coils (Brew 1946:288). The design was made by pressing or crimping certain sections of each coil in a pattern that resulted in the overall triangular design.

The vessel is approximately 43 cm deep, 127 cm in circumference at the widest point, 66 cm in circumference at the neck, 73 cm in circumference at the mouth and has a smoothed exterior rim 3.5 cm wide. The interior is entirely smoothed. The entire exterior is corrugated, with the exception of the smoothed rim, with an indentation design in a zig-zag triangular pattern (Figure 13). The vessel is cracked from one side to the other across the bottom. A small piece of the pot along the break appears to have been broken out at one time, then replaced, and lodged in place with pine pitch on the exterior near the vessel bottom (Figure 14). The vessel also appears to have been used over a fire at one time as evidenced by the burning on the exterior surface (Figure 15) and some interior staining (Figure 16).

Floral Remains

Floral remains were collected through two different methods in hopes of determining the original content of the vessel and possible changes in surrounding environmental conditions (Table 2). Soil samples for pollen and macrofloral analysis were taken at various vertical and horizontal locations surrounding the vessel. Macrofloral remains were also collected as they were observed during screening.

Deposits from various horizontal and vertical proveniences in relation to the vessel were screened separately and recovered macrofloral remains were bagged with the appropriate provenience designations. These items are listed by provenience in Table 3. Items recovered included several yucca seeds and pod fragments, one yucca leaf fragment, one squash stem, and one corn cob. The corn cob is a twelve-rowed cob with marks indicating possible abrading or chewing near the center of the cob. The lack of teeth marks in this area, however, suggests that the damage was done after the cob had dried (Cummings 1989). Additional information about the cob is presented in Table 4.

All other floral remains were recovered through the sampling of soils in and around the vessel. Four bulk soil samples were taken for recovery of macrofloral remains. Two samples were taken from the fill surrounding the pot and two from the vessel interior (see Table 2). One pollen sample was taken from the vessel fill during excavation and an additional pollen wash was taken from the vessel interior at the laboratory at the Midwest Archeological Center. Methods of pollen and macrofloral analysis are described in Appendix B. The pollen and macrofloral remains observed in these samples are listed in Tables 5 and 6. The pollen record displays relative consistency between the fill and wash samples. The macrofloral remains recovered are typical of local vegetation. Bone and insect fragments were also recovered in all of the bulk soil samples.

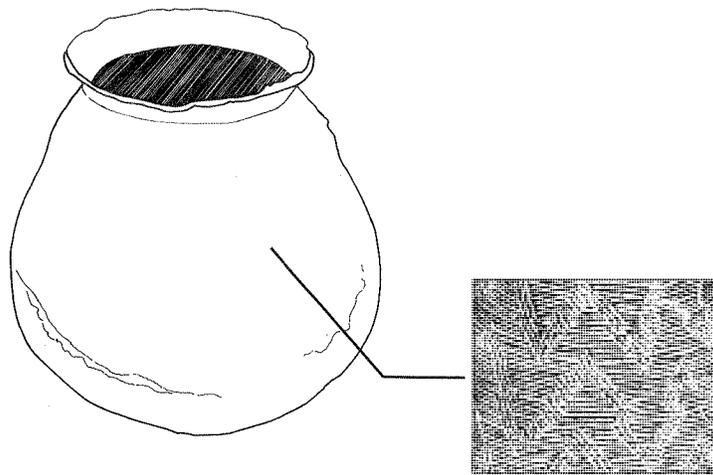
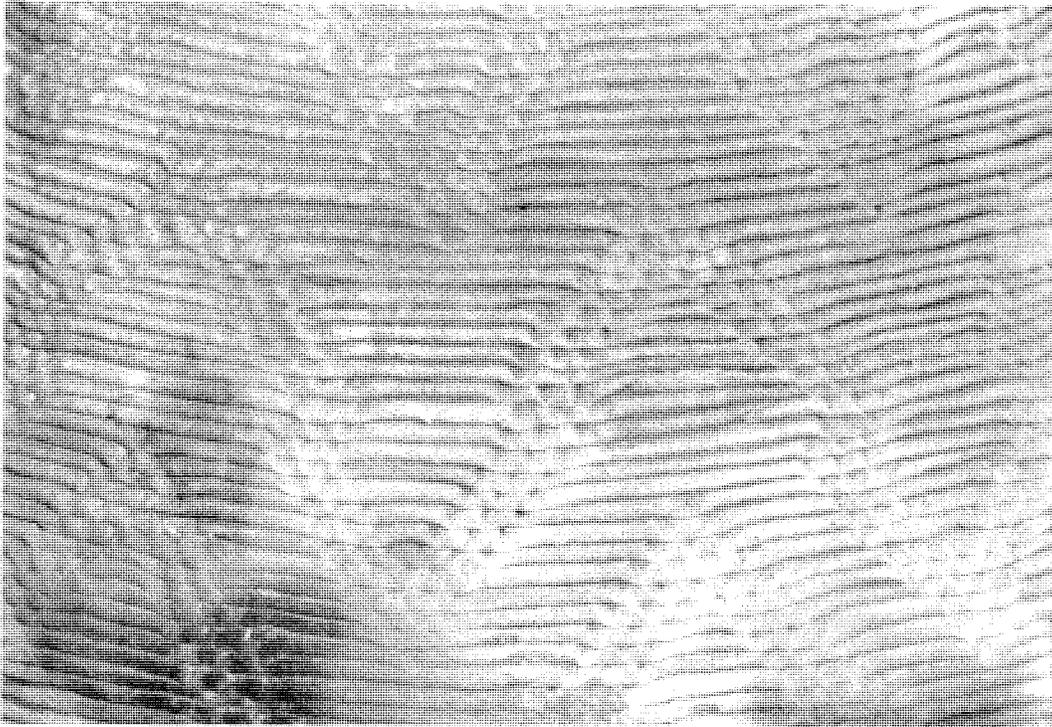


Figure 13. Close-up of the design on the corrugated vessel and artist's rendering of the design.



Figure 14. Base of the vessel showing the cracked bottom and sides as well as the repaired hole secured with pine pitch.

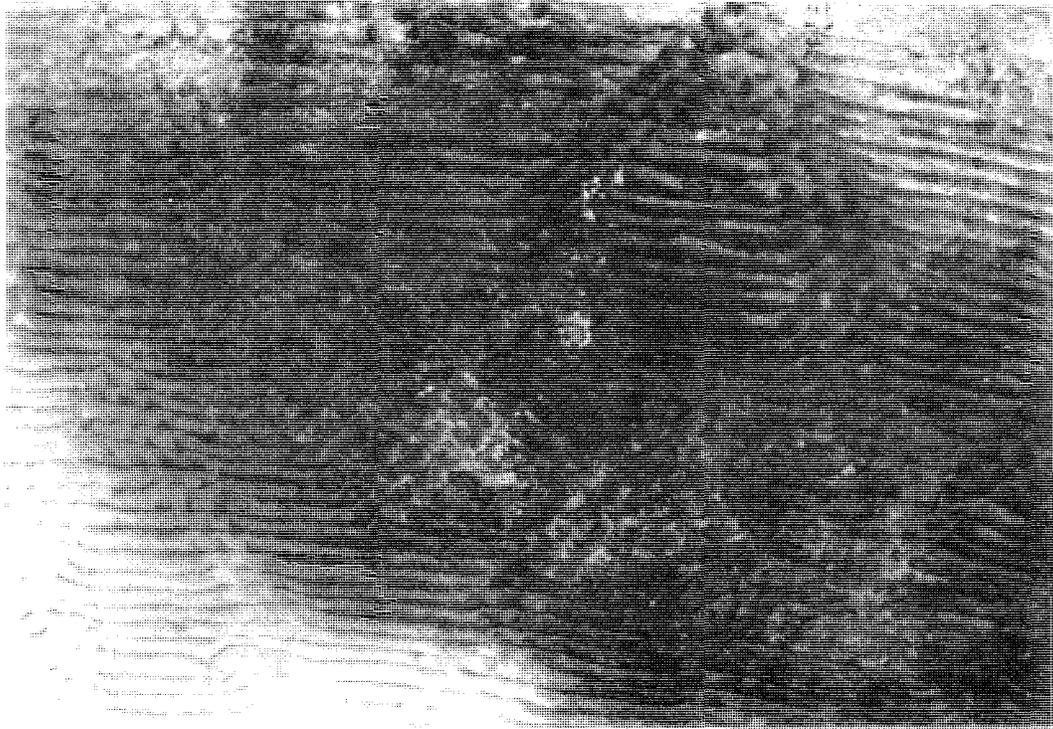


Figure 15. Blackening and deterioration of vessel exterior believed to be a result of use of the vessel over a fire.



Figure 16. Staining of interior also believed to indicate vessel's use for heating or cooking .

Table 2. Soil Samples from Site 42SA20779

Catalog #	Sample Type	Provenience
42SA20779-3	Macrofloral	Fill in pack rat midden behind the vessel at level with vessel rim.
42SA20779-7	Macrofloral	Compacted surface near base of and in front of vessel.
42SA20779-10	Macrofloral	Fill just below the neck of the vessel interior.
42SA20779-11	Macrofloral	Fill near base of the vessel interior.
42SA20779-12	Pollen	Fill near base of the vessel interior.
42SA20779-13	Pollen	Pollen wash from pot interior.

Note: Due to the lack of actual soil in the pack rat midden, no comparative samples for pollen were taken from exterior fill.

Table 3. Vegetal Remains Collected During Screening at Site 42SA20779

Catalog #	Provenience	Items Recovered
42SA20779-1	Fill in pack rat midden behind the vessel at level with vessel rim.	10 Yucca seeds 3 Yucca seed pod frags. 1 Yucca leaf
42SA20779-2	Fill in pack rat midden behind the vessel at level with vessel rim.	1 corn cob
42SA20779-8	Fill from vessel interior.	2 Yucca seeds 1 squash stem

Table 4. Measurements of Corn Cob Recovered from Site 42SA20779

Rows	Diameter (mm)	Length (mm)	Rachis Seg Lg	Cupule (mm)		
				Length	Spikelet	Height
12	14 (tip)	89	11.5	7.0	3.5	2.0
	16.5 (butt)			7.5	3.5	2.5
				7.0	3.0	3.0

Source: Cummings 1989

Table 5. Pollen Types Observed in Samples from Site 42SA20779

Scientific Name	Common Name	Fill		Wash	
		#	%	#	%
ARBOREAL POLLEN:		68	34.0	77	38.5
<u>Juniperus</u>	Juniper	17	8.5	44	22.0
<u>Picea</u>	Spruce	1	0.5		
<u>Pinus</u>	Pine	43	21.5	31	15.5
<u>Quercus</u>	Oak	5	2.5	2	1.0
<u>Salix</u>	Willow	2	1.0		+
NON-ARBOREAL POLLEN:					
Anacardiaceae/Rhamnaceae	Sumac/Buckthorn families			1	0.5
Rhamnaceae	Buckthorn family		+		
<u>Ceanothus</u>	Buckbrush		+		
<u>Arceuthobium</u>	Mistletoe	1	0.5		
Cheno-ams	Includes amaranth and pigweed family	42	21.0	32	16.0
<u>Cleome</u>	Beeweed	1	0.5		
Compositae:	Sunflower family				
<u>Artemisia</u>	Sagebrush	25	12.5	20	10.0
Low-spine	Includes ragweed, cocklebur, etc.	8	4.0	7	3.5
High-spine	Aster, rabbitbrush, snake-weed, sunflower, etc.	20	10.0	24	12.0
Liguliflorae	Dandelion and chicory		+		
Cruciferae	Mustard family		+		
<u>Ephedra nevadensis</u>	Mormon tea	8	4.0	9	4.5
<u>Ephedra torreyana</u>	Mormon tea	2	1.0	1	0.5
<u>Eriogonum</u>	Wild buckwheat	1	0.5		
<u>Euphorbia</u>	Spurge			1	0.5
Gramineae	Grass family	3	1.5	1	0.5
Hydrophyllaceae	Waterleaf family	1	0.5		
<u>Phacelia</u>	Purple fringe	2	1.0		
Labiatae	Mint family	1	0.5		
Leguminosae	Legume or pea family	2	1.0		
<u>Polygonum</u>	Knotweed			1	0.5
Rosaceae	Rose family	8	4.0	3	1.5
<u>Rumex</u>	Dock		+		
Saxifragaceae	Saxifrage family			1	0.5
<u>Shepherdia</u>	Buffaloberry		+		
<u>Typha angustifolia</u>	Cattail		+		
<u>Zea</u>	Maize, corn		+		+
Indeterminate		7	3.5	13	6.5

+ Pollen observed outside the regular count while scanning the remainder of the microscope slide.

