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Investigations at LA 110299, a Late Dinetah Phase Occupation along U.S. 550, North of Cedar Hill, New Mexico

Office of Contract Archeology
University of New Mexico

New Mexico State Highway and Transportation Department

Investigations at LA 110299, a Late Dinetah Phase Occupation along U.S. 550, North of Cedar Hill, New Mexico

by

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with contributions by Paul Nugent and Lisa Huckell

Prepared for
The New Mexico State Highway and Transportation Department
Project Nos./Control Nos. NH-550-1 (29) 14, CN 3000;
NH-550-1 (36) 25, CN 3329;
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ABSTRACT

The New Mexico State Highway and Transportation Department (NMSHTD) has initiated a project to widen and improve U.S. Highway 550 between Aztec, New Mexico, and the New Mexico-Colorado border (NMSHTD Project Nos./Control Nos. NH-550-1 (29) 14 CN 3000; NH-550-1 (36) 25, CN 3329; NH-550-1 (37) 27, CN 3696). This undertaking complies with the provisions of the National Historic Preservation Act of 1966, as amended through 1992, and applicable regulations.

This report describes the excavation at an early Navajo site, LA 110299, along U.S. 550 north of Cedar Hill, New Mexico. The report is consistent with applicable federal and state standards for cultural resource management.

The site is situated on state land controlled by NMSHTD and appears to be wholly within the expanded right-of-way for the widening and improvement of U.S. 550. This data recovery project was implemented by the Office of Contract Archeology, University of New Mexico under a statewide services contract with the New Mexico State Highway and Transportation Department.

The data recovery program at LA 110299 focused on the complete excavation of an ash stain, the recovery of associated artifacts, and the excavation of any additional subsurface features. This work revealed the presence of a small brush structure, two extramural activity areas with associated hearths, and the recovery of 197 lithic artifacts and 183 ceramic fragments. Radiocarbon assays obtained from corn cupules indicated a Dinetah phase occupation. The evidence suggests that this site was a residential camp occupied by a nuclear family group for a short period of time, probably during the summer/early fall. The lithic artifacts indicate a lithic technology that emphasized a combination of bifacial reduction and formal tool manufacture and expedient tool production. This technology suggests that hunting and gathering were important components of the early Navajo subsistence system. The charred macrobotanical remains recovered from the fill of the features also support a reliance on wild plant resources supplemented by maize agriculture.

ACKNOWLEDGMENTS

The efforts and cooperation of numerous individuals have contributed to the successful completion of the data recovery at LA 110299. First and foremost, I want to thank the field crew, Byrd Bargman and John Mark Sheppard, for their fine work and extra effort to get the fieldwork done before the weather turned against us. Second, many thanks to Patrick Hogan, principal investigator, who not only helped with the excavations, but also returned to the site to get a new sample of subsurface floor sediments for the TL dating and cored the juniper tree for the tree-ring dating sample.

I also want to thank Jim Copeland, district archeologist, BLM, Farmington Field Office, for his help in obtaining the tree-ring sample and Lori Reed for her help and advice on TL dating and Dinetah Gray ceramics. Special thanks also go to Dave Brugge, Mike Marshall, Patricia Hancock, and Dean Wilson for their valuable input in the ceramic analysis.

Michael Dussinger, Janet Spivey, and Blake Roxlau were the NMSHTD representatives for the project. Their support of the project research is greatly appreciated.

The preliminary processing of the field samples was completed by Kathy Piece. The analysis of flotation and macrobotanical materials was conducted by Lisa Huckell. Kari Schmidt analyzed the faunal assemblage. Peter Eschman coordinated all the computer work and designed the lithic and ceramic input programs. Ron Stauber produced all the graphics, while Dave Kilby did the artifact illustrations.

Paul Nugent conducted the refiring and x-ray analysis as part of a class project under the direction of Dr. Patricia Crown of the University of New Mexico's Department of Anthropology. The Office of the Medical Investigator was most generous with providing access to the x-ray machine and taking the pictures of the ceramic samples. Finally, June-el Piper served as the technical editor and produced the final report, and Donna Kay Lasusky typed the editorial changes.

To all of these people I offer my heartfelt thanks. Their interest and contributions greatly aided in the success of this project.

Peggy A. Gerow

CONTENTS

TABLES

FIGURES

Chapter 1

INTRODUCTION

The New Mexico State Highway and Transportation Department (NMSHTD) has initiated a project to widen and improve U.S. Highway 550 between Aztec, New Mexico, and the New Mexico-Colorado border (NMSHTD Project Nos./Control Nos. NH-550-1 (29) 14 CN 3000; NH-550-1 (36) 25, CN 3329; NH-550-1 (37) 27, CN 3696). This undertaking complies with the provisions of the National Historic Preservation Act of 1966, as amended through 1992, and applicable regulations. The report is consistent with applicable federal and state standards for cultural resource management.

This report describes the results of archeological data recovery at LA 110299, which is located in San Juan County, New Mexico, along U.S. 550 about 2 miles (3.3 km) north of Cedar Hill (Figure 1). The site is on the east side of U.S. 550 on state land controlled by NMSHTD in the NW ¼ of the SW ¼ of the SE ¼ of Section 21, T32N, R10W (Cedar Hill, NM USGS 7.5-minute quadrangle, provisional edition 1985; UTM Zone 13, 243160 E, 4094800 N). It is situated on an elevated bench or terrace between U.S. 550 and County Road 2105, within the highway right-of-way but outside the active construction area (Figure 2).

PROJECT HISTORY

The project area was surveyed for archeological resources by Cibola Research (Marshall 1996). The survey report recommended that test excavations be undertaken at five sites along a segment of the highway near Cedar Hill, New Mexico, to assess their potential to yield information important in prehistory or history.

Testing at these sites was completed during July 1998 by the Museum of New Mexico, Office of Archaeological Studies. As described in the testing report (Toll 1999), four of the sites (LA 110297, LA 110298, LA 110299, and LA 110303) were quite small and were wholly within the right-of-way. The fifth site (LA 79486) was larger, but only a small portion extended within the right-of-way. Based on results of the testing program, cultural resources within the right-of-way at four of the sites were judged to have little potential to add significant information relating to the prehistory and history of the region. Intact cultural remains were encountered only at LA 110299—an early Navajo site—which was recommended for further investigation if the site was to be affected by construction activities.

In July 1999, the University of New Mexico's Office of Contract Archeology (OCA) was authorized to prepare and implement a data recovery plan for LA 110299 under our statewide services contract with NMSHTD (UNM Proposal Nos. 185-653A and 185-653B). Fieldwork for the data recovery program at LA 110299 was completed between 8 and 16 November 1999 by Patrick Hogan (Principal Investigator), Peggy A. Gerow (Project Director), Byrd Bargman, and John Mark Sheppard. The fieldwork required 27

Figure 1. Location of the project area.

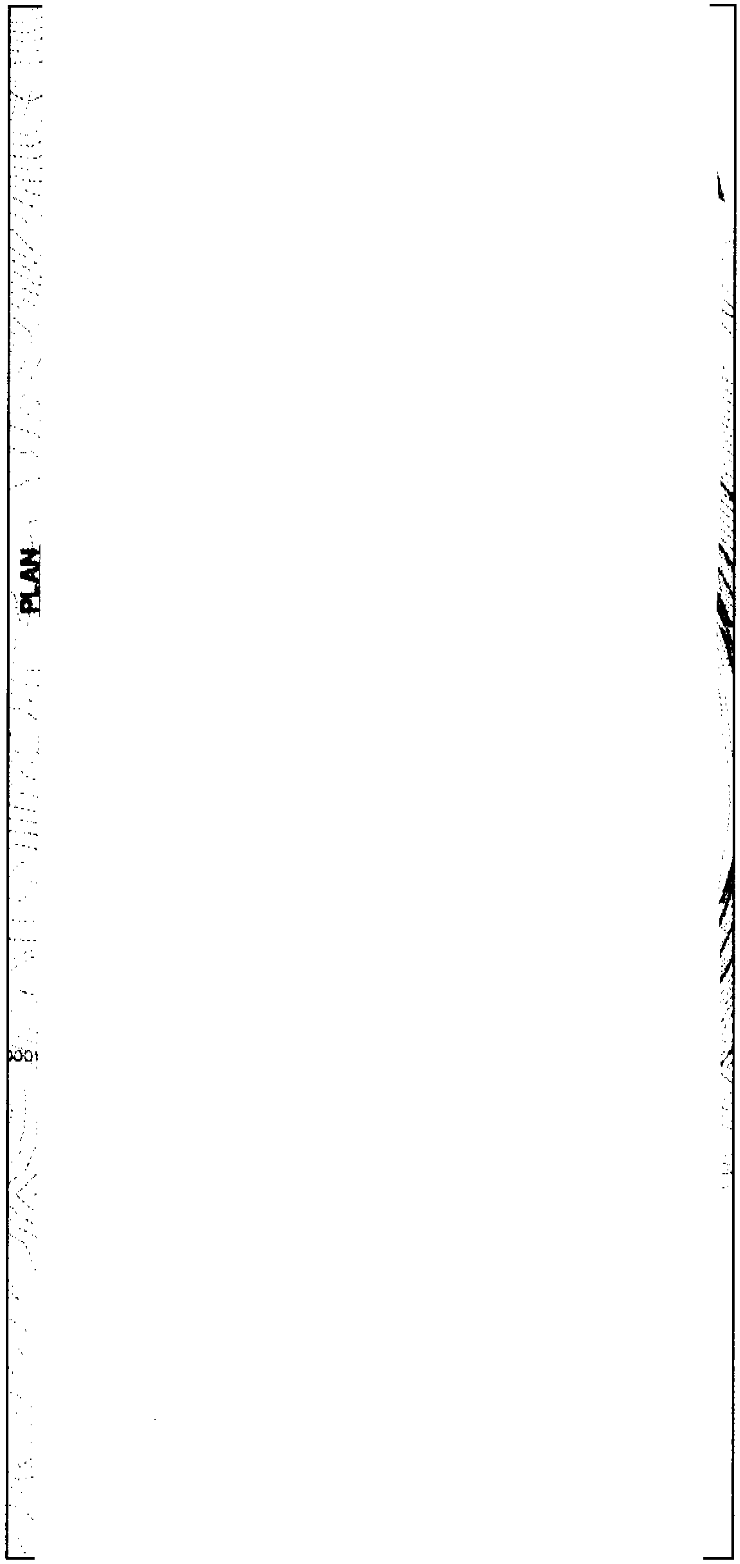


Figure 2. Location of LA 110299 within the right-of-way.

person-days of labor. A preliminary report of the excavations was submitted to NMSHTD on 29 November 1999, and in January 2000 OCA was authorized to proceed with the analysis and reporting phase of the project (UNM Proposal No. 185-653C). Michael Dussinger and Janet Spivey were the NMSHTD representatives for this project.

This report is divided into four major sections. The first section consists of this chapter, a culture history overview of the project area, and a discussion of the research design and data requirements. The second section describes the results of the excavations. Results of the various analyses are presented in the third section, while the fourth section summarizes the results of the data recovery and analysis.

ENVIRONMENTAL SETTING

LA 110299 is situated in the Animas Valley, approximately 40 km above the confluence of the Animas and San Juan rivers. The valley is about 200 m wide in the vicinity of LA 110299. It is flanked by high, steep bluffs composed largely of the early Tertiary San Jose Formation. Modern vegetation consists largely of cultivated crops on the floodplain and modified terraces, while an open piñon-juniper woodland is predominant on the hillslopes and gravel terraces at the margins of the valley. Prior to modern agricultural development, deciduous trees—cottonwood, oak, poplar, and willow—were common on the Animas floodplain, and the more poorly drained sediments supported grass meadows or areas of reeds and sedges.

The understory of the piñon-juniper community is dominated by rabbitbrush and sage, particularly at lower elevations, but also includes varying numbers of Utah serviceberry, Gambel oak, mountain mahogany, cliffrose, antelope bitterbrush, squash bush, joint-fir, and yucca. There are also lesser amounts of grasses and forbs including blue grama, Indian ricegrass, threeawn, nodding onion, tanseyleaf aster, Indian paintbrush, goosefoot, gilia, goldenweed, lupine, and other elements of the sagebrush vegetation zone.

Annual precipitation at Aztec averages 23 cm (9 in), about 65% of which falls between July and December (Bennett 1986). Highest rainfall typically occurs from August through October, although there may be up to 91 cm (36 in) of snowfall during the winter. Average minimum daily temperatures in Aztec range from 8° to -23° F (-13° to -31° C) during the winter, while average maximum daily temperatures reach 85-90° F (29-32° C) during the summer. The growing season is typically 120 days, extending from the end of May to about 20 September (Wilshusen and Ruppé 1995:25).

The upper San Juan drainage supports a variety of wildlife, including more than 70 species of mammals, 200 species of birds, and at least nine species of amphibians and reptiles (Hogan et al. 1991). Among the more notable mammals are desert cottontail and black-tailed jackrabbit; species of mice, packrats, and gophers; skunk; porcupine; coyote; badger; bobcat; mountain lion; and black bear. Large game are also well represented. Mule deer are found throughout the upper basin, and their winter range includes the upper two-thirds of the Animas Valley. Elk range in the mountains northeast of the study area; and pronghorn, in the region immediately south of the San Juan River.

GEOMORPHOLOGY

A geomorphological reconnaissance of the site area was undertaken as part of the data recovery program to determine the integrity and stratigraphic context of the protohistoric occupational debris, and to assess the probability that evidence of earlier occupations might remain

buried in the site area. The results of that reconnaissance are summarized in this section.

LA 110299 is situated on a terrace cut into the lower slope of a southeast-trending ridge, approximately 60 m above the modern Animas River floodplain. The terrace surface is overlain by a thick basal stratum of cobble- to boulder-size gravel in a matrix of red (2.5YR 4/6) sandy clay loam. The clay content and deep oxidized color of the fine-grained sediments, together with the Stage II carbonate development, suggest that the deposit dates to the late Pleistocene.

A second stratum of gravel overlies the terrace gravels. This stratum dips to the south-southeast at an angle roughly corresponding to the modern ridge slope. The gravels in this deposit also exhibit Stage II carbonate development but the associated fine grained sediments are lighter in color—reddish yellow (5YR 6/6) to light brown (7.5YR 6/4)—and have a lower clay content. The stratum therefore appears to be colluvium composed of material eroded from higher on the ridge and deposited on the terrace, forming a low hillock immediately north of the site.

A small drainage runs southward from this hillock through the western edge of the site. Runoff in this drainage has cut into the terrace gravels forming a small basin that was subsequently filled by fine-grained sediments, which are now exposed in a roadcut approximately 200 m south of the site. The basal stratum in this roadcut is a hard, reddish yellow (7.5YR 6/4) sandy loam similar to the fine-grained sediments intermixed with the colluvial gravels. The upper boundary of this stratum is marked by a pale brown (10YR 6/3) band of carbonate-cemented sediments, which could be a middle Holocene paleosol or simply an accumulation of carbonates deposited by groundwater percolating through the overlying deposits. Above the carbonate band is a stratum of light yellowish brown (10YR 6/4) coarse sand, which is in turn overlain by a stratum of light yellowish brown loamy sand exhibiting Stage I carbonate development. Given the degree of carbonate development, it seems likely that this uppermost stratum is the Bk horizon of a paleosol dating to the late Archaic or Formative period.