Table 6. Macrofloral Contents of Samples from Site 42SA20779

FS No.	Identification	Part	Uncharred		
			Whole	Frag	
3	Cactaceae	Spine clumps	12		
	Cactaceae	Spine base	2		
	Cactaceae	Spine	241*		
	Cheno-am	Seed	1		
	cf. Cheno-am	Embryo	1		
	Chenopodiaceae	Leaf	29*	515	
	Atriplex	Fruit	99*	66*	
	Compositae	Seed	1		
	Compositae	Pappus		5	
	Cruciferae	Fruit		2	
	Cryptantha	Seed	1		
	Euphorbia	Seed	1	2	
	Euphorbia	Fruit		7	
	Gramineae	Floret	1		
	Leguminosae	Seed	1		
	Leguminosae cf. Lupinus	Seed	7		
	Phlox	Seed	3		
	Physalis	Seed	12	10	
	Unknown A	Seed		5	
	Unknown C	cf. Seed		1	
	Unidentified	Floret	7		
	Unidentified	Fruit		2	
	Unidentified	Bract	31		
		Bone		24	
		Insect fragments		22	
	7	Cactaceae	Spine clumps	5	
		Cactaceae	Spine base	1	
Cactaceae		Spine	107*		
Chenopodiaceae		Leaf	3	88*	
Atriplex		Fruit	22	13	
Compositae		Seed	4		
Compositae		Pappus		1	
Cruciferae		Fruit		2	
Lepidium		Seed	2		
Cryptantha		Seed	1		
cf. Euphorbiaceae		Leaf	2		
Euphorbia		Seed	1		
Euphorbia		Fruit		25*	
Gramineae		Floret		3	
Leguminosae cf. Lupinus		Seed	2		
Mentzelia		Seed	1		
Papaveraceae		Seed	4		
Physalis		Seed	1	2	
Unknown AB		Seed		3	
Unknown B		Seed	2		

Table 6, Continued.

FS No.	Identification	Part	Uncharred	
			Whole	Frag
	Unidentifiable	Seed		3
	Unidentified	Floret	4	2
	Unidentified	Fruit w/ pedicel		1
	Unidentified	Fruit		1
	Unidentified	Bract	61*	
	Unidentified	Leaf		8*
	Unidentified	Spiny stem		X
	Bone			16
	Insect fragments			28
10	Cactaceae	Spine clumps	2	
	Cactaceae	Spine base	3	
	Cactaceae	Spine	67*	
	Chenopodiaceae	Leaf	60*	861*
	Atriplex	Fruit	81*	50*
	Compositae	Seed	1	
	Compositae	Pappus	2	1
	Cruciferae	Fruit		1
	Euphorbia	Seed	2	
	Euphorbia	Fruit		15*
	Gramineae	Floret	1	
	Oryzopsis	Seed		1
	Unknown A	Seed		5*
	Unidentifiable	Seed		4
	Unidentifiable	Fruit		1
	Unidentified	Floret	39*	8
	Unidentified	Bud		5*
	Unidentified	Bract	244*	
	Unidentified	Leaf		35*
	Unidentified	Spiny stem		X
	Bone			8
	Insect fragments			27
	Scat			1
11	Conifer	Needle		3*
	Cactaceae	Spine clumps	6	
	Cactaceae	Spine	88*	
	Cheno-am	Seed		1
	Chenopodiaceae	Leaf	12	4091*
	Cruciferae	Fruit	1	1
	Cryptantha	Seed	3*	
	Euphorbia	Fruit	21*	62*
	Gramineae	Floret	6	31*
	Leguminosae	Seed	7	
	Leguminosae cf. Lupinus	Seed	1	1

Table 6, Concluded.

FS No.	Identification	Part	Uncharred	
			Whole	Frag
	Physalis	Seed	13	50*
	Unknown A	Seed	2	3
	Unidentifiable	Seed		3*
	Unidentified	Floret	2	5*
	Unidentified	Fruit		11*
	Unidentified	Bract	97*	
	Unidentified	Bud stem	8	9
	Unidentified	Thorn	4*	
	Unidentified	Leaf		14*
	Bone			16*
	Insect fragments			208*
2	Corn cob		1	

* Estimated frequency based on materials examined that passed through the .5mm sieve.

X Present, no count.

Source: Cummings 1989

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Faunal Remains

Faunal materials were recovered through two methods during excavations; screening and direct excavation. Materials recovered during screening were bagged according to horizontal/vertical provenience as were the floral specimens. Sixteen items were recovered from the screen while one, FS#4, was recovered in situ from the fill behind the vessel. Of the 17 specimens recovered, nine individuals from seven taxa are represented (Appendix C). All of the taxa present, with one exception, are common to the surrounding area and are present in the sample in relative frequencies that are similar to those in the existing natural communities (Dominguez 1989). FS#4, an antelope metatarsal, is believed to be of much greater age than the other faunal materials present on the basis of weathering on the bone (Dominguez 1989) and the disappearance of antelope from the Glen Canyon area some time ago. The distribution and taxonomy of the faunal remains from the site are listed in Table 7.

Other Remains

The only other materials recovered during excavations include eight coprolites. All specimens were recovered from the screen. Their proveniences include the vessel fill and fill from the midden outside the vessel. All of the coprolites are non-human. The specimens and their proveniences are listed in Table 8.

Discussion

Pollen and macrofloral analysis of the vessel and material associated with the vessel were undertaken to distinguish between the probable contents of the vessel and material introduced by packrat activity. The pollen record displays relative consistency between the fill and wash samples. The fill sample was collected from the central portion of the vessel fill, while the wash sample was collected after the fill had been removed and the interior of the vessel had been brushed to remove any dirt still adhering to the surface. The major discrepancy noted was in the *Juniperus* pollen frequency; 8.5 percent in the fill and 22.0 percent in the wash. This suggests either that at the time of the cache juniper may have been more abundant or that the vessel may have been cached during the spring when juniper pollinates. Other variations in the pollen record are very small (Cummings 1989). Analysis of the fill sample, representing the packrat midden accumulation, notes the presence of a wide variety of plants that are not present in the wash sample. These may represent plants within collection distance of the packrat den (30-100 meters) (Spaulding 1985:6, 10; Vaughn n.d.), as well as wind transport of these pollen grains over the relatively long period of time that the midden accumulated. Members of the Rhamnaceae family, *Arceuthobium* (mistletoe), *Cleome* (beeweed), Liguliflorae, Cruciferae, *Rumex*, *Shepherdia*, and *Typha* are all represented in the packrat midden

Table 7. Taxonomic Distribution and Minimum Number of Individuals from Site 42SA20779.

Taxon	FS#			Total
	1	4	8	
Bird, unknown	MNI = 1 # specimens = 1			1 1
Micromammal, unknown	1 1			1 1
c.f. Sciuridae (e.g., squirrel)	1 1			1 1
<u>Peromyscus</u> sp. (mouse)	1 1			1 1
<u>Neotoma</u> sp. (rat)	2 2			2 2
<u>Sylvilagus</u> sp. (cottontail)	1 7		2 3	2 10
<u>Antilocapra</u> <u>americana</u> (antelope)		1 1		1 1

Totals:				
MNI	6	1	2	9
# specimens	13	1	3	17

MNI = Minimum Number of Individuals.

Table 8. Other Remains from Site 42SA20779

Catalog #	Provenience	Items Recovered
42SA20779-5	Fill from in front of and near base of vessel.	4 Coprolite fragments
42SA20779-6	Fill from in front of and near base of vessel.	1 Coprolite
42SA20779-9	Fill from vessel interior.	3 Coprolite fragments

sample, but are absent from the vessel wash (Cummings 1989).

Zea mays pollen was recovered in both the fill and wash samples and, thus, was not as valuable as had been hoped in determining whether the corn was cached in the vessel or introduced by packrat activity. If corn had been present in the vessel at the time it was cached two possibilities are noted for the pollen record. First, *Zea mays* pollen could have been recovered from the wash, but not the fill sample. Second, *Zea mays* pollen could have been recovered from both the wash and fill samples through packrat activity in moving and consuming the corn. If the corn had been introduced by packrat activity it is more probable that corn pollen would have been recovered only from the fill sample, as the wash sample represents material in direct contact with the vessel, such as goods cached, and the accumulation of wind transported pollen. Although *Zea mays* is anemophilous, or wind pollinated, the pollen is relatively heavy and not readily transported by the wind. It frequently drops within three to four feet of the plant in undisturbed conditions, although it may travel for as much as 1.8 miles in windy areas (Stanley and Liskens 1975). Bradfield (1971:5-6) reports that Freire-Marreco noted that the Hopi located their corn fields approximately 1/2-mile apart to maintain purity of the corn races by preventing cross-pollination by the wind. It is, therefore, unlikely that *Zea mays* pollen entered the vessel through wind transport (Cummings 1989).

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Careful comparison of the materials in the five macrofloral samples yields similar elements in samples representing the top and bottom fill and the packrat midden and compacted surface. This distribution of macrofloral remains indicates that all of the remains recovered from the midden fill in the vessel may be attributed to packrat activity (Cummings 1989).

The macrofloral remains recovered are typical of the local vegetation. Included were cactus spines, Chenopodiaceae and Chenopodium seeds, leaves, and embryos, *Atriplex* (saltbush) fruits, Compositae (sunflower family) seeds and pappus, Cruciferae (mustard family) fruits, *Lepidium* (pepperweed) seeds, *Cryptantha* (cryptantha) seeds, *Euphorbia* (spurge) seeds and fruit, Gramineae (grass family) florets, *Oryzopsis* (Indian ricegrass) seeds, Leguminosae (legume family) and cf. *Lupinus* (lupine) seeds, *Mentzelia* (stickseed) seeds, Papaveraceae (poppy family) seeds, *Phlox* (phlox, pink) seeds, *Physalis* (ground cherry) seeds, and several unknown, unidentified, and unidentifiable seeds, fruits, florets, bracts, leaves, stems, thorns, and bud stems. Bone and insect fragments were also recovered in all of the samples (Cummings 1989).

In summary, pollen analysis of the fill and wash samples collected from the vessel yielded *Zea mays* pollen in both proveniences. This distribution is viewed as more representative of material stored in the vessel than

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material introduced by packrat activity following caching. Macrofloral analysis of material recovered inside and outside the corrugated vessel yielded evidence of plants growing in the vicinity of the cache and collected by the packrats. No remains of edible portions of plants (with the exception of a few seeds and the corn cob) or probable contents of the vessel were recovered.

Analysis of the faunal materials also indicated that nearly all of the materials were secondarily deposited by packrats with the exception of one item, the antelope metatarsal, which was possibly deposited by cultural means. All of the seven taxa identified, with the exception of antelope, are common in the area now. Bailey (1971) notes that antelope were present but scarce in the San Juan Valley prior to 1883 but have only been observed in the more eastern plains regions of New Mexico since that time. However, Nelson (1925:55) notes that "Antelope were once plentiful and widely distributed over the greater part of Utah." He also discovered approximately 150 antelope living along the Green River in Wayne, Emery, and Grand Counties during a census in 1923.

Although a small sample, the minimum number of individuals (MNI) distribution across these taxa is consistent with frequencies observable in natural communities. The element distributions and breakage patterns on many specimens suggest these individuals were originally killed and ingested by larger carnivores such as coyotes (Andrews and Evans 1983). Signs of

gnawing by larger carnivores are absent, but rodent gnawing occurs on two specimens. Many of the specimens may represent predation by larger carnivores but their final deposition in the crack is believed to be due to collection by packrats. One rabbit which is represented by a large number of complete or relatively complete elements was probably not a kill by a large carnivore but was probably collected from a nearby scatter (Dominguez 1989).

Weathering in the crack was most likely slow and the materials were probably stirred frequently by rodent activities. Weathering stages as described by Behrensmeyer (1978) were recorded. With this method the extent of weathering is recorded on a scale with 0 indicating the least amount of weathering. The distribution of weathering stages for the faunal material is fourteen specimens at 0, two at 1, and one at 2 (the antelope metatarsal). Weathering stages were uniform over all surfaces of the specimens and were evenly distributed throughout the deposits. There were occasional dry bone fractures as evidenced by two specimens with rodent gnawing. Although there is a small number of items, these observations do suggest that most of the materials in the midden were often disturbed by packrat activity (Dominguez 1989).

One item, the antelope metatarsal (FS#4), may have been culturally deposited but the evidence is ambiguous. This specimen is moderately weathered (stage two), much more

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so than all other specimens, suggesting much greater age. It is possible that this item remained in or near this position for a long period prior to burial. It was found behind the vessel, near the bottom. It has no carnivore gnawing and slight rodent gnawing. It is heavier than most materials transported by packrats, weighing 42 gm. However, Hoffman and Hays (1987) observed that packrats do move deer bone weighing up to 100 gm. The possibility of deposition of this antelope metatarsal by packrats cannot be ruled out in this case.