The terrain in the site area is nearly level, with dominant slope and drainage to the south (Figure 3). Poorly sorted, pebble- to boulder-size gravels are exposed over much of the site, and on the slightly higher ground to the north. The surface sediments (Stratum 1) are loose fine loamy sand intermixed with plant debris. These sediments occur as low hummocks, 10–20 cm thick, around the base of trees and larger shrubs, and as thin sheet deposits in areas stabilized by vegetation. They overlie a more compact stratum of carbonate-cemented loamy sand (Stratum 2) that can be correlated with the late Archaic/Formative paleosol in the roadcut. The coarse sand stratum underlying this paleosol was encountered 40 cm below modern ground surface in two test pits located in the east-central part of the site.

A lens of charcoal-stained sediments intermixed with artifacts and structural debris is sandwiched between Strata 1 and 2. Slope wash has locally eroded Stratum 1 within a drainage rill, exposing a portion of this lens at the surface—the ash stain noted by the survey crew. These sediments fill a shallow depression in the upper surface of Stratum 2 and appear to be the razed remnants of a structure. Other features associated with this occupation are also dug into the top of Stratum 2, indicating that it was the aboriginal ground surface during the protohistoric occupation. Stratum 1 therefore postdates that occupation. Since a number of artifacts were recovered from Stratum 1 during our excavations, particularly from grid units situated west of the structure, there has clearly been some downslope movement of cultural materials. The degree of erosion is not severe, however. Judging from the position of the features, the site retains some spatial integrity.

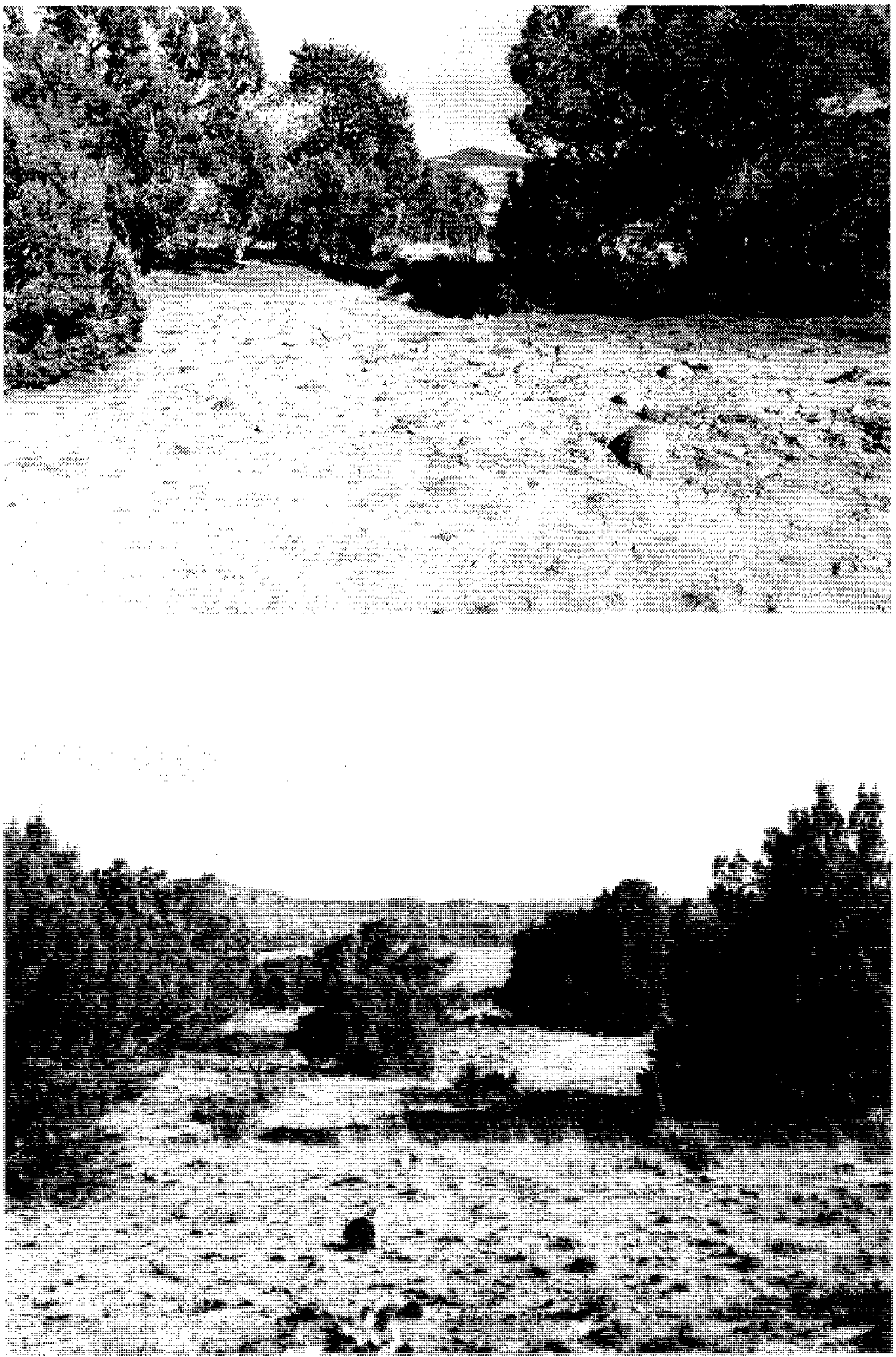


Figure 3. Overview of LA 110299.

Chapter 2

CULTURE HISTORY

PREHISTORY

The Paleoindian is the earliest well-documented occupation period in the American Southwest. Judge (1982:48) argues that the Paleoindian subsistence strategy is best viewed as a "focal" economy in which the primary food elements were a limited variety of megafauna, supplemented by plant foods and small mammals. Given this strategy, the location of habitation sites probably was conditioned primarily by the location and number of large mammals, which suggests a high degree of residential mobility.

Based on the diagnostic projectile points recovered during various surveys, the Paleoindian period in the San Juan Basin spans the full temporal period from Clovis through the Cody Complex (12,000–7500 BP). Twelve Paleoindian components are reported for the upper San Juan drainage (Kearns 1992), seven of which consist of Paleoindian artifacts at sites with later occupations. Kearns concludes that the paucity of Paleoindian remains indicates that the upper San Juan was not critical Paleoindian habitat, although it may have been a corridor used by Folsom groups moving between the San Juan Basin and San Luis Valley.

In contrast to the "focal-hunting" economy of the Paleoindian period, the Archaic adaptation is characterized as a "diffuse" economy in which a variety of plant and animal resources were exploited (Judge 1982:49). The Archaic occupants of northwestern New Mexico are assumed to have possessed many of the basic characteristics observed in modern hunting-and-gathering groups inhabiting arid environments—a primary dependence on plant food resources, a seasonally mobile settlement pattern, and a flexible social structure in which group size and composition vary in response to changing economic opportunities (Hogan et al. 1991).

Previous research in the NIIP and adjacent Navajo Mine area (e.g., Hogan and Winter 1983; Vogler et al. 1982) indicates that the lowland areas of the northern San Juan Basin were primarily utilized by Archaic groups from spring through late summer. Subsistence activities apparently focused on the procurement of a relatively few vegetal resources—chenopods, amaranth, ricegrass, and dropseed grass—and on hunting. Rabbits and prairie dogs were the primary game species, but antelope and deer were procured occasionally. Based on assessments of seasonal plant resource availability (Toll and Cully 1994), upland areas on the fringes of the central basin—including much of the upper San Juan drainage—would have been favorable areas for occupation during the fall and winter.