The only other materials recovered were the non-human coprolites. These items are believed to have been deposited during natural use of the crevice by local fauna or through collection by the pack rats. No cultural significance is attributed to these materials in association with the vessel.

CERAMIC VESSELS, FOOD STORAGE, AND CACHING: EXPLANATORY FRAMEWORK AND COMPARATIVE DATA

The following discussion is presented as a preliminary interpretative framework for understanding isolated archeological occurrences of ceramic vessels like the specimen found at site 42SA20779 in the Glen Canyon region of southern Utah. A preliminary examination reveals that there are a number of cases of food, resource, and tool caches in the archeological and ethnological record of the American Southwest, southern California, and northern Mexico. Such isolated artifacts or ethnohistorical observations, like individual data points on a regression plot, provide little insight into the patterns of aboriginal life. However, if archeologists make use of a number of these occurrences, such data can be utilized to recognize suggestive patterns and to test contemporary ideas about the past.

This section will consist of three components: 1) an interpretative framework for aboriginal caching and food storage practices, as well as a discussion regarding the adaptive significance of ceramic technology; 2) a description of both archeological and ethnohistorical examples of caching and food storage involving ceramic vessels; and, 3) an interpretative summary of the Hite ceramic vessel cache.

There is no doubt that numerous isolated ceramic vessels like the one described here have been recovered throughout the American Southwest. However, many such specimens have probably been retained in private collections or museums and thus are not documented in the archeological literature. Hopefully, this report will demonstrate the significance of such isolated artifacts, e.g., ceramic vessels, chipped and ground stone tools, baskets, and other perishable remains. These isolated artifacts can provide significant information regarding past human activities that occurred beyond the perimeters of residential sites.

Aboriginal Storage and Caching: An Interpretive Framework

In order to explain the broad range of archeological remains found in the American Southwest, archeologists must make use of an even broader interpretative framework. A considerable portion of the archeological record in the Colorado Plateau reflects the past lifeways of hunting and gathering peoples. The explanatory framework to be utilized here has been proposed by Lewis R. Binford. Adaptive strategies for contemporary hunter-gatherers have been envisioned by Binford (1980, 1982, 1983) as a graded series of increasing organizational complexity from foragers to collectors.

CERAMIC VESSELS

This continuum provides a conceptual basis for organizing and accommodating a broad range of variation exhibited by ethnohistorically-documented hunter-gatherers throughout the world. Binford's theoretical framework for hunter-gatherers has been discussed at length by a number of investigators (Schalk 1977, 1978; Kelly 1980, 1983, 1985; Goland 1983; Torrence 1983; Thomas 1983, 1985; Camilli 1983; Ebert 1986; Chatters 1987; Ebert and Kohler 1988; Kelly and Todd 1988). The reader is referred to these materials for detailed treatment of the forager-to-collector arguments.

Critical Resource Procurement and Food Storage. In essence, foragers and collectors represent fine-grained (generalist) and coarse-grained (specialist) adaptive responses, respectively. These strategies are described by evolutionary ecologists concerned with animal feeding behavior. Foragers exploit critical resources in roughly the same proportions that they are found within their home range(s); they are generalists (Pianka 1983). Individual or group demands for food, fuel, and water are generally met on a day-to-day basis. In these situations, residential moves and/or adjustments in group size and composition serve as responses to local resource depression. Efforts to gain either time or space utility from critical resources through storage or caching are quite limited.

Collectors, on the other hand, exploit essential resources in a coarse-grained or specialized manner (see

Pianka 1983). Resources are exploited disproportionately relative to their occurrence in the environment. Collectors utilize logistic mobility strategies where producers transport essential resources such as food, fuel, water, and raw materials to consumers at residential locations. Collectors, as opposed to foragers, are characterized by the implementation of resource storage strategies. Considerable effort is expended by collectors to obtain large quantities of essential resources within a brief period of time for later use. Frequently, stored resources such as food exhibit high bulk and consequently inhibit residential mobility. Like horticulturalists, collectors must devote considerable time and energy to food processing. Collectors who rely heavily on meat, e.g., bison, caribou, or fish, must process very large quantities of animal products prior to storage. This is particularly true if freezing is not an option. Plant-dependent collectors must devote considerable effort to preliminary seed/nut processing including winnowing, toasting, and/or leaching. In a number of instances, such initial processing is designed to enhance the storage potential of the food resource.

The need to store essential resources among hunter-gatherers has been shown to increase as the length of the growing season decreases. This may be a result of the fact that resource incongruity also increases as an inverse function of the length of the growing season. Logistical mobility tends to replace residential mobility as a means to solve problems stemming from local

resource depression, the need for raw materials, and resource incongruity. Binford (1980:344) states, "Logistical strategies are labor accommodations to incongruent distributions of critical resources or conditions which otherwise restrict mobility." Collectors must make use of logistical travel to accomplish multiple tasks including resource acquisition and monitoring (Kelly 1983).

Organization of Technology and Caching Strategies. The forager-collector continuum also has important implications for the organization of hunter-gatherer technology. As mentioned previously, foragers exploit their environment on a day-to-day basis. Temporal and spatial separation between the procurement and the consumption or use of critical resources is minimal. In such foraging adaptations, there is relatively little need to anticipate future needs; therefore, planning depth with respect to technological organization is minor. Exploitative problems related to resource incongruities are solved primarily through residential moves and adjustments in residential group size. As a result, technological aids such as implements and facilities are more apt to be transported from one residential site to another throughout the course of seasonal movements. One would expect "active gear" to exceed "passive gear" at any particular point in time.

Collectors, on the other hand, must coordinate monitoring and procurement of many low bulk, yet critical, resources within a logistical web

that surrounds the residential "hub" of their land use system. Such critical resources may be widely dispersed and frequently require establishing field camps for task groups exploiting resources more than one day's travel from the main residential site. Such logistical activities require greater complexity in technological organization. For example, raw materials are most frequently obtained while carrying out other logistical activities. A greater proportion of the total "tool kit" used for exploiting widely spaced resources, including implements and facilities used as "passive gear" and "insurance gear," is stored or cached outside the residential site at numerous nodes in the logistical network across the landscape.

Binford (1979:256) comments, for example, that, "Nunamiut technology is characterized by a well developed storage and caching strategy for gear, such that at any one time some of the gear organized within the technology is in storage and not being used"

Nunamiut caches at spring residential sites include sleds, snow shoes, goggles, ice-fishing gear, and winter clothing; whereas, caches at late summer residential sites include kayaks, fishing nets and leisters, and snare traps.

Unlike passive gear, insurance gear is generally not cached at seasonal residential sites but instead, ". . . is generally distributed throughout the region: as site furniture at locations not in use . . . , as discrete

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caches at stream crossings, in well-known caves and rock crevices, in caches adjacent to known archeological sites, or in deliberately constructed rock cairn caching facilities" (Binford 1979:257).

Binford (1979) points out that site furniture may frequently consist of household gear that has been laterally recycled from residential loci. He (1979:264) states, "I suspect that this is not unique to the Nunamiut [Eskimo], and that pots introduced into hunting camps or gathering locations are likely to be well worn but usable elements of household gear which has been replaced at the household location."

Quite interestingly, Binford (1979:258) estimated that, ". . . at any one time between 60 and 70 percent of all gear considered part of the technology might be considered passive." He (1979:258) found that approximately 40 percent of the gear possessed by the Nunamiut at Anaktuvuk was cached outside the village.

Thomas (1985) has recently discussed aboriginal caches and related mobility strategies. In the context of his investigation of Hidden Cave near the Carson River in west-central Nevada, Thomas (1985:29-38) describes resource caches (foodstuffs and raw materials), tool caches (personal gear and insurance gear), communal caches (site furniture), and afterlife caches (burial goods). Thomas (1985:36-37)

reiterates part of Binford's previous discussions of caching, food storage, and technological organization. Food caches are primarily designed to solve adaptive problems associated with the temporal availability of food resources. Seasonal peaks in resource productivity are cropped and stored in order to "fill in" associated lows in food availability. However, as Thomas (1985:37) points out, ". . . the act of storage can create difficulties of spatial incongruity." Frequently, such a spatial problem results from the fact that residential groups must then be located near food stores. Raw materials are also cached in order to resolve temporal and spatial problems for hunter-gatherers and horticulturalists that are organized logistically. Such raw material caches "especially those of low bulk resources- are usually constructed a great distance from the zone of procurement" (Thomas 1985:37). He (1985:37) also points out that "Such low bulk items are also commonly processed in preliminary fashion ("staged") prior to storage, and such caches very often contain appropriate fabricating tools as well." Tool caches can be expected to contain either personal gear or insurance gear. Personal gear includes seasonally and/or functionally specific implements and facilities that are ". . . usually high cost, heavily curated, well-maintained, ready to use, and gender specific" (Thomas 1985:37). Insurance gear is generally cached in strategic locations, e.g., caves, river crossings, and mountain passes, in order to serve contingent needs.

Extending the Continuum: Horticulturalists As Complex Collectors. Binford (1980, 1982, 1983) did not examine horticultural adaptations in the research discussed above. However, one might suggest that the forager-collector continuum might be extended to encompass aboriginal groups that became more dependent on domesticated plants. In general, such groups would have been more dependent on select plant resources, food storage, and logistical mobility strategies than collectors. Binford (1980:18) states, "We would therefore tend to expect some increase [in logistically organized procurement strategies] associated with shifts toward agricultural production." Increased dependence on carbohydrate-rich plants, particularly cereals in this case, would favor collapsed home ranges based on energy needs. A major reduction in residential mobility is frequently associated with decreased home range size, regional packing, and the emergence of territoriality (Binford 1982, 1983). On the other hand, logistical mobility related to animal protein procurement may increase dramatically in areas that lacked domesticated animals.

Reduced residential mobility and heavy dependence on carbohydrate-rich food resources would also be associated with consequent changes in adult female body composition and reproductive physiology and associated increases of fertility and population growth rates. In the arid Southwest, aboriginal food production based on cereal crops (i.e., maize) would have intensified time constraints on labor

required for field preparation, planting, weeding, and harvesting. As Schalk (1977) points out, the implementation of a specialized food storage strategy shifts environmental and organizational stresses from times of food scarcity to times of food abundance. With cereal horticulture, however, such labor organization stresses coincide with the growing season but precede the actual period of food abundance. Large quantities of food have to be planted, tended, and harvested within discrete, relatively short periods of time. Furthermore, heavy dependence on food production and a more specialized diet based on carbohydrate or oil-rich plants requires significant and dramatic increases in processing costs (Ember 1983; Howell 1986:183-185).

Like collectors, horticultural groups would be expected to occupy residential sites for greater portions of the annual cycle. Such sites would contain a number of more permanent residential structures and storage facilities. Initial horticultural commitments would have been managed at the household level. Increased labor demands for cereal horticulture could have been met by adoption of a "household extending strategy" (Sahlins 1957; Netting 1965; Bender 1967; Pasternak et al. 1976; Reyna 1976; Minge-Kalman 1977; Yanagisako 1979). Adoption of the household extending strategy serves to recruit adult producers into the domestic labor force. Given this response to labor stress, food production, storage, and consumption can still be handled at the household level among closely related kin.

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Archeological Correlates of Aboriginal Land Use

Geographical patterns of archeological site distribution can provide correlative evidence for such past strategies of aboriginal land use as discussed in the previous section. The location of forager residential sites is expected to correlate closely with the distribution of high bulk critical resources such as plant/animal foods, fuel, and/or water. Constraints imposed by the quality, quantity, and/or accessibility of such critical resources can be circumvented via residential moves. The probability for site re-use is low. These residential sites for foragers would exhibit interassemblage variability primarily as a function of seasonal variations in resource availability. Intersite and/or interassemblage variability for foraging groups would be marked given seasonal variation in critical resource availability. Artifactual assemblages would exhibit greater redundancy if seasonality were slight or if they represented similar seasons of use or occupation. There should be few, if any, specialized activity sites present in forager land use systems.

As Binford has pointed out, logistically-organized hunter-gatherers produce a more complex archeological "landscape" than foragers. Residential sites tend to be highly visible archeologically, given the dependence on bulk storage, attendant storage facilities, domestic structures, midden accumulations, and so forth. Like foragers, collectors also generate

locations or places at which resources are procured and/or processed. In addition, storage-dependent hunter-gatherers also produce field camps for extra-residential site occupation, stations for resource monitoring, and caches for storing tools, essential raw materials, and food.

Archeologists could expect to observe further elaboration of this logistically organized land use for initial horticultural groups, particularly for those dependent on cereal crops (e.g., maize) in more arid lands where short-fallow swidden systems were not an option. Local soil depletion would also lead to the proliferation of more distant, seasonally-occupied field houses and/or agricultural intensification, e.g., terracing, gridding, and irrigation. Residential sites would be occupied by larger groups for longer periods of time. Domestic architecture might be expected to reflect year-round use (Gilman 1987), while cleanup activities would produce very visible midden accumulations. It is at this point in the archeological sequences in the New World that we observe the appearance of ceremonial architecture and communal mortuary features (e.g., cemeteries and charnel houses).