As defined by Irwin-Williams, the En Medio phase of the Oshara Tradition (2800–1550 BP) encompasses the Basketmaker II period, reflecting her perception that the transition from hunting and gathering to agriculture was a gradual process resulting in the emergence of Anasazi culture

from an indigenous Archaic base (Irwin-Williams 1973:11). Recent research indicates that Basketmaker II populations were already dependent on cultigens (Gilpin 1994; Matson 1991), however, so the transition to an agricultural economy had largely been completed by this period.

Basketmaker II settlements in the upper San Juan drainage seem to be centered in the Durango-Bayfield-Ignacio area of southern Colorado but extending southward into the Navajo Reservoir district (Eddy 1972; Morris and Burgh 1954). In the latter area, sites are typically located on the first or second Pleistocene bench, overlooking the river valley. Shallow pitstructures are arrayed in an open, seemingly random pattern with sheet middens, extramural work areas, hearths, roasting pits, storage facilities, and small jacal surface rooms scattered in the intervening areas (Dittert et al. 1961; Eddy 1961, 1966, 1972). Dean's (1975) reanalysis of tree-ring dates from the Durango district suggest that the Los Pinos occupation dates roughly to AD 150–400, although the upper Animas drainage appears to have been abandoned by about AD 350 (Fuller 1988; Ware 1981; Winter et al. 1986).

Basketmaker III sites in the northern San Juan Basin generally consist of villages of shallow pithouses and numerous exterior storage pits and hearths. At some larger sites, unusually large pitstructures spatially segregated from most of the domiciles have been interpreted as ceremonial structures. The artifact assemblages are characterized by the widespread occurrence of a plain grayware pottery, small projectile points that suggest the introduction of the bow and arrow, and the first occurrence of trough metates (Cordell 1979). Sites are most commonly located on alluvial terraces, the first benches of rivers, or on ridges and bluffs adjacent to drainage valleys.

The phase sequence for the Navajo Reservoir district (Eddy 1966, 1972) reflects the presumption that the area was occupied continuously, with the Sambrito phase (AD 400–700) filling the gap between the better-documented Basketmaker II (Los Pinos) and early Pueblo I (Rosa) occupations. Berry (1982) challenged the validity of the Sambrito phase, however, arguing for an occupational hiatus across the Colorado Plateau between AD 400 and 600. The available chronometric data (Hogan et al. 1991:4-16 to 4-18), including new dates from the Oven site (Hammack 1992), are consistent with Berry's contention but indicate that there was a late Basketmaker III occupation in the Navajo Reservoir district during the seventh century.

The Pueblo I period, AD 700 to 900, is generally marked by the appearance of above-ground rooms and neck-banded pottery. While some areas evidence dramatic population increases during this period, Plog and Cordell (1979:416) feel that population levels remained relatively stable for the Colorado Plateau as a whole. Within the northern San Juan Basin, Pueblo I population density appears to have been greatest along the northern periphery—in the Navajo Reservoir district (Eddy 1966; Schoenwetter and Dittert 1968), the Gobernador area (Hall 1944), and the upper La Plata Valley (Morris 1939; Ware 1981).

The Rosa phase settlement pattern is one of village-size sites surrounded by smaller habitations, which Eddy (1972:29) interprets as simple nuclear-centered communities separated by areas with scattered, isolated homesteads. Eddy (1966) indicates that Rosa habitations were preferentially located on the Pleistocene benches, while the old floodplain was favored for campsites. This suggests a river-oriented settlement pattern, although the trend is not as strong as during the Los Pinos phase.

Piedra phase occupations are distinguished primarily by the presence of grayware pottery tempered with crushed igneous rock. As in the Rosa phase, the basic settlement unit consisted of a pithouse backed by one or more jacal surface

rooms, with a few extramural pits and scattered sheet midden deposits. The surface structures included residential rooms as large as pithouses as well as smaller storage rooms, some of which had stone slab floors. At multiple-unit sites and villages, the units occur singly or in pairs, clustered in a random fashion. Villages have one or rarely two Shabik'eschee kivas (i.e., large integrative pitstructures). Although fewer Piedra than Rosa sites were recorded in the Navajo Reservoir district, Eddy (1966) feels that population levels during the Piedra phase were comparable to those of the Rosa phase. The proportion of multiple-unit sites increased sharply during this period (Dittert et al. 1961), and the villages appear to have been much larger than during the Rosa phase (Eddy 1966:493).

Recent research has dramatically altered the picture of Pueblo I settlement developed during the Navajo Reservoir project. As summarized by Wilshusen (1995:43–80), assumptions that the region was occupied continuously through the Pueblo I period have been bolstered by the co-occurrence of Rosa, Piedra, and Arboles Gray on many of the sites. These types are distinguished largely on the basis of differences in temper and surface treatment and were assumed to be temporally sequent, with each type diagnostic of its respective phase. It is now recognized that Rosa Gray appears after AD 775 in the Upper San Juan, not at AD 700. Further, up to half of the pottery recovered from sites dating to AD 880–900 may be Rosa. Consequently, for the period between AD 775 and 950, sherds typed as Rosa, Piedra, and Arboles are apparently contemporary. The presence of these ceramics on a single site is therefore not necessarily indicative of a long, continuous occupation.

Wilshusen (1995:43–80) contends that the problems associated with ceramic dating of sites in the Navajo Reservoir district has masked evidence for major population movements during the Pueblo I period. Based on the evidence provided by fine-grained ceramic seriation, he argues that habitation sites in the district were occupied for only about 10–15 years, and that there were major discontinuities in the occupational sequence during the Pueblo I period. An early Rosa phase occupation is evident in the Navajo Reservoir–Frances Mesa area, apparently dating to between AD 800 and 845. Subsequent villages, including three probable communities in the Cedar Hills area, occur in different locales and date to the AD 880s–890s. These later villages appear to have been intentionally abandoned.

Anasazi population reached its maximum geographic dispersal during the Pueblo II period (AD 900–1050). In the San Juan Basin, site density is highest in Chaco Canyon, the Chuska Valley, and the Red Mesa Valley and adjacent areas of the basin's southeastern quadrant (Cordell 1982:69). At Chaco Canyon, the Pueblo II period was marked by initial construction at the Chacoan "town" sites. Chacoan outlier communities were established in other parts of region during the Pueblo II period, primarily in the Cibola region along the southern periphery of the San Juan Basin. This evidence and the prevalence of imported ceramics from the Red Mesa Valley in Pueblo II deposits at Chaco Canyon suggest a southern focus for the Chacoan system between approximately AD 920 and 1020. After AD 1020 ceramics and other materials from the Chuska Valley become the predominant imports at sites in Chaco Canyon (Judge and Schelberg 1984).

In contrast to these early centers, there is relatively little evidence for Pueblo II settlement in the upper San Juan drainage. Research by the Museum of New Mexico's Office of Archaeological Studies indicates that clusters of small pueblos dating to the tenth and eleventh centuries are scattered along the lower La Plata River in areas with good bottom land, confirming Prudden's (1903) observation. These pueblos reflect successive reoccupation of favorable areas, but many of the individual occupations appear to

have been rather short. Prudden, Moorehead (1908), and Morris (1915, 1939) describe a lesser number of small cobble masonry or adobe houses dotting the Animas Valley in New Mexico, but the dating of those sites is uncertain.

The Pueblo II occupation in the Navajo Reservoir district has been defined as the Arboles phase (AD 950–1050), which is marked in part by the appearance of masonry surface structures, corrugated pottery, and Arboles Black-on-white, a slipped decorated whiteware (Eddy 1966). Pure Arboles phase settlements are single- or multiple-unit sites with one or two pithouses and surface structures. Although some sites in the vicinity of Sambrito Creek continued to be occupied, most of the Pueblo II population appears to have been centered in two communities near the confluence of the Piedra and San Juan rivers.

In the Cedar Hills Special Treatment Area, 13 sites with clear Pueblo II components and four sites with mixed assemblages that included Pueblo II sherds were recorded (Wilshusen 1995:81–83). Only two of these sites are habitations, one unit pueblo and one multiple-unit pueblo. Both are situated on prominent points overlooking potential floodwater farming areas in the southeast corner of the survey area. The majority of the other Pueblo II components—artifact scatters with and without features—are also situated in the eastern half of the survey area, suggesting a focus toward the Animas Valley.

In general the Pueblo III period (AD 1050–1300) is marked by population aggregation in a few localities and by the eventual abandonment of the major sites in the Four Corners region. Pueblo III sites are scattered more or less evenly in the San Juan Basin, with only the northeastern periphery and north-central portion of the basin having low site densities (Cordell 1982:70). During this period, the culture history of the San Juan Basin is dominated by the expansion and decline of the Chacoan system.

Three Chacoan outliers have been identified in the San Juan Valley—Sterling, Jaques, and Salmon Ruin. Given the favorable environment of the valley, it seems likely that all of the outliers were production-related (Marshall et al. 1979), although the communities that should be associated with these sites have not been identified (or at least have not been published). Salmon Ruin, the best-dated of the San Juan outliers, was built between AD 1088 and 1092, with subsequent additions between AD 1094 and 1096 and AD 1100 and 1106 (Irwin-Williams 1983:4–6). Surface ceramics at the other San Juan outliers suggest that they also were established in the late eleventh century. Irwin-Williams argues that Salmon was a scion community erected by immigrants from Chaco Canyon. This hypothesis remains unverified, but the anomalously large size of Salmon Ruin in comparison with other outliers does suggest that Salmon might have held a unique position in the regional hierarchy of the Chacoan system.

Morris 39 and 41 in the La Plata Valley both appear to be "ancestral" (*sensu* Irwin-Williams: populations that predate Chacoan influence), production-related outliers, as does Squaw Springs to the west. In the Animas Valley, Aztec Ruin is distinguished by its size which, like Salmon, rivals that of Bonito-phase towns in Chaco Canyon. Stein and McKenna's (1988) reconnaissance survey of the cobble terraces north of the outlier established the existence of an associated community of at least 30 small sites ranging from 2 or 3 to 100 rooms, and seven large depressions that probably mark great kivas. Across the Animas Valley 5 km southwest of Aztec is Kello Blancett, identified by Stein and McKenna as another Chacoan great house. Extensive ruins on the remnant mesas south of

this site include multiple buildings, great kivas, and substantial esoteric constructions (Stein and McKenna 1988:76–77).

The Navajo Reservoir district does not appear to have been occupied during the Pueblo III period, nor were any Chaco or McElmo ceramics noted during surveys in the Cedar Hill Special Treatment Area. The upper Animas River valley is likely to have remained an important area for hunting and the collection of wild resources, though.

Beginning about AD 1200 there may have been an attempt to reestablish a Chaco-like system centered in the San Juan and Animas drainages. Interesting in this regard is a pattern noted by Stein and McKenna (1988:99). They suggest that large late Pueblo III sites may have been constructed at intervals of 5–7 km along the Animas River between Aztec and the San Juan River confluence. Similar patterns are evident in the lower La Plata River valley and along the San Juan River between Farmington and Bloomfield (Stein and McKenna 1988:Figure 13).

If such a system existed, it was probably organized by a local population familiar with the operation of a hierarchical system. In this context, it is interesting that the apparent abandonment of the upper San Juan drainage in the late twelfth century roughly corresponds to a population peak at Mesa Verde at about AD 1200. This correspondence suggests that drought conditions between AD 1130 and 1180 might have forced Anasazi groups in the San Juan Valley to seek temporary refuge at Mesa Verde. As climatic conditions improved, these same groups might have returned to their former homes.

The ultimate abandonment of the major sites in the region by about AD 1300 still has not been satisfactorily explained. Deteriorating climatic conditions—reduced precipitation and cooler temperatures—were clearly a key factor. The Anasazi had weathered similar conditions before, but not for so long a period. Moreover Pueblo III population levels and, perhaps more important, population density would have aggravated the problem. Finally, developing social and political organization might have limited the adaptive options open to the society. Whatever the ultimate chain of causality, it is generally accepted that the eastern Anasazi merged with Pueblo groups in the Rio Grande valley and Zuni-Acoma areas.

THE PROTOHISTORIC PERIOD

The protohistoric period bridges the gap between the prehistoric and historical periods. The period is dated between AD 1450 and 1700 for the American Southwest (Wilcox and Masse 1981), although it could be extended to the 1800s since there is relatively little documentary evidence relating to occupation of the upper San Juan drainage before the late nineteenth century. Research on the protohistoric in northwest New Mexico has focused almost exclusively on the ancestral Navajo occupation. Two phases were defined during the Navajo Reservoir project to span this period, the Dinetah and Gobernador (Dittert 1958; Eddy 1966; Hester 1962).

The Dinetah phase was first proposed by Dittert (1958:19) as a working hypothesis. A trait list was formulated by subtracting from the Gobernador phase trait list all the traits that were attributable to Pueblo influence, and a date range of AD 1550–1700 was suggested on the basis of early historical records and reports of early tree-ring dates from Navajo sites in the Gobernador area (Dittert et al. 1961:245–246). Although five probable Dinetah phase components were identified during the Navajo Reservoir project (Hester and Shiner 1963), Eddy (1966:605–608) argues that the small number of sites and small size of the ceramic assemblages do not provide convincing proof of the validity of the Dinetah phase.

Subsequent excavations at early Navajo sites in northwestern New Mexico have yielded absolute dates supporting Dittert's hypothesis (Brown 1991; Brown and Hancock 1992; Hogan 1989) and pushing the beginning date for the Dinetah phase back to at least AD 1500. Reed and Horn (1990) argue that discrete Navajo components dating to the late 1300s have been identified. Brown disputes this claim but observes that the formalized and well-adapted nature of the Dinetah complex described at some sites suggests local antecedents (1996:55). The identification and dating of this possible "pre-Dinetah" occupation remain major research issues.

In arguing the validity of the Dinetah phase, chronology is only one aspect of the problem. The Athabaskan affinity of the groups occupying Dinetah phase sites also must be demonstrated. Wilcox (1988:275) acknowledges that recent work in the San Juan drainage has identified a series of sites which may date as early as AD 1300–1700 but cautions that "why they are Apache-Navajo rather than Ute sites has not been explained." Schaafsma (1996) goes further, arguing that the Dinetah phase sites north of the San Juan River are actually Ute sites. His argument is based on two lines of evidence—Spanish historical documents, which indicate that the San Juan River was the southern Ute boundary by the mid-eighteenth century and probably as early AD 1626, and the presence of fingertip-impressed decoration on ceramics from the La Plata sites, which Schaafsma contends is uncharacteristic of Dinetah Gray and more closely resembles the decoration on Uncompahgre Brownware from Ute sites on the Uncompahgre Plateau.

Brown (1996) disputes Schaafsma's assertions, arguing that Dinetah phase sites both north and south of the San Juan River exhibit a number of common traits not shared with Numic sites—Dinetah Gray pottery (distinguishable from Ute pottery on the basis of temper and possibly construction technique), grooved shaft abraders, forked-pole hogans, and formalized house and site layouts. He describes Dinetah phase hogans as being built in shallow polygonal pits with a substantial earth covering over the forked-pole superstructure and with, in at least one instance, a log-covered entry tunnel. The structures have front-centered hearth placement, with refuse areas or ash dumps southeast of the structure, and hearth-oriented activity areas to the south and/or east (Brown 1996:63).