Assemblage or content variability within specific archeological sites will vary as a function of its stability of use (Binford 1978:483-497). Stability of site use is, in turn, a function of the mobility strategies employed by hunter-gatherers in a given setting. Topographically-fixed loci such as mountain passes, rapids or cataracts, fords,

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caves/rockshelters, lithic source areas and so forth frequently emerge as special purpose sites within hunter-gatherer land use systems. As a result, Binford (1978:491) states, "Special purpose locations are more discrete in their location and more redundant in their use and contents." In contrast, residential sites and transient camps are less likely to be reused or re-occupied since their locations are more likely to be conditioned by the variable location and abundance of critical resources such as food, fuel, and water. Residential sites are "more flexible in their location and more variable in their content" (Binford 1978:491).

Repetitive use of a given geographical location would vary in relation to a given hunter-gatherer group's differential use of residential versus logistical mobility. Foragers making use of a very large home range might not be expected to establish residential sites at the same point on the landscape year after year unless they were mapping on to point resources such as springs or waterholes (Binford 1982). Residential sites for collectors would be expected to be re-used as greater amounts of energy and time were invested in the adoption of a food storage strategy and the construction of permanent residential and storage facilities. Repetitive use of specific locations for residential and special purpose activities would increase as group mobility decreased and as home ranges contracted (Binford 1982). Given these generalizations regarding aboriginal land use, archeologists might then expect to observe artifactual and

ecofactual remains that reflect more stable or consistent site histories in relation to collector or horticultural subsistence strategies.

Adoption of Ceramic Technology

As previously mentioned, archeologists have traditionally devoted considerable attention to prehistoric ceramics in the American Southwest. Yet, most of these studies focused on potsherds instead of complete vessels and discuss "style" and not function. However, this focus is currently changing. A few investigators have addressed questions that deal with the evolutionary significance of ceramic technology in this region. Recent investigations regarding aboriginal use of ceramic vessels have provided a number of insights regarding vessel function and their adaptive significance (e.g., Stoltman 1974; Hayden 1981; Ozker 1982; Hally 1986; Braun 1983; Sullivan 1983; Smith 1985; Steponaitis 1984; Osborn 1987, 1988; Schiffer and Skibo 1987; Hill 1988).

Many anthropologists and archeologists have assumed that ceramic vessels were not used by mobile hunting and gathering peoples (Rafferty 1985:132-134). Drucker (1941:176) comments in this regard,

The universality of pottery making among sedentary and roving groups alike is a noteworthy aspect of the regional culture. The relative importance of the art of course

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varied. Walapai and Shivwits informants volunteered statements on this point. According to the former, his people made little pottery because they were continually moving from one place to another, and pottery was difficult to transport. "We weren't like the Mohave, and Hopi, who stay in one place and have lots of pottery."

Rafferty (1985:133-134) points out that 42.5 percent of the mobile societies in Murdock's standard sample manufactured and used ceramic vessels. In addition, forty percent of the same sample of 150 ethnographic societies that were not dependent on agriculture made use of ceramics. A chi square test for both sets of Rafferty's (1985) data reveals that pottery making and sedentary lifestyle are significantly associated (chi square = 18.47; df = 1; two tailed test, $p < .001$). Furthermore, pottery making and agriculture are significantly associated (chi square = 24.38; df = 1; two tailed test, $p < .001$). However, we find that phi coefficients are low and equal 0.35 and 0.40, respectively. These correlation coefficients suggest that less than 15 percent of the variability in the observed use of ceramics can be accounted for in terms of mobility or dependence on agriculture. Archeologists can, therefore, expect to observe a broad range of variability in the manufacture and utilization of ceramic vessels among foragers, collectors, and horticulturalists.

Stoltman (1974) argued that the earliest ceramics in the southeastern United States are Late Archaic fiber-tempered ware used to cook shellfish. Ozker (1982) suggested that Early Woodland ceramics in the Great Lakes region were utilized to process oils from wild nut crops. Braun (1983) has proposed that ceramic vessels became very important during the Late Woodland for heating carbohydrate-rich starchy plant foods. He (1983:116) states, "Both the palatability and digestibility of starchy seeds can be enhanced by cooking them to the point of gelatinization in a liquid broth."

Hargrave and Braun (1981:12) point out that external heat sources would ultimately affect the boiling time and consistency; so, "Consequently, we may expect that an increasing importance of starchy broths would . . . involve increasing levels of heat intensity and greater rates of temperature change in the use of cooking jars."

Braun (1983) discusses three significant trends in the character of prehistoric ceramic vessels during the Woodland period (circa 600 B. C. to A. D. 900). These three trends include: 1) decreased wall thickness; 2) decreased size and density of temper particles; and, 3) a shift from flat-based cylindrical to globular vessel shapes. All of these changes in vessel construction are seen to be systematically linked to ". . . an increasing attention to the extraction of digestible nutrition from starchy seed foods through cooking--presumably through simmering or

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boiling rather than parching or popping . . .”(Braun 1983:119).

Such increased emphasis on cooking wild, as well as domesticated plant seeds and nuts can be understood in terms of food processing that is essential for several reasons. First, boiling seeds, roots, and nuts facilitates mastication and enhances their palatability and digestibility (Braun 1983). Crapo (1985:104) points out that, "Cooking swells the starch within the cell, bursting the cell wall [of raw foods], and potentially makes the starch more available for digestion." Furthermore, "some foods contain natural amylase inhibitors that may be inactivated by cooking or other aspects of food processing or preparation" (Crapo 1985:104).

Second, cooking destroys heat sensitive toxic compounds contained in many wild and domesticated plants. Such toxins include oxalates, phytates, polyphenols (e.g., phenolic acid, tannins, lectins, and flavanoids) (Abrams 1979; Heizer 1981; Lieberman 1987). Many of these **anti-nutrients** decrease the rate of carbohydrate digestion and absorption (Crapo 1985:105). Various cooking methods, including boiling and roasting, can serve to destroy the inhibitory effects of anti-nutrients. These cooking processes may also destroy highly toxic mycotoxins in seed and nut crops produced by fungal growth. Legumes, for example, contain lectins " . . . that cause red blood cells to agglutinate and can destroy the walls of intestines, leading to decreased

nutrient absorption" (Lieberman 1987:249). Maize contains phytates that chemically bind with trace metals such as iron, zinc, magnesium, and copper and render them unavailable to human metabolism. Both lectins and phytates are broken down by cooking.

Ceramic vessels have also played a significant role in the alkali processing of maize in the New World. Katz et al. (1974) have demonstrated a strong correlation between high levels of maize consumption and alkali treatment throughout the New World. This method involves soaking, heating, and decanting a mixture of maize, water, and lime. This processing treatment softens the maize kernel, modifies the amino acid balance, and adds calcium, phosphorus, potassium, copper, magnesium, and zinc to the solid product *nixtamal*. Osborn (1987, 1988) has argued that shell-tempered ceramic vessels used by prehistoric Mississippian peoples in eastern North America served to alkali process maize. In addition, alkali treatment and heating also destroys extremely poisonous mycotoxins in maize crops attacked by fungi (Osborn 1988). Detoxification of toxic compounds in wild and domesticated plant resources, as well as contaminants such as mycotoxins is a significant research problem that should receive further attention.

The evolutionary development of ceramic cooking and storage vessels may also be closely tied to human demography. Several investigators have suggested interrelationships between

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increased consumption of carbohydrate-rich plant resources, decreased residential mobility, shifts in cooking methods including use of ceramic or metal vessels, and supplemental feeding of weanling infants (e.g., Binford and Chasko 1976; Lee 1980:343-344; Buikstra et al. 1986:540).

Binford and Chasko (1976:138-139) provide the following provocative comments:

Ceramics is commonly added to the archaeological assemblage in the context of sedentism and is demonstrably associated with a diet characterized by small food packages and the use of stored foods. Although not well understood, the appearance of ceramics, the implied increase in the consumption of boiled foods, and trends in sedentism are commonly linked. In situations with

increased consumption of boiled foods linked to increasing intensification of female labor in food procurement, the depressant effects of the latter might be prevented through increased division of labor with respect to child care. Namely, with boiled foods an elderly woman or man could feed children in the absence of their mothers, therefore obviating the disadvantages of having children closely spaced and of necessity with the mother at all times. Thus, other things being equal, we might expect increased rates of population growth in response to increased realized fertility to follow the adoption of ceramics and attendant increases in boiled foods, even with increased female participation in food-procurement activities.

BEHAVIORAL IMPLICATIONS OF THE HITE CERAMIC VESSEL CACHE

The previous discussion does not deal specifically with the Hite ceramic vessel cache or with the archeological record of the American Southwest. Instead, the foregoing sections have focused on a broad adaptive continuum that includes foraging, collecting, and food producing systems. Contemporary anthropological and archeological explanatory ideas have been presented in order to provide a meaningful organizational and explanatory framework for viewing prehistoric and historic artifact caches. Although this particular study deals solely with an isolated ceramic vessel, much of this explanatory framework is also relevant to caches of food, raw materials, site furniture, and/or insurance gear. The former discussion has focused on aboriginal behavioral patterns that might account for the occurrence of ceramic vessel caches. Review of the archeological and ethnographic data indicates that there are many occurrences of such caching activity that may fit this pattern of behavior.

Archeological and Ethnographic Correlates

Observations derived from the extant archeological literature for this region regarding prehistoric and historic ceramic vessel caches indicate a number of recorded incidences of caches. (Figure 17, Table 9, and Appendix D). Ethnohistorical accounts

of ceramic vessel caches in southern California, northern Mexico, and the American Southwest describe examples of food storage, facility caches, and site furniture and are relatively extensive (Table 10 and Appendix E). These same accounts also provide provocative observations about ceramic vessel function and food preservation techniques, vessel repair methods, recycling, and caching locations, all of which may be applicable to the Hite vessel and other similar archeological sites.

With respect to food storage these ethnographic accounts indicate that a variety of foods stuffs, e.g., Panic grass seeds, goosefoot or *Chenopodium* seeds, pine nuts, mesquite beans, tepary beans, agave and mesquite cakes, cactus fruits, palo verde, yucca pods, squash seeds, and maize was stored in ceramic vessels throughout southern California, northern Mexico, and the American Southwest. Ethnographic and archeological cases of food storage in these regions also include animal products such as dried meat of marine fish and turtle, as well as terrestrial mammals, e.g., deer and rabbit.

Cache locations and resource sharing are also discussed in the ethnographic literature. A number of aboriginal groups including the Seri, Serrano, Desert and Mountain Cahuilla, Mountain and Desert Diegueno, Luiseno, Juaneno, Gabrieleno,

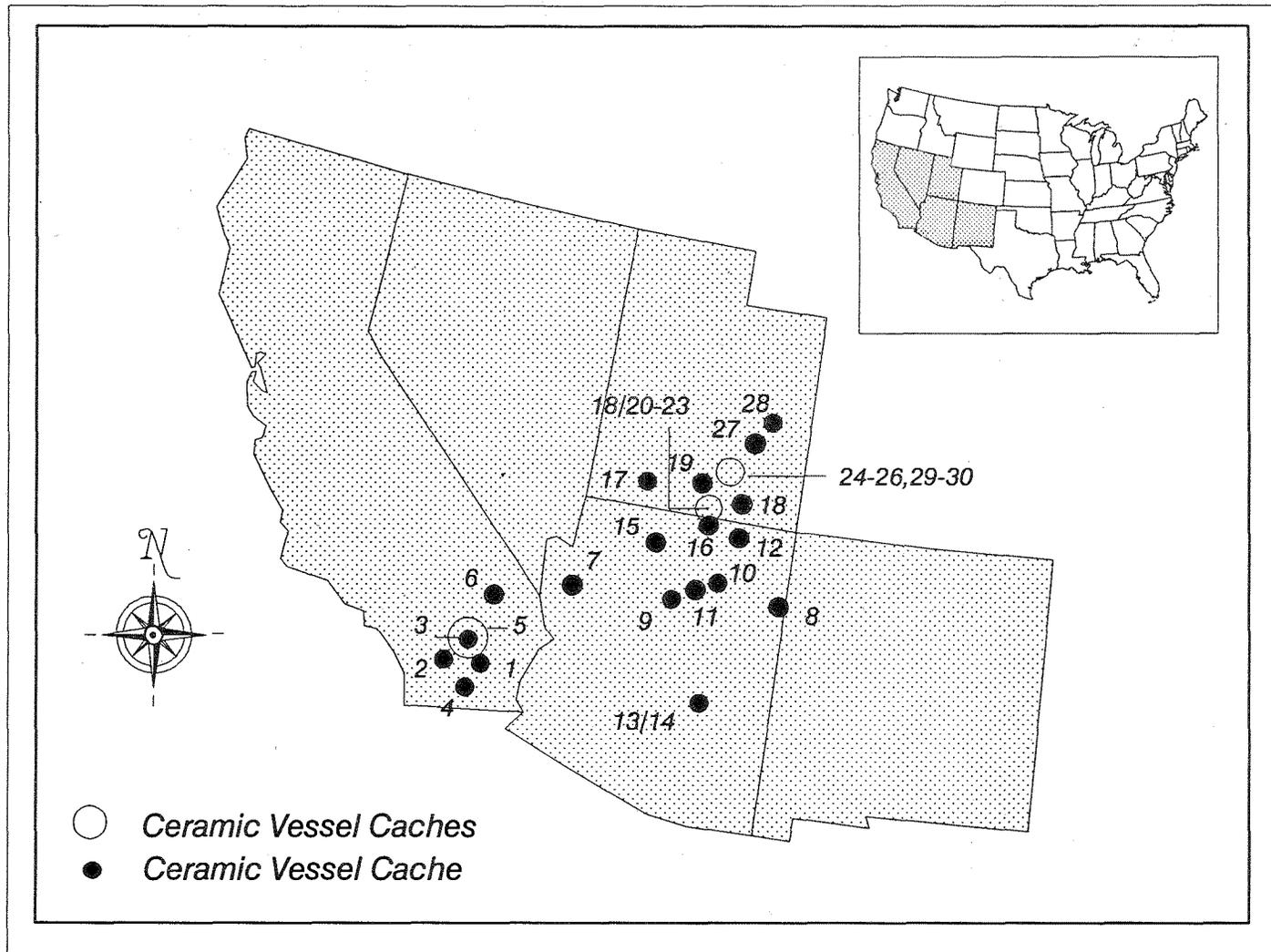


Figure 17. Location of prehistoric and historic ceramic vessel caches in the southwest region.

Table 9. Archeological Examples of Ceramic Vessel Caching and use for Resource Storage.

Location	Use Context	Archaeological Context	Comments	Reference
1. Colorado Desert, SE California	Food storage	Rock-shelter	Large olla contained several honey mesquite beans	Swenson 1984
2. Palm Springs, California	Food storage	Unknown	An olla containing panic grass seeds	Bean and Saubel 1972
3. Joshua Tree National Monument, California	Food storage	Rock-shelter	Large olla containing goldfield and sage seeds; also cache contained large burden basket, iron pan, and spirit sticks	King 1976
4. Lake Cahuilla, SE California	Food/Crop seed storage	Isolated find in dunes?	Small olla containing several squash seeds	Wilke et al. 1977
5. Twenty Nine Palms, S California	Food/Water storage Site furniture	Caves and rock-shelters Sand dunes	Numerous ollas, jars, and bowls	Campbell 1931
6. Southcott Cave, SE California	Site furniture	Cave	Six restorable vessels (4 jars, 1 olla, 1 cooking pot)	Sutton et al. 1987
7. Kingman, Arizona	Food storage	Cave	Lac sealed olla containing 45 mescal cakes	Euler and Jones 1956
8. Lupton, Arizona	Food storage	Cave	Clay/mud sealed large jar containing 22 lbs pinyon nuts	Euler and Jones 1956
9. Flagstaff, Arizona	Food storage	Cave	Large jar containing several maize kernels; covered with pine bark lid	Euler and Jones 1956

Table 9, Continued.

Location	Use Context	Archaeo- logical Context	Comments	Reference
10. Hotevilla, Arizona	Seed storage	Room fill	Corrugated jar containing cotton	Euler 1959
11. Grand Falls, Arizona	Food storage	In rock fissure	Storage jar sealed with clay and covered with inverted bowl	Hevly 1970
12. Olla House, NE Arizona	Food storage	Masonry structure in alcove	Large corrugated jar containing yucca basket half filled with shelled maize and dried rabbit meat	Kidder and Guernsey 1919
	Site furniture	In terrace fill	Six additional cer- amic vessels (5 corrugated)	
13. Red Bow Cliff Dwell- ings, Point of Pines, Arizona	Site furniture	Room floor fill	Two inverted cor- rugated jars, one inverted corrugated jar over bowl, and one inverted bowl	Gifford 1980
14. Pine Flat Cave, Point of Pines, Arizona	Site furniture	Room floor fill	One plain and three corrugated jars	Gifford 1980
15. E. Grand Canyon, Arizona	Insurance gear (?)	Small cave	Three corrugated jars one painted jar, one corrugated olla, two painted pitchers, one twilled basket, one walking stick	Euler 1971
16. Navajo Canyon, Glen Canyon, Utah	Insurance gear (?)	Cave	Two bowls and 1 laddle	Everhart 1982; Donnelly 1984
17. Zion Nat. Park, Utah	Food storage	Cave	Fiber/clay sealed jar containing shelled maize	Euler and Jones 1956

Table 9, Continued.

Location	Use Context	Archaeological Context	Comments	Reference
18. San Juan River, S Utah	Site furniture	Shallow overhang	Corrugated jar	Geib and Bungart 1988
19. Buried Olla Site, Utah	Site furniture (?)	Room fill masonry structure	Painted olla and two corrugated jars	Lipe et al. 1960
20. Glen Canyon, Utah	Salt cache	Cave	Small ceramic jar containing salt; covered with small bowl	Lipe et al. 1960
21. Horsefly Hollow, Utah	Site furniture	Room fill pithouses	Twelve corrugated jars and one painted jar (ten jars with sandstone slab lids)	Sharrock et al. 1961
22. River Crossing Site, Utah	Insurance gear (?)	In masonry "granary" in cliff recess	Two empty corrugated storage jars	Long 1966
23. 42SA739 Glen Canyon, Utah	Unknown	Shallow alcove	Corrugated jar (?) 43 fragments	Sharrock et al. 1963 Schroedl 1977
24. 42GA436 Trachyte Creek, Glen Canyon, Utah	Insurance gear (?)	Small rock-shelter	Corrugated jar (?) 29 fragments	Fowler et al. 1959
25. NA3728 Glen Canyon, Utah	Site Furniture	Shallow alcove	Corrugated jar (?) (fragments)	Foster 1953
26. 42SA20779 Glen Canyon, Utah	Food storage	Crevice in sandstone ledge	Large corrugated olla	This report
27. 42SA17599 Canyonlands National Park, Utah	Insurance gear(?)	Small crevice/ Overhang in bedrock	Corrugated jar and black-on-white bowl	Vetter 1986

Table 9, Concluded.

Location	Use Context	Archaeological Context	Comments	Reference
28. 42SA16858 National Canyonlands National Park, Utah	Site furniture	Placed in shallow pit	Large black-on-white olla (mended)	Osborn and Vetter n.d.
29. Glen Canyon, Utah	Unknown	Unknown	Complete isolated Tusayan corrugated pot	Schroedl 1981
30. 42KA2688 Glen Canyon, Utah	Insurance gear (?), Food storage	Partially buried with surrounding upright slabs in alcove	Moenkopi corrugated vessel with slab cover. Corn cobs in nearby crevice w/ subterranean granary	Metzger and Chandler 1986
31. American Falls, Idaho	Insurance gear (?)	Slabrock niche among boulders	Large globular grayware jar	Butler 1986
32. Seri Region NW Mexico	Food storage	Cave	At least 3 large ollas filled with carbon cactus seeds; ollas sealed with rock lids and lac	Felger and Moser 1985

Table 10. Ethnographic Examples of Ceramic Vessel Caching
and Use for Resource Storage.

Aboriginal Group(s)	Functional Context	Comments	Reference
Seri(1)	Food storage	Seeds, mesquite bean flour, dried fruit, agave cakes, seaweed, dried fish, turtle and deer meat; jars were sealed with lac and hidden in caves.	Felger and Moser 1985
Serrano, Cahuilla, Diegueno, Luiseno, Juaneno, Gabrieleno(2)	Food storage	Ceramic vessels frequently placed in mountain caves	Drucker 1937
Diegueno, Akwa' ala, Papago(3)	Food storage	Domesticated/wild plant foods stored in ceramic vessels and placed in pits in cave floors	Drucker 1941
Papago(8)	Food storage	Food stored in hermetically sealed ollas in houses, village storehouses, and camps in nearby foothills	Castetter and Bell 1942
Gila River Yuma(4)	Food storage	Mesquite meal and saguaro cactus fruits stored in unsealed ceramic vessels	Spier 1933
Cocopa, Mohave, Yuma(5)	Food storage	Maize, tepary beans, pumpkin seeds, and wheat(?)	Euler and Jones 1956
Tompanowots Ute	Food storage	Stored in ceramic vessels	Stewart 1942
NE. Yavapai(9)	Food storage	Maize stored in ceramic vessels in caves	Gifford 1936
SE. Yavapai(10)	Food storage	Acorns, mesquite beans, and sunflower seeds stored in ollas buried in caves	Gifford 1932
Walapai(11)	Food storage	Mescal cakes and yucca pods stored in sealed ollas and placed in caves	Dobyns in Euler and Jones 1956

Table 10, Continued.

Aboriginal Group(s)	Functional Context	Comments	Reference
Pueblo(12)	Food storage	Maize stored in mud-sealed ollas in caves and holes	Euler and Jones 1956
Cahita(13)	Food storage	Ears of maize stored in clay sealed ceramic vessels and cached underground	Beals 1943
Tepehuan(14)	Crop seed storage	Stored in small ollas	Pennington 1969
Yuman(15)	Crop seed storage	Stored in hermetically sealed ollas	Castetter and Bell 1951
Huhula Papago(16)	Crop seed storage	Stored in lac or clay sealed vessels	Euler and Jones 1956
Mohave(17)	Crop seed storage	Tepary beans stored in ollas sealed with gum	Castetter and Bell 1951
Seri(18)	Water storage	Large "eggshell pottery" ollas buried near dry waterholes	Bowen and Moser 1968; Felger and Moser 1985
Owens Valley Paiute(19)	Site furniture	Cached at "habitual camping places"	Liljeblad and Fowler 1986
Tarahumara(20)	Site furniture	Cached near winter cave residences	Bennett and Zingg 1935

Note: Numbers in parentheses in the first column correlate with descriptions in Appendix E.

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Cocopa, Mohave, Yuma, Papago, Northeastern and Southeastern Yavapai, and Walapai stored food in ceramic vessels in locations removed from their residential sites. Frequently, such stored food was hidden from unrelated groups or "enemies." However, Bean (1972:54) mentions that the Cahuilla of southern California "... kept caches of food secretly hidden from everyone- sometimes in distant and remote places, sometimes buried in ollas under the ground, or placed in small caves." We might expect that food resources were hidden in such cases from more distantly related individuals living outside one's immediate household and/or affines within a village or densely populated area. Frequently, such food and resource caches were protected from intruders by "spirit sticks" or other territorial markers (see Campbell 1931; Bean 1972).

On the other hand, caches of food, water, and other essential resources were made available to a limited number of individuals contingent on timely renewal and/or delayed reciprocity.

For example, Bean (1972:54-55) states,

General etiquette dictated that a hungry traveler who was able to discover a food cache might partake of the foods. He was, of course, expected to reciprocate by returning goods to the cache at a later date, or in some way compensate the owner. For this reason small

food caches were placed along trails. Today, Cahuilla frequently recall that while traveling, an olla of seeds was often found, providing them with nourishment for their journey.

Ethnographic descriptions also refer to instances in which ceramic vessels were laterally recycled from domestic use at residential sites to logistical locations such as field camps or hunting stands. Castetter and Bell (1942:184) describe lateral recycling among the Papago of southern Arizona. Food storage vessels were frequently large water jars or ollas that had lost their porosity. Such ollas were better suited for dry storage purposes. Campbell (1931:28) mentions that the Serrano of southern California removed ceramic ollas and bowls from archeological cave sites and used them at their residential locations. As Binford (1979:264) points out, site furniture frequently consists of worn or damaged household gear that is laterally recycled from residential to special purpose sites.

Recycled household gear such as ceramic vessels might be expected to exhibit evidence of repair or modification. Campbell (1931:61) describes a number of methods for mending or repairing damaged ceramic vessels. These repair methods include pinyon pitch plugs, sherd patches, pinyon pitch "smears", gluing, and "shoe lacing." The last method, "shoe lacing," involves drilling paired holes through the vessel walls on both sides of a

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fracture or crack. These paired holes are then laced with bark or plant fiber cord. In some cases, "shoelaced" fractures are then covered with pitch or resin (e.g., Campbell 1931:61). Archeological examples of such vessel repairs are described for several cases in Appendix D; the corrugated jar described in the present study from 42SA20779 has been mended using a combination of sherd patching and pinyon pitch "smears."