Brown also rejects Schaafsma's contention that the San Juan River marked the southern boundary of Ute territory during the protohistoric period. After reviewing the archaeological evidence for protohistoric Ute sites in the region, he concludes that based on the current evidence the boundary line between Ute and Navajo was probably somewhere north of the Colorado–New Mexico line for much of the historic period, and that it shifted southward toward the San Juan River in the late 1600s or early 1700s (Brown 1996: 61–62). The documentary evidence seems to support this conclusion.

The earliest historical reference to Utes in the vicinity of the study area occurs in the Relaciones of Fray Zarate Salmeron, a missionary at Jemez in the 1620s. The Jemez informed Salmeron that the Gualuetu or Gauputu, which Schroeder (1965) interprets as a reference to the Capote, could be reached by traveling up the Rio de Chama. After passing through the lands of the Apache de Nabaju, one then reached a large river (the San Juan) and followed it to the Utes who lived near the Laguna de Copalla (Milich 1966:94).

This reference places the Capote in the headwaters of the San Juan at what may have been the western edge of their territory. Later historical references indicate that the Capote occupied the San Luis Valley in Colorado and the Chama Valley of New Mexico until the mid-nineteenth century when they were forced west of the continental divide and settled near the Animas

River (Callaway et al. 1986). Schroeder (1965) also indicates that the upland basins in the Chama area were favored winter hunting grounds for the Utes during the eighteenth and early nineteenth centuries.

The records of the Escalante expedition in 1776 provide information on other Ute bands west of the continental divide. Father Escalante's party moved up the Chama from Santa Fe and then turned westward, crossing the San Juan, Los Pinos, Florida, Animas, La Plata, and Mancos rivers on their way to the Uncompahgre Plateau (Bolton 1950). There is no mention of Indians in the upper San Juan drainage in Escalante's journal, but Miera's map of the expedition route shows a "Yutas" camp between the Piedra and Los Pinos rivers, and a "Yutas Muchaches" camp on the Mancos River north of Mesa Verde.

On 17 August 1776, Escalante reached the Dolores River near its junction with Disappointment Creek and found recent tracks. A party sent to investigate learned that the tracks had been made by "Yutas Tabehuaches," and that the Rio de las Paratthuas (Disappointment Creek) divided the territory of the Yutas Tabehuaches to the north and the Yutas Muchaches to the south. Moving northeastward, the expedition found the Yuta Tabehuaches camped in the foothills of the Uncompahgre Plateau and a third band, the Sabuaganas, on Grand Mesa and the adjacent Elk Mountains (Petersen 1977).

By the early nineteenth century, the Muchaches or Muache occupied an area running north from Trinidad, Colorado, to the Denver region. East of the Sangre de Cristos, they ranged as far south as Santa Fe. The Tabehuaches, later referred to as the Taviwach or Uncompahgre, were located in an area that included the Elk Mountains and Gunnison and Uncompahgre drainages, and that extended eastward from Grand Junction through the South Park of the Colorado Rockies (Callaway et al. 1986). There are no later references to the Sabuaganas, but it seems likely that they merged with the Taviwach. Another Ute band, the Weeminuche, occupied a territory extending west from the Dolores River to the Blue (Abajo) Mountains in southeastern Utah. The southern boundary of their territory was the San Juan River, including the San Juan Valley in northwestern New Mexico (Callaway et al. 1986).

From these fragmentary records, there is little evidence of Ute settlement in the study area during the late eighteenth and early nineteenth centuries. Although the lands north of the San Juan River were part of Ute territory, the Utes appear to have resided primarily in more mountainous areas to the north, east, and west. It was not until the mid-nineteenth century, when Hispanic settlement in the San Luis Valley was displacing the Muache and Capote, that the Southern Utes were forced closer to the San Juan.

Although most scholars working in the region accept Brown's arguments that protohistoric sites north of the San Juan River are ancestral Navajo, the question of cultural affinity remains an important research issue. At this point, however, further research to resolve the problem is unlikely to be productive without comparable dates from undisputed protohistoric Ute sites.

The scant evidence provided by charred macrobotanical and faunal remains from Dinetah sites suggests a subsistence pattern based primarily on hunting and gathering (Brown and Hancock 1992; Winter and Hogan 1992). Plant remains indicate that the seeds of pigweed, goosefoot, purslane, beeweed, and dropseed, piñon (nuts), and possibly juniper berries and barrel cactus seeds and fruit were consumed. Faunal remains indicate that deer, antelope, rabbits, and other small game were hunted. No evidence of domestic animals has been recovered from Dinetah sites, but small quantities of cultigens are present at some sites. The latter evidence suggests that agriculture may have been

a minor component of the subsistence system, or the cultigens may have been obtained from Pueblo groups through trading or raiding.

Settlement strategies are equally uncertain. Variations in architectural facilities (i.e., sites with hogans vs. sites with ramadas or windbreaks) may indicate a biseasonal residential pattern (Hogan et al. 1991:4-36). Alternatively, the residence may have been a semipermanent, multiseason base used as a hub for foraging and hunting trips (Hancock and Moore 1988).

Dittert defined the Gobernador phase (AD 1700–1775) "on the basis of materials excavated by Keur (1944) and Farmer (1942) together with that observed and excavated from the Navajo Reservoir District" (1958:246). The major material traits of the phase include forked-stick, cribbed log, and stone masonry hogans; pueblitos; fortified sites; ramadas and sweatlodges; rock art with Puebloan motifs and recognizable yei and Twin War God figures (Schaafsma 1963); corn and beans; horses and sheep; and a small number of European trade goods (Dittert 1958). The ceramic assemblage consists of Dinetah Utility, Gobernador Indented, Gobernador and Frances Polychrome, and Pueblo tradewares. Jemez Black-on-white and Rio Grande Glazes E and F are the most common tradewares in the Navajo Reservoir district. Lesser amounts of Koytyiti Glaze Polychrome, Tewa Polychrome, and Puname Polychrome also suggest trade with the Rio Grande Pueblos, while sherds Hawikuh Glaze Polychrome and Jeddito Yellowware reflect contact with the Acoma-Zuni and Hopi areas, respectively (Eddy 1966:404–407).

The beginning date for the Gobernador phase corresponds to the 1696 Reconquest, after which Pueblo refugees were assumed to have fled to the Navajo. The selection of this date reflected a long-standing interpretation of pueblito sites in the Gobernador area as refugee pueblos. A massive influx of Pueblo refugees was seen as the mechanism for a fundamental change in eighteenth-century Navajo culture.

Originally the influx of Pueblo refugees was seen as a short-term intrusion, but gradually perceptions changed toward the position that the refugees were assimilated into the Athabaskan population: "Although scholars have tended to view the Navajos as Athabaskans whose culture had absorbed Puebloan cultural traits, we prefer to see them as biological and cultural hybrids, neither Athabaskan nor Puebloan, but a product of both" (Bailey and Bailey 1986:15).

The end date for this phase coincides with the temporary withdrawal of the Navajo from the region. Hester (1962) and Schroeder (1963) argue that the ceramic and tree-ring dates for Gobernador sites are consistent with documentary evidence that increasing Ute and Comanche raiding had forced the Navajo out of the upper San Juan by the late 1700s. The abandonment of Navajo sites north of the San Juan River in the early 1700s was seen as the first stage of a gradual withdrawal from the Dinetah.

The southward movement of the Navajo in the eighteenth century is well documented in Spanish historical accounts. By 1750, most of the Largo-Gobernador area had been abandoned but there were Navajo settlements in the San Mateo area northwest of Mt. Taylor and in the Cebolleta area southeast of the mountain. Concomitant with this southward movement, the Navajo also were expanding to the west. Tree-ring dates from Navajo sites, collected during the Navajo Land Claim Field Research Project (Stokes and Smiley 1963, 1964, 1966, 1967), indicate that the Navajos were firmly established in the lower San Juan, Little Colorado, and Rio Puerco (of the east) drainages by the mid-eighteenth century (Hurt 1942).