The Hite Vessel

Given the preceding discussion, what insights have we gained regarding one isolated occurrence of a complete ceramic vessel from the Glen Canyon region of southern Utah? First, the hunter-gatherer continuum formulated by Binford (1980, 1982, 1983) suggests that caching behavior, in general, is most frequently correlated with logistically-organized behavioral responses. As suggested previously, such behavioral patterns are exhibited by collectors such as the Owens Valley Paiute of the Great Basin. We can also extend this forager-collector continuum to include aboriginal groups like the Hopi, Zuni, Pima, and Papago that were increasingly dependent on domesticated crops. Second, such logistically-organized groups were less residentially mobile, lived a great portion of the year in homesteads, hamlets, or small villages, and utilized smaller task groups to move critical resources such as food, water, and raw materials to dependent consumer groups. Third, collectors and some horticulturalists

most probably produced a greater variety of more "ephemeral" sites including temporary field camps, resource and tool caches, stations, and locations. Fourth, frequently such reductions in residential mobility were closely tied to increased dependence on the storage of high bulk food resources, e.g., dried or frozen meat; wild seeds, nuts, and tubers; domesticated cereals. Fifth, increased dietary specialization involving carbohydrate-rich wild and domesticated plants might also be associated with more costly food processing activities involving the manufacture and use of ceramic vessels for cooking plant resources. Ceramic technology may have been critical in order to enhance digestibility and to reduce toxic and/or inhibitory secondary compounds. Sixth, increased dependence on more specialized diets was associated with increased human labor demands which means that households, as well as residential group sizes, must be larger in order to effectively procure and process large quantities of critical resources during and immediately following the growing season. Seventh, increased residential group size and regional population packing may also have forced increased food hoarding behavior. Such behavior might be expected once local and regional populations included more and more distantly related individuals.

Discussion

Given the preliminary nature of this adaptive behavior framework, it may seem premature to extend its

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interpretive potential to implications concerning the vessel found at site 42SA20779. However, the extent of analysis of the physical remains at the site lends support to interpretation of the vessel through this process.

The results of investigations at site 42SA20779 suggest that the corrugated olla was cached in the crevice sometime during the Pueblo II or Pueblo III Period (circa A.D. 850-1300) as either a hidden food reserve or as provisions for a logistical activity locality. Easy access to upland areas through this drainage and the sites proximity to lithic and possible wild food resources (e.g., ricegrass and wild game) indicates that logistic activities may have occurred here frequently and resulted in the caching of food at this site. However, materials recovered with the vessel during excavation, including the corn, yucca pod fragments, antelope metatarsal, and pollen indicating several other possible food items, are similar to items identified in ethnographic accounts as items commonly stored as hidden food reserves (See Table 10 and Appendix E). Similar collections of items have also been identified at similar archeological sites (See Table 9 and Appendix D).

Given the lack of tools or debitage in association with the site, and evidence from floral remains, it appears that the emphasis was on the storage of food items as opposed to tools or other insurance gear. Such food storage activities would be expected from a group of collectors or horticulturalists depending on stored

food at least part of the year. The high incidence of corn pollen in the pot and the presence of the corn cob suggest that those who cached the vessel were horticulturalists.

If these people were indeed practicing horticultural subsistence, we could further conclude that they were spending a majority of the year in a permanent residence and that the residential group is large. Horticulture requires less residential mobility, greater logistical mobility, and larger residential groups due to the increased labor demands of planting, harvesting, and processing. The location of site 42SA20779 approximately two miles from several large, residential sites of the same period that are adjacent to arable land helps support this interpretation.

This discussion of aboriginal caching, food storage, and ceramic technology has been presented as an interpretative context within which we can begin to understand aboriginal resource and tool caches in the American Southwest. The present study has focused on an isolated ceramic vessel recently found in the Glen Canyon region of southern Utah. Specific archeological and ethnographic cases involving ceramic vessels, i.e., food or water caches, site furniture, or insurance gear, have also been presented in order to provide additional insights into caching strategies. Such relatively small archeological sites have traditionally not received much attention by archeologists. However, the study of caching behavior is now the focus of a

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number of provocative studies. Such prehistoric and historic occurrences offer archeologists yet another pathway for investigating aboriginal adaptations to the arid environments of the American Southwest and adjacent regions.

Thomas (1985:38) states in this regard,

This, in fact, is the most important point that emerges from a

consideration of archaeological visibility in storage strategies. Cache assemblages contain a subset of the artifacts, ecofacts, and unmodified resources that cycle through the behavioral system. So long as caches remain intact, one can employ the concrete criteria of diversity, condition, and functional specificity to readily distinguish the strategies behind their construction.

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APPENDIX A:
FIELD SPECIMEN PROVENIENCE

FS#	Horizontal Provenience	Vertical Provenience
1	Fill behind (north) vessel	Above vessel rim
2	Fill behind (north) vessel	Above vessel rim
3	Fill behind (north) vessel	Level with vessel rim
4	Fill behind (north) vessel	Below vessel rim
5	Fill in front (south) of vessel	Below vessel rim
6	Fill in front (south) of vessel	Below vessel rim
7	Compact surface in front (south) of vessel	Below vessel rim/above vessel base
8	Fill, vessel interior	Upper 1/2 of vessel
9	Fill, vessel interior	Lower 1/2 of vessel
10	Fill, vessel interior	Upper 1/2 of vessel
11	Fill, vessel interior	Lower 1/2 of vessel
12	Fill, vessel interior	Lower 1/2 of vessel
13	Surface wash, vessel interior	Vessel interior

APPENDIX B:

METHODS FOR POLLEN AND MACROFLORAL ANALYSIS

by Linda Scott Cummings

The pollen was extracted from soil samples from southern Utah and submitted by Midwest Archeological Center. A chemical extraction technique based on flotation is the standard preparation technique used in this laboratory for the removal of the pollen from the large volume of sand, silt, and clay with which they are mixed. This particular process was developed for extraction of pollen from soils where preservation has been less than ideal and pollen density is low.

Hydrochloric acid (10 percent) was used to remove calcium carbonates present in the soil, after which the samples were screened through 150 micron mesh. Sodium polytungstate (density 2.0) was used for the flotation process. All samples received a short (10 minute) treatment in hot hydrofluoric acid to remove any remaining inorganic particles. The samples were then acetolated for three minutes to remove any extraneous organic matter.

A light microscope was used to count the pollen to a total of 100 to 200 pollen grains at a magnification of 430x. Pollen preservation in these samples varied from excellent to poor. Comparative reference material collected at the Intermountain Herbarium at Utah State University and the University of Colorado Herbarium was used to identify the pollen to the family, genus, and species level, where possible.

Pollen aggregates were recorded during identification of the pollen. Aggregates are clumps of a single type of pollen, and may be interpreted to represent pollen dispersal over short distances, or the actual introduction of portions of the plant represented into an archeological setting. Aggregates were included in the pollen counts as single grains, as is customary. The presence of aggregates is noted by an "*" next to the pollen frequency on the pollen table. A "+" on the pollen table indicates that the pollen type was observed outside the regular count while scanning the remainder of the microscope slide.

Indeterminate pollen includes pollen grains that are folded, mutilated, and otherwise distorted beyond recognition. These grains are included in the total pollen count, as they are part of the pollen record.

The vessel was washed at the Midwest Archeological Center with distilled water and dilute hydrochloric acid to recover any pollen from the interior of the vessel. The interior surface was brushed with a dry brush so that all loose dirt was removed. The surface was washed with distilled water and dilute hydrochloric acid, and scrubbed with a brush to release all trapped pollen. The resulting liquid was saved, and processed in a similar

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manner to the soil samples, with the exception that the zinc bromide separation was not used.

The macrofloral samples were floated using a modification of the procedures outlined by Matthews (1979). Less than one liter per sample was floated in approximately three gallons of water. The sample was stirred until a strong vortex formed, which was allowed to slow before pouring the light fraction through a 150 micron mesh sieve. Additional water was added and the flotation process repeated until all visible macrofloral material was removed from the sample (a minimum of three times). The floated portion was then dried and passed through a series of graduated screens (U.S. Standard Sieves with 4mm, 2mm, 1mm, and 0.5mm openings) to separate charcoal debris and to initially sort the seeds. The contents of each screen were then measured and examined. The material which remained in the 2 mm, 1 mm, and 0.5 mm sieves was scanned under a bin-

ocular microscope at a magnification of 10x, while a portion of the finest material, which passed through the 0.5 mm sieve, was examined under a magnification of 20x. Macrofloral remains were identified using a binocular microscope at magnifications of up to 40x. The coarse fraction was water-screened, dried, and examined for macrofloral remains. The term "seed" is used to represent seeds, achenes, caryopses, and other disseminules.

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APPENDIX C:
FAUNAL MATERIALS

by Steve Dominguez

FS# 1a Taxon: *Neotoma* sp.
Element: Mandible
Side: Right
Portion: Missing anterior portion of I/1
and superior portion of coronoid process.
Dev't: Late adult
Break types: Green
Carnivore alteration: Unknown
Weathering stage and sides: 0, even

FS#: 1b Taxon: *Neotoma* sp.
Element: Mandible, anterior
Side: Left
Portion: Only superior portion with diastema and alveolus of M/1,2
Dev't: Adult
Break types: Green
Carnivore alteration: Unknown
Weathering stage and sides: 0, even
Comment: Not same individual as FS# 1a,
tooth eruption dissimilar

FS#: 1c Taxon: *Sylvilagus* sp.
Element: Squamosal and parietal
Side: Right
Portion: Lateral and superior, bears portion of zygomatic arch and portion of parietal
Dev't: Unknown, full sized
Break types: Green
Carnivore alteration: Unknown, possibly broken during ingestion
Weathering stage and sides: 0, even

FS#: 1d Taxon: c.f. *Sciuridae*
Element: Femur
Side: Left
Portion: Missing distal epiphysis
Dev't: Unfused distal epiphysis
Break types: None
Carnivore alteration: None
Weathering stage and sides: 0, even

FS#: 1e Taxon: *Sylvilagus* sp.
Element: Humerus
Side: Left
Portion: Distal
Dev't: Fused
Break types: Green
Carnivore alteration: Possibly broken during ingestion
Weathering stage and sides: 0, even

FS#: 1f Taxon: *Sylvilagus* sp.
Element: Thoracic vertebra
Side: Middle
Portion: Missing small portion of centrum
Dev't: Unfused
Break types: Dry
Carnivore alteration: None observed
Weathering stage and sides: 0, even

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FS#: 4 Taxon: *Antilocapra americana*

Element: Metatarsal

Side: Left

Portion: Diaphysis

Dev't: Unfused, both ends

Break types: None

Carnivore alteration: None observed

Weathering stage and sides: 2, even

FS#: 8c Taxon: *Sylvilagus* sp.

Element: Mandible, anterior

Side: Right

Portion: Anterior to P/2, P/1 missing, I/1 present.

Dev't: Probably adult

Break types: Green

Carnivore alteration: Unknown, possibly broken during ingestion

Weathering stage and sides: 0, even

FS#: 8a Taxon: *Sylvilagus* sp.

Element: Calcaneus

Side: Left

Portion: Complete

Dev't: Fused

Break types: None

Carnivore alteration: None

Weathering stage and sides: 0, even

FS#: 8b Taxon: *Sylvilagus* sp.

Element: Mandible

Side: Right

Portion: Portion anterior to M/1, missing ventral portion

Dev't: Adult

Break types: Dry, possibly overlying green breaks

Carnivore alteration: Unknown, possibly broken during ingestion

Weathering stage and sides: 1, even

APPENDIX D:
ARCHEOLOGICAL ACCOUNTS OF CERAMIC
VESSEL CACHES

1. A large ceramic olla or storage jar was found in 1972 in a small rockshelter (CA-RIV-519) in the Colorado Desert near the Mecca Hills in southeastern California. This large spherical, buff-ware olla contained decayed mesquite beans that were C-14 dated to 200 +/- 100 years B. P. or to the early historic period. The cache was thought to have been placed here by the Desert Cahuilla (Swenson 1984).

2. An olla was found in 1969 near Palm Springs, California. It contained panic grass seeds (*Panicum urvilleanum*) (Bean and Saubel 1972:99).

3. A burden basket, an olla, an iron pan, and three "spirit sticks" were discovered in a rockshelter cache near Cottonwood Spring, California in Joshua Tree National Monument in 1975. The buffware olla resembles those described by Bean (1974:54) as water or seed storage vessels used by the Cahuilla. Processed soil from the vessel interior contained seeds of goldfield, sage, juniper, nolina, grape, and goat-nut. This cache is assumed to have been placed in the rockshelter by Cahuilla ca. A. D. 1895 to 1910 (King 1976).

4. ". . . a . . . smaller, olla containing a few cultivated squash (*Cucurbita pepo*) seeds was recovered from a site located on the shoreline of the most recent stand of Lake Cahuilla near the base of the Fish Creek Mountains approximately 65 km. south of the Mecca Hills (Wilke et al. 1977:56-57)" (Swenson 1984:248).

5. Numerous ceramic vessel caches were found within a 25-mile radius of Twenty Nine Palms in San Bernadino County, California. This region was intensively surveyed by Elizabeth W. Crozer Campbell and William H. Campbell between 1925 and 1931. This region was occupied and/or exploited by historic groups of Paiute, Serrano, Cahuilla, and Chemehuevis. Most of the ceramic vessels recovered from these caches were large, thin-walled, narrow-necked ollas (see Campbell 1931:45-61, Pl. 25-35). Additional vessel forms found included wide-mouthed jars and bowls. These ceramic vessels along with baskets, wooden implements, stone tools, and "spirit sticks" were recovered primarily from caves and boulder outcrops.

6. Six ceramic vessels and three sherd lids were recovered from Southcott Cave in the Providence Mountains of southern California (Sutton et al. 1987). Three of these vessels were jars assigned to Tizon Brown Ware circa A. D. 800-1900; and three vessels (one jar, one olla, and one large cooking pot) were classified as Parker Buff Series circa A. D. 1000-1900. The Parker Buff olla had originally been hermetically sealed with a buffware sherd cover (lid) and creosote lac. Two disparate accelerator radiometric dates were computed based on this creosote lac; they were 2100 +/- 230 B.P. and 230 +/- 85 B.P. (Sutton et al. 1987). This material may have been introduced into the cave by historic Mohave.

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7. Large globular sand/calcite tempered olla found in a cave near Kingman, Arizona in 1938 (Museum of Northern Arizona Catalog No. 1019/L). The olla was sealed with a ground sherd lid and creosote bush lac. It contained 45 slabs of mescal cakes. This organic material was dated via radiocarbon method; the date was 650 +/- 200 years (A.D. 1305 +/- 200). This olla is illustrated by Euler and Jones (1956:88, Fig. 1).

8. Large Puerco Black-on-White jar found by Milton A. Wetherill in 1943 in a cave [Site NA5010] in the Lupton region of eastern Arizona. The jar was sealed with a clay stopper and mud. It contained 22 pounds of pinyon nuts [probably roasted]. It was assumed to have been cached circa A. D. 1000. This black-on-white jar is illustrated in Euler and Jones (1956:92, Fig. 2).

9. A large Deadmans Fugitive Red jar [Museum of Northern Arizona Cat. No. 41/29] containing a few kernels of maize was found in Medicine Cave near Flagstaff, Arizona. It was covered with a ponderosa pine bark lid (Euler and Jones 1956:93).

10. A Tusayan Corrugated jar was found eroding from room fill in a road cut through the late Pueblo III village Ma-chon-pi (NA 835) near the present Hopi village of Hotevilla, Arizona (Euler 1959:23). The base of the jar had been broken and a large corrugated sherd had been placed inside to cover it. Cotton seeds (*Gossypium Hopi*) filled about one-fourth of the jar.

11. A sealed storage jar was found in a rock fissure on the Little Colorado River approximately one-quarter mile

downstream from Grand Falls, Arizona. The jar orifice was covered with an inverted Alameda Brown Ware bowl and sealed with clay. It contained several cobs and kernels of maize, a bean seed, a juniper berry, 10 cotton seeds, dipteran pupae cases, and a leaf of a broad-leaf yucca. It is assumed to date circa A. D. 1200-1250 (mid-Pueblo III period; Hevley 1970).

12. Olla House (Ruin 7) in northeastern Arizona yielded seven completed vessels. One large corrugated jar was covered with a sandstone lid. It contained a yucca ring-basket half filled with shelled corn and dried rabbit meat (Kidder and Guernsey 1919:52).

Three complete, empty corrugated ollas were found just below the surface near an outer terrace retaining wall in this "cliff dwelling" [Olla House -Ruin 7, northeastern Arizona] (Kidder and Guernsey 1919:52, Pl. 16a).

Two additional, complete corrugated ollas were recovered approximately three feet from the first three vessels. Each was covered with a sandstone slab. (Kidder and Guernsey 1919:52, Pl. b).

A sixth vessel was found with a yucca leaf "harness" or sling. It was broken on the bottom and had been reinforced with a coil of feather-cloth string.

13. Red Bow Cliff Dwellings, Point of Pines Region, Arizona

1. Reserve Plain Corrugated jar- inverted [Room 4]
2. Kinishba Red bowl- inverted [Room K]

3. Point of Pines Indented Corrugated jar- inverted [Room 1]
 4. Cooking utensil cache- Point of Pines Indented Corrugated jar inverted over Kinishba Red bowl [Room 1]
(Gifford 1980:136, Fig. 20a-d)
14. Pine Flat Cave, Point of Pines Region, Arizona:
Four jars- standing upright just beneath floor Room 8 included-
1. Alma Plain storage jar
 2. Pine Flat Neck Corrugated jar
 3. Tularosa Patterned Corrugated jar
 4. Three Circle Neck Corrugated jar
(Gifford 1980:143, Fig. 104)
15. A cache of two corrugated jars, a corrugated olla, two black-on-white pitchers, a small black-on-white jar, a small twilled yucca basket, and walking stick was found in a small cave (Ariz. C:13:68) in upper Lava Canyon in the eastern Grand Canyon region of Arizona (Euler 1971). This cache included:
1. Moenkopi Corrugated jar (C:13:68.9)
 2. Tusayan Corrugated jar (C:13:68.11)
 3. Tusayan Corrugated, fugitive red variety olla (C:13:68.1)
 4. Tusayan Corrugated jar (C:13:68.5)
 5. Black Mesa Black-on-White pitcher (C:13:68.14)
 6. Tusayan White Ware, Flagstaff Black-on-White? jar (C:13:68.16)
 7. Walnut Black-on-White pitcher (C:13:68.15)
 8. Twilled yucca sifter basket (C:13:68.20)
- All vessels are illustrated by Euler (1971:180, Fig. 3; 181, Fig. 4).
16. Cache of ceramic vessels including two ceramic bowls and a ladle was found in a small "solution pocket" or "cave" about 15 miles up Navajo Canyon on its northern bank. This small cavity (AZ C:3:4; GLCA-NC-1) measures 1.5 meters wide, 1.5 meters deep, and 1 meter high. Both bowls were inverted and were resting on the sandy fill of the cave. One bowl is Tusayan Black-on-White (circa A.D. 1150-1300), has a single loop handle, and cracks that were later repaired with yucca fiber twine. It measures approximately 20-21 cm in diameter and is 10 cm deep. The second bowl is a brownware vessel, possibly Shinarump Brown (circa A.D. 1100-1300), and it also exhibits a loop handle. It exhibits wear marks on the interior and exterior that are thought to reflect mixing action. It apparently contained cornmeal mush based on the results of pollen analysis. The ceramic ladle is 20 cm long and 10 cm wide at the "bowl;" it exhibits a loop handle (Everhart 1982; Donnelly 1984).
17. A wide-mouthed North Creek Gray jar was found in a cave [site ZNP-21/NA5471] by Ben Wetherill in Parunaweap Canyon on the Virgin River. It was sealed with a clay and fiber-covered lid and contained shelled corn. Mud had been smeared over the entire surface of the lid and around the neck. The vessel was enclosed with a coarse rope sling. It has been assigned to the "Developmental Pueblo period of the Virgin Branch, Anasazi Root, even though *in situ* it was in Basketmaker cultural debris" (Euler and Jones 1956:93, Fig. 3; Schroeder 1955:87, 86, Pl. 13d).

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18. A Mesa Verde corrugated jar was found in a shallow overhang (42SA18849) on the San Juan River near Lake Powell (Geib and Bungart 1988:41, 54-56, 55, Figs. 33-34). The overhang contains two "storage rooms" constructed between large fall rocks and the cliff face. The corrugated jar has a maximum diameter equal to 88 cm and a rim diameter equal to 15 cm. Vessel wall thickness is approximately 0.7-0.8 cm. The exterior surface exhibits carbon soot indicating that the vessel was used for cooking. The basal portion of the jar is cracked around its circumference. It was repaired with clay and apparently was recycled out of a residential site.

19. Buried Olla Site (42GA367; NA5363) in Utah:

Tusayan Black-on-White olla found 24 inches below the surface in an upright position. There was no lid on this vessel. Probably placed in pit (Lipe et al. 1960:78). Illustrated by Lipe et al. (1960:162, Fig. 40a).

Two Tusayan Corrugated jars also found in upright positions; they had no lids (Lipe et al. 1960:80). Illustrated by Lipe et al. 1960: 162, Fig. 40c). Estimated period of occupation- A.D. 1050-1300.

20. Salt cache in small ceramic jar with a ceramic bowl used as a lid found in Stratum III of Benchmark Cave northeast of Catfish Canyon in the Glen Canyon area of southern Utah (Lipe 1960:96, Fig. 23).

21. Horsefly Hollow (42SA544), Glen Canyon, Utah:

Thirteen ceramic storage vessels were found set in intrusive pits in the floor of a pit house cluster. Five vessels were

Mancos Corrugated, three were Mesa Verde Corrugated, four were Moenkopi Corrugated, and one was a Mesa Verde Black-on-White jar.

Ten of the corrugated pots were covered with flat, shaped sandstone slab lids. "All were found upright with slab lids in place but nearby all had broken apart or had cracked along coil seams . . . The vessels evidently were used for water and/or food storage." (Sharrock et al. 1961:56) Dates span A. D. 900-1300. Two storage vessels are illustrated in Fig. 55, p. 195.

22. Two empty corrugated storage jars found in one of four masonry granary structures in a sandstone cliff located on the left bank of the Colorado River at the River Crossing Site (NA6426;42SA411) (Long 1966:11).

23. Forty-three sherds representing a corrugated Tusayan Gray Ware olla (restorable) were found on a sandy fill covered floor of a small alcove in a sandstone cliff on the left bank of Moqui Canyon, San Juan County, Utah. This site 42SA739 was recorded in July 1961 by Day (Sharrock et al. 1963; Schroedl 1977:329).

24. Twenty-nine sherds representing one Tusayan Gray Ware corrugated vessel were found in a small rockshelter (42GA436) on the right bank of Trachyte Creek, Garfield County, Utah. All sherds were recovered from an area of the floor measuring 4 ft x 7 ft. This material was collected by Richard Ambler in late August, 1958 (Fowler et al. 1959).

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25. Sherds representing one corrugated ceramic vessel were collected from a shallow cliff alcove approximately one-half mile south of the Colorado River (Mile 84.6) in Glen Canyon, Utah. This site, NA3728, was recorded by Gene Foster in October 1953 (Original site record card F-40, Foster 1953).

26. A large corrugated Mesa Verde jar was found by hikers in Glen Canyon National Recreation Area in southern Utah. The vessel had been cached in a crevice located beneath a sandstone outcrop. This site has been designated 42SA20779 and is the subject of the present study.

27. A large corrugated jar and Mesa Verde black-on-white (?) bowl were found beneath a shallow ledge near the Green River overlook in Canyonlands National Park, Utah. This location was designated 42SA17599 (temporary no. GR-1985). Both ceramic vessels have been looted from this location (Vetter 1986).

28. A large Mesa Verde black-on-white olla was found during excavations at 42SA16858 (Dunes Sites) in the Island-in-the-Sky district of Canyonlands National Park, Utah. This incomplete olla had been placed upright within a narrow pit (Feature 40). It exhibits a number of paired mend holes; these holes had been used to repair large cracks in the vessel walls. Soil samples from the vessel walls, as well as the earth fill within it yielded maize, squash, and legume pollen. Two radiocarbon samples from this site provided radiometric determinations equal to A.D. 615 +/- 65 and A.D. 740 +/- 80 (Osborn and Vetter n.d.).

29. Complete Tusayan Corrugated pot, isolated, discovered north of Hite along the Colorado River in Cataract Canyon. The context and content of the pot is unknown, however, the pot was isolated and not associated with any other materials (Schroedl 1981).

30. Site 42KA2688 (covered Pot Alcove). Moenkopi or Tusayan corrugated gray pot with shaped slab cover, partially buried with a few surrounding upright slabs. No other materials noted. Pot is in alcove at one end of a large amphitheater. At the opposite end is another crevice with a subterranean granary and scattered corn cobs and rubble (Metzger and Chandler 1986).

31. Large, nearly complete jar was found in winter 1982-1983 on the north side of the Snake River several miles below American Falls, Idaho. The vessel was resting upside down in sandy silt on the floor of a narrow slabrock niche. A portion of the vessel bottom was broken; several sherds were later recovered. Based on an examination of several of these basal sherds that were tempered with crushed quartz, R. Madsen assigned the vessel to Great Salt Lake Gray Ware. However, D. Madsen assigned the crushed basalt tempered vessel to Sevier Gray Ware (Butler 1986:46-47, Fig. 13).