Research within the past decade has greatly altered perceptions of the Gobernador phase. The

assumption that large numbers of Pueblo refugees fled to the Navajo has been questioned on the basis of both archeological and documentary evidence (Hogan 1991). Tree-ring dating now indicates that most of the pueblitos were built in the 1730s and 1740s, well after the Spanish Reconquest of New Mexico (Powers and Johnson 1987; Towner 1992, 1996). The pueblitos were almost certainly built and occupied by Navajos as a defense against Ute raiding parties. It has also been demonstrated that Gobernador Polychrome—a hallmark of the Gobernador phase originally interpreted as pottery manufactured by the Pueblo refugee population—was being manufactured by AD 1650, well before the Pueblo Revolt and Spanish Reconquest (Brown et al. 1992; Reed and Reed 1996). These findings have discredited the "refugee hypothesis" and led researchers to view the evident Puebloan influence on Navajo culture as a product of long-term Navajo-Pueblo interaction (Hogan 1991; Reed and Reed 1992).

Reinterpretation of the pueblitos has also led to the recognition that the pueblito is only one element of sometimes extensive site complexes that may include outlying hogan settlements, storage bins, hearths, sweatlodges, rock art panels, and cache sites generally situated within 100–500 m of the pueblito (Marshall 1991, 1995; Towner and Johnson 1996). Further, it appears that communities may have been organized in a regional defensive system based on line-of-site signaling among pueblitos (Jacobson et al. 1992). These findings have raised numerous questions about early Navajo settlement and social organization.

Data from pre-pueblito sites, particularly those dating from the late seventeenth and early eighteenth centuries, are important in testing any new models. As Towner (1996:169) observes, "it is critical to know just what the Navajo were before they responded to Ute pressures." Based on information now available, it appears that those sites are most likely to be found north of the San Juan River.

As with the Dinetah phase, relatively little is known about early Navajo subsistence practices during the Gobernador phase. Although Spanish accounts suggest that the eighteenth century Navajo farmed and herded extensively (Hill 1940; Wozniak 1985), the limited archeological data do not support this impression. There is some archeobotanical evidence for domesticated plants and faunal evidence for the domesticated animals, but it is not at all clear that they were dominant in the Navajo subsistence economy. Consequently, the recovery of subsistence data, particularly from early Navajo residential sites, remains a research priority.

Surveys of the Navajo Reservoir district (Dittert 1958) recorded 140 Gobernador phase components. Two-thirds were single-unit sites; 24% had two or three structures—hogans, ramadas, or rarely masonry rooms; and 5% had three or more clustered hogans. The largest village site, LA 4199, had eight hogans. About half of the Gobernador sites were concentrated near the confluence of the Los Pinos and San Juan rivers. The next largest cluster was found at the confluence of the Piedra and San Juan rivers, and smaller concentrations occurred at the mouth of Sambrito Creek and in Frances Canyon. Sites appear to have been preferentially located on benches adjacent to the river valley, with the lower benches most favored. Narrow canyon topography was favored over open valley terrain.

Fifty-one early Navajo components were documented in the Cedar Hills Special Treatment Area (Wilshusen 1995:88–95): 21 artifact scatters, 22 scatters with features, and 8 possible residential sites. The majority are clustered in three areas—midway up the northern and southern side canyons, and along the main drainage. All three clusters are in potential farming areas that were intensively exploited during Pueblo I, and

sites in the south-central part of the study area are in or near historical grazing areas.

Although no distinction between Dinctah and Gobernador phase sites could be made on the basis of survey data, 18 sites yielded Gobernador Polychrome or Gobernador Indented sherds. Given the small number of artifacts associated with these sites, the fact that Gobernador Polychrome does not occur at all Gobernador phase sites, and the fact that sites with only Dinetah Gray are intermixed with sites yielding Gobernador Polychrome, Wilshusen hypothesizes that all of the sites in the Cedar Hills area may relate to a relatively short-term warm season occupation sometime between AD 1650 and 1720.

Fourteen sites with early Navajo components were excavated during the Arkansas Loop Pipeline project (Honeycutt and Fetterman 1994). The sites are primarily habitations clustered near the heads of Hart, Arch Rock, Sandstone, and Pine canyons just above the present-day ecotone between the piñon-juniper woodlands and the sage-covered benches flanking the Animas Valley. The majority are within 0.5 km of a spring and in relatively close proximity to a suspected Navajo pueblito (LA 46147) at the head of Arch Rock Canyon.

Dating of the Arkansas Loop sites is problematic. Seventy-six radiocarbon dates were obtained from wood charcoal samples from 11 of the components. The calibrated date ranges for most samples fall between AD 1200 and 1400. Based on comparisons of the wood-charcoal radiocarbon dates from selected proveniences with dendrochronological dates and radiocarbon dates on annuals, Fetterman (1996) argues that these dates underestimate the occupation date by 200 to 400 years, owing to the combination of cross-sectional effect and the use of old wood by the Navajos. Applying this correction to the 637 BP average of the wood-charcoal dates yields a date range of roughly AD 1500–1700. Radiocarbon dates on annuals from three of four sites have calibrated between AD 1500 and 1660; the fourth date has calibrated intercepts of AD 1660 and between AD 1750 and 1950. The two components dated by dendrochronolgy—both large pit features—appear to postdate AD 1760. These features may represent ephemeral late Gobernador use episodes.

THE HISTORICAL PERIOD

The next phase of Navajo occupation has been termed the Cabezon phase by Hester (1962), which he dates to between AD 1770 and 1863. The material traits characteristic of this interval seem to be tied to the proscriptions of the Blessingway. Square houses were no longer being built but stone-walled hogans are common. Elaborately painted pottery, Gobernador Polychrome, was replaced by the more muted Navajo Painted pottery, and Dinetah Utility was replaced by Navajo Utility. The period is further marked by a shift toward a herding economy.

Brugge (1983:494–495) argues that drought and intensified Ute attacks during a transitional period between about AD 1753 and 1770 aggravated internal conflicts between Puebloan and Apachean values, forcing the Navajo to seek one of two solutions. The first, for some segments of the population, was to convert to Catholicism and seek Spanish protection. Missions were established for the Navajos at Cebolleta and Encinal, but they could not adapt to mission life, and the missions appear to have been abandoned shortly after a bloodless revolt in March of 1750. The second solution suggested by Brugge was a revitalization movement emphasizing Apachean values. Many of the more overt Puebloan traits were rejected, but those introduced traits most compatible with Apachean values were retained.

Brugge (1963) also contends that Ute raids precipitated a gradual change in the focus of Navajo economy from farming to herding.

Herding allowed the Navajo to increase their mobility and lessened their vulnerability to these raiders. As Haskell (1975:178) observed, the terrain of the Gobernador-Largo region does not lend itself to pastoral activities, so it was not until the Navajo moved to more open terrain further to the south that herding became a viable subsistence and defensive strategy.

The waning years of Spanish control in New Mexico were typified by an accelerated cycle of Navajo raids and reprisals, a pattern that persisted when Mexico assumed control of New Mexico in 1821 and when the United States annexed the territory in 1846. Raids on Euro-American settlements in New Mexico and Arizona finally were curtailed in 1851 when Fort Defiance was built in the heart of Navajo country, but sporadic conflict continued, and when the fort was abandoned at the outbreak of the Civil War, virtually every faction in the territory seized the opportunity for vengeance and looting (Bailey and Bailey (1986:18).