32. At least three large sealed ollas filled with columnar cactus (*cardon*) seeds. These ollas were cached in a cave located on Pico Johnson Peak in the Sierra Seri range in northwestern Mexico (Felger and Moser 1985:91-92, Fig. 6.13).

APPENDIX E: ETHNOGRAPHIC ACCOUNTS OF CACHING BEHAVIOR

1. Seri Indians:

"Different kinds of food were stored. Seeds (both whole or ground into flour), dried fruit, mesquite and century plant cakes, and dried fish, sea turtle, and deer meat were kept in large pottery vessels, or ollas (Bowen and Moser 1968:118-120). These vessels had pottery, rock, or clamshell (e.g., *Laevicardium elatum*) lids sealed with creosote bush lac (*csipx*). Storage vessels were often cached in small caves (Fig. 6.13). Parching or cooking food prior to storage and storing freshly harvested seeds in tightly sealed pottery vessels helped prevent spoilage and losses from rodents. Plant derived foods from the following species were commonly stored: *Agave* spp., century plant; *Amaranthus watsonii*, bledo; *Carnegia gigantea* sahuaro; *Cercidium microphyllum* foothill paloverde; *Chenopodium murale* goosefoot; *Pachycereus pringlei* cardon; *Prosopis glandulosa* mesquite; *Stenocereus thurberi* organ pipe; *Zostera marina* eelgrass" (Felger and Moser 1985:91).

Mesquite bean flour was mixed with water and made into rolls or cakes.

"The rolls and cakes were dried immediately so that they would not spoil. When dry they could be stored in pottery vessels for a long time. Seri families often had two or more large vessels filled with mesquite rolls hidden in caves for times of need" (Felger and Moser 1985:339).

2. Serrano, Desert Cahuilla, Mt. Cahuilla, Mt. Diegueno, Desert Diegueno, Pass

Cahuilla, Western Diegueno, Luiseno, Juaneno, Gabrieleno:

Food stored in ceramic vessels and frequently cached in the mountains (Drucker 1937:10).

3. Yuman-Piman groups--Diegueno, Akwa'ala, and Papago:

Both domesticated and wild foods stored in ceramic vessels and placed in caves and/or pits in caves (Drucker 1941:102).

4. Yuman tribes of the Gila River:

They stored "... mesquite meal and saguaro fruits in pottery vessels, but feels that these were not sealed" (Spier 1933:51,57 in Euler and Jones 1956:94)

5. Cocopa, Mohave, and Yuma:

"Some informants stated that grain was first sealed in ollas and the vessels in turn placed in the granary baskets . . . The materials stored in the various containers [including gourds] were dried products such as maize, tepary beans, pumpkin seeds, and wheat, and were given further protection by being hidden in rock crevices, placed in caves for safekeeping against enemies and floods, or sometimes buried" (Euler and Jones 1956:94).

6. Cahuilla (Southern California):

"... the climate of the Cahuilla area was exceedingly arid, a natural

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condition advantageous for the storage of food. And, as has been described, foods were dried and then stored for future use in large basket granaries and ollas. Preservation was facilitated by placing perishable foods in storage vessels and then hermetically sealing them with pine pitch, or beeswax.

The large granaries were built near each household and each *kis amna wet* (ceremonial house) and were used for storing enormous quantities of food. A single acorn granary, for instance, might hold several bushels of acorns; a single olla might hold several quarts of seeds, and a handful might produce a meal for several persons. Some clay storage vessels stood as high as four feet and were two feet in diameter . . .

Generally speaking, the storage activities of each household were sufficiently public so that all were aware of the amount of food being stored. A major amount of this stored food was easily in view of any visitor, and, as will be seen, hoarding or stinginess was a serious breach of normative postulates . . . However, other caching activities were admissible.

In addition to the storage of food in granaries located about the village, families or individuals characteristically kept caches of food secretly hidden from everyone--sometimes in distant and remote places, sometimes buried in ollas under the ground, or placed in small caves. The openings to these small caves were carefully covered with brush to keep their presence unknown to others. Ritual protection was also employed whereby the owner made 'spirit sticks' from which he dangled feathers or other magical items so that poachers who discovered the cave would be

harmed if they stole the contents of the cache.

A safety mechanism was built into the caching system, however, to compensate for the negative aspects which might be attached to this. General etiquette dictated that a hungry traveler who was able to discover a food cache might partake of the foods. He was, of course, expected to reciprocate by returning goods to that cache at a later date, or in some way to compensate the owner. For this reason small food caches were placed along the trails. Today, Cahuilla frequently recall that while traveling, an olla of seeds was often found, providing them with nourishment for their journey.

It is interesting to speculate the extent to which these caches were secret or were deliberately placed in spots that would be found easily. As will be seen, etiquette dictated a set of reciprocity rules which could not be avoided, so the caching of secret supplies of food and other goods could have provided some release from the frustrations or obligations so prominent in sharing. The secret caching, then, could have acted as a safety mechanism for individual families or persons in times of great food stress" (Bean 1972:53-55).

7. Southern Numa:

"The Indian can save food for future use only by caching it. As long as it is in camp it is common property, or at least it would be considered very ill mannered indeed to not offer a portion of it to any one who might be destitute.

A cache is a hiding or storing away of any articles of value which may be used at some future time. When the season for gathering seeds is passed many of the baskets used for this purpose are thus placed away ready for the next year, but stores of

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food are the principal objects thus temporarily put away. I have observed two methods of making caches; one was to dig a hole in the ground, and in it place the articles to be preserved. It was then covered with stones, and sand raked over the top. Then a fire is built over this and kept up perhaps for two or three days which serves a double purpose first to hide all evidence that might otherwise have appeared to indicate the position of the cache, to persons who might be passing, and second, which is the principal cause as asserted by the Utes, to destroy the odor by which wolves or other animals might be attracted to the spot.

Many caches are made in caves and crevices, which are everywhere to be found in this region of cañons and cliffs, the seeds or other articles being placed in baskets or sacks, and sometimes covered with bast of cedar, and over the whole a huge pile of stones is placed.

It should be remembered that this climate is exceedingly arid, and if these caches are properly secured from rain they remain permanently dry. I once discovered a basket in a little cave in Still Water Cañon, a few miles above the junction of the Grand and Green [rivers] made by peoples who inhabited this same region of country at a period anterior to its occupation by the present races, a people who had fixed homes, and although it afterwards crumbled to pieces, due to rough usage in packing, when it was found it was quite entire, without mould or perceptible decay. I am inclined to believe that it has laid in the cave for centuries.

A cache in the rocks or cave is called *To-go'-i*. A cache in the ground is called *U-rai'-go-i*.

The people of the same tribe never disturb a cache belonging to one of

their own number although it seems that no pains are taken to conceal their situation, but they are probably so thoroughly hidden, others would rarely discover them" (John Wesley Powell in Fowler and Fowler 1971:49).

8. Papago:

"However, Papago preferred to hide their food, and the usual expedient was to use jars rather than baskets. The most common jar was an old olla which had lost its porosity and no longer kept water cool. But special jars for storage purposes were made, as well as traded. The lid consisted of a piece of broken olla weighted with dirt or a stone . . . A patriarchal Papago family stored its crops in several different places. A large supply was kept in the storehouse close to the village, while a few granary baskets might rest on stones near the dwelling, or, rarely, on the roof. A supplementary storage place was located in the flats not far from the base of the mountains, within easy reach of the winter camp. This was often a pit, deep enough to hold jars and baskets, and covered with brush or dirt. Here the baskets were protected with branches of the very spiny cholla, *Opuntia Bigelovii*. During the winter travels, the family sent a man back to the storehouse now and then to get food, but they tried to leave the supply at the village untouched until spring, the period of food scarcity, and it was not drawn upon until absolutely necessary" (Castetter and Bell 1942:184).

9. Northeastern Yavapai:

"At least 2 caves (uwiya) occupied by some Mat-haupapaya in winter: one on Cherry cr., one on Turkey cr. near

APPENDIX E

Prescott National Forest boundary. Second, which I examined, housed 3 or 4 families totaling about 12 persons . . . Usually 2 fires. Water fetched from spring about a mile upstream. Mouth of cave faced E. this cave was a smaller one for storing nonfood articles, e.g., buckskin. Close to spring was another cave where maize was stored. Caves used from November to April. When moving from cave, people carried all supplies with them. Food kept in pots and baskets. No cists dug" (Gifford 1936:271).

10. Southeastern Yavapai (Wikedjasapa/Walkamepa bands):

These groups lived in the Matzatzal and Pinal mountains of south-central Arizona.

"In winter, caves or rock shelters held heat better than huts . . . Living in caves . . . was an ancient practice.

In caves, pottery ollas of food were buried, covered with stone lids, grass, and earth. Acorns, mesquite beans, sunflower seeds, and others were stored. The informant remembered from his boyhood arrival at such a cave and how the women of the party immediately unearthed a storage olla of food, which they cooked" (Gifford 1932:203).

"Storage cists were pits dug in dry caves or rock shelters. Usually they were lined with straw, sometimes with flat slabs of stone. The material stored was covered with straw, brush, stone, and earth. Sometimes pottery ollas were buried instead of a pit being used. Cist or olla storage was primarily for foods" (Gifford 1932:221).

11. Walapai:

Stored "mescal 'cakes' and yucca pods in caves in sealed pottery jars" (Dobyns in Euler and Jones 1956:90).

12. Pueblo Indians:

"In 1601 members of the Onate expedition reported that in attempt to seize food from the Pueblo Indians they unearthed 'small ollas' from 'holes and caves.' These vessels contained maize, and 'the lids of these ollas were sealed with mud . . .'" (Euler and Jones 1956:92).

13. Cahita Indians (Northwestern Mexico):

Stored ears of corn in ceramic vessels stoppered with clay and cached underground (Beals 1943:20 in Euler and Jones 1956:95).

14. Tepehuan (Chihuahua, Mexico):

They used small ollas for storing seeds (Pennington 1969:215; Table VIII, p. 258).

15. Yumans (Lower Colorado River):

". . . stored seedstock of various crops in ollas which were then closed with potsherds sealed in place with either arrow-weed gum or lac, or a mixture of mud and straw" (Casterter and Bell 1951:162-164 in Euler and Jones 1956:90).

16. Huhula Papago:

These people stored seeds in sealed vessels using greasewood gum (lac?) or clay (Euler and Jones 1956:90).

17. Mohave:

They stored tepary beans in ollas similarly sealed with arrowweed gum.

APPENDIX E

18. Seri Indians:

"Seri water-carrying vessels were among the largest and thinnest in the world" [2-5mm thick "eggshell pottery"] (Felger and Moser 1985:80-81).

"Large pottery ollas were occasionally buried and used for water storage, sometimes near a water hole that was about to dry up. The vessel was sealed with a lid and covered with brush" (Bowen and Moser 1968:120 in Felger and Moser 1985:81).

Ollas were used by the Seri to store mesquite bean flour, seaweed grain, or seaweed grain and saguaro, or mesquite bean embryos. Sometimes used to ferment cactus wine.

Bowen and Moser (1968:120) state that the Coolidges (1939:92, 120) mention use of large ollas by the Seri to store water near dried pools or water sources.

19. Owens Valley Paiute:

"Heavier articles, metates and mortars, pottery vessels, and prepared food, were cached at habitual camping places" (Liljeblad and Fowler 1986:420).

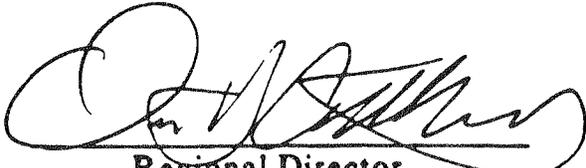
20. Tarahumara:

"When winter comes, the family go to the cave, bringing with them their goats, a few small pots, baskets of wool, odds and ends, and a supply of corn. Large pots are usually left hidden under nearby boulder from one season to another. The metate and the sleeping-board (*kuhubela*) have remained since the last occupancy. The cave is habitable by repairing the wind-breaks and arranging the metate, pots, baskets, and food supply" (Bennett and Zingg 1935:79).

REPORT CERTIFICATION

I certify that "An Isolated Storage Vessel at Site 42SA20779 In
Glen Canyon National Recreation Area: Adaptive Storage and
Caching Behavior in the Prehistoric Southwest" by Anne M. Wolley
and Alan J. Osborn.

has been reviewed against the criteria contained in 43 CFR Part 7(a)(1) and upon
recommendation of the Regional Archeologist has been classified as
available.


Regional Director

12 / 04 / 90
Date

Classification Key Words:

"Available"--Making the report available to the public meets the criteria of 43 CFR 7.18(a)(1).

"Available (deletions)"--Making the report available with selected information on site locations and/or site characteristics deleted meets the criteria of 43 CFR 7.18 (a)(1). A list of pages, maps, paragraphs, etc. that must be deleted for each report in this category is attached.

"Not Available"--Making the report available does not meet the criteria of 43 CFR (a)(1).