In 1862, Brigadier General Carlton was appointed military commander of New Mexico. Carlton quickly turned his attention to curbing Indian hostilities. After defeating the Mescalero Apache, he ordered troops under the command of Kit Carson to wage a scorched-earth campaign that ultimately led to the military conquest of the Navajo and to their incarceration near Ft. Sumner in 1863. The internment was a dismal failure, and the Navajo suffered from exposure, hunger, and disease. The government finally allowed the Navajo to return home in 1868.

The Navajo Reservation established by the Treaty of 1868 extended from the present Colorado–New Mexico and Utah–Arizona borders southward to the Chaco Slope and Defiance Plateau, and from Lukachukai Wash and Canyon de Chelly eastward to the Chuska Valley. Officials recognized that the Navajos needed more land to become self-sufficient, and General Sherman promised Navajo leaders that they would be allowed to use any off-reservation lands not occupied by white settlers. Since there were no white settlers in northwestern New Mexico or northeastern Arizona at that time, this meant that most Navajo families could return to their former homes (Bailey and Bailey 1986:26).

The proximity of the Utes largely precluded Navajo resettlement of the San Juan River valley when they returned from Fort Sumner. A few Navajo were observed in the valley as early as 1868. The following spring, a group moved north from Fort Defiance and planted along the river, but they were forced out by the Utes by mid-summer. The Navajos made a second unsuccessful attempt to farm the valley in 1871, but a government agent reported that they had abandoned the effort by 1872 (Winter 1983:473). This population void in a fertile river valley made it an attractive area for Euro-American settlement.

The developing mining industry in southwestern Colorado led directly to Euro-American settlement of the upper San Juan drainage by opening key areas to homesteaders. Hispanic and Anglo sheep owners from Rio Arriba County had begun grazing their flocks in portions of the San Juan and Animas drainages during the late 1860s, and during the 1870s a number of Hispanic settlers moved into the region from the Chama drainage. In 1878, a wagon route running up the Animas Valley was finished, linking settlements on the San Juan with the mining camps. Completion of this transportation corridor led to a further influx of homesteaders (Reed and Kemrer 1989).

By the late 1870s, a few Anglo ranchers began settling in the canyon country south of the San Juan River, but the upper San Juan drainage remained largely a Hispanic population center. Anglo settlers were concentrated near Farmington, Aztec, Bloomfield, and Cedar Hill. The mining camps in Colorado provided a ready

market for agricultural products and stimulated development of a farming and herding economy in the San Juan region.

Most of the early settlers were sheep herders, but Anglo ranchers began bringing cattle into the region in the late 1870s. Commercial farming in the San Juan and Animas valleys began in 1877, and agriculture soon was an important industry in the Aztec, Bloomfield, and Cedar Hill areas. Despite the poor transportation network, the agricultural products of the region found a ready market in the Colorado mining camps, and the small trading centers in the valley prospered. The local economy received a further boost in 1906 when a branch line of the Rio Grande and Western railroad was opened between Farmington and Durango, providing a reliable means of transporting livestock and agricultural produce to northern markets.

The first effects of the Great Depression were felt in the San Juan region in the spring of 1930 when wool and livestock prices began to drop sharply. Heavy snows during the winter of 1931-1932 forced herders to purchase feed for their animals and caused heavy stock losses, compounding an already bad economic situation. Traders and merchants stopped extending credit and wage labor opportunities declined. The situation for some of the small ranchers and farmers became untenable, and many families were forced to abandon their homesteads. The Hispanic communities, in particular, suffered significant population losses during this period.

The regional economy languished in the early postwar years but was revitalized by the development of a new industry. The mineral wealth of the San Juan region had been recognized in the early 1900s, but the resources had been left largely undeveloped owing to the distance from major markets and the poorly developed transportation system. Conditions changed dramatically in the 1950s with the westward movement of the U.S. population and the sharply higher energy need of the postwar economic boom.

With the improved transportation system and job opportunities brought by energy development, the region's Euro-American population increasingly concentrated near the area's major commercial centers and along transportation routes. The construction of Navajo Dam in the late 1950s and early 1960s provided further impetus for Hispanics in the upper San Juan to abandon their isolated communities. The lease bonuses, royalties, and rentals paid to the tribes for energy development on reservation land has bolstered the economies of Native American groups in the region, but all of the tribes remain partly dependent on government assistance, and many Navajos and Utes continue to live below the poverty level.

The improving road system in the Four Corners region, availability of cheap fuel, and booming national economy also fostered the development of the tourism industry beginning in the late 1950s. This industry has developed rapidly over the past four decades, and today it is second in importance only to energy development in the regional economy.

Chapter 3

RESEARCH DESIGN AND DATA RECOVERY PLAN

The results of test excavations at LA 110299 suggested that the site was an early Navajo camp, possibly with an ephemeral Anasazi component (Toll 1999). There was also a rock alignment that Toll suspected to be more than 50 years old. The test excavations established that shallow cultural deposits were present, which contained wood charcoal and faunal material as well as lithics and sherds. The limited testing did not determine the extent or integrity of the cultural deposits, nor the character of the occupation(s).

The suspicion that the site had an Anasazi component was based on the recovery of six small grayware sherds from Test Pit 2. Those sherds had a textured exterior and were classified as "corrugated?"—suggesting the presence of an Anasazi utility vessel (Toll 1999:22). Partial reconstruction of the vessels recovered during our excavations, however, demonstrated that the sherds are from a Dinetah Gray jar with fingertip-impressed decoration at the neck-shoulder juncture. Consequently, there is no evidence of a Formative component at LA 110299.

Similarly, excavations to investigate the rock alignment established that it dates to the early 1960s and is probably associated with construction of a utility road, which runs along the western edge of the site. LA 110299 is therefore a single-component site dating to the protohistoric period. As such, the site has a clear potential to contribute information relevant to two important issues in regional prehistory.

First, the site is north of the San Juan River, which is the historically recognized boundary between Ute territory to the north and Navajo territory to the south (Schaafsma 1996). Brown (1996:61–62), however, contends that the Numic-Navajo boundary lay somewhere north of the Colorado–New Mexico border during the protohistoric period, and that mounting pressure from Ute raiders forced the Navajo south of the San Juan River by the early eighteenth century. If Brown is correct, then an early Navajo occupation at LA 110299 would most likely date to the Dinetah or early Gobernador phase. Considerable research has been conducted at early Navajo sites in the upper San Juan drainage during the past decade, but attention has focused primary on the pueblito communities of the late Gobernador phase. Settlement and subsistence patterns during the Dinetah and early Gobernador phases remain poorly understood.

For the Dinetah phase, a critical research issue is the relative importance of agriculture in the overall subsistence system. Spanish documents report that the Navajo had extensive farm fields by the early eighteenth century, but relatively little archaeological evidence of earlier agricultural practices has been recovered. LA 110299 is located on a bench overlooking the Animas Valley and potentially arable land in a nearby tributary drainage, so it could contribute information relating to this problem area. Alternatively, the lithic assemblage from the site suggested that it might be a hunting camp.

Buckskins are mentioned as a major item traded by the Navajo with the Pueblos and Spanish, so the site could provide information on this aspect of the early Navajo economy.

Determining the character of the occupation at LA 110299 would also contribute information on early Navajo settlement patterns. Two models of early Navajo settlement systems have been proposed. Variations in architectural facilities at Dinetah phase sites are suggestive of a pattern of seasonal movement of residential groups among resource zones (Hogan et al. 1991), a pattern typical of hunter-gatherer populations. Alternatively, the residence may have been a semipermanent, multiseason base used as a hub for foraging and hunting trips (Hancock and Moore 1988). Excavations at LA 110299 seemed likely to provide information about residential or limited activity sites that could, in combination with research in adjacent areas (e.g., Honeycutt and Fetterman 1994; Wilshusen 1995), aid in the testing of those models and in the definition of early Navajo settlement patterns in the greater Animas River drainage.

Although we expected our excavations at LA 110299 to contribute information relating to these regional research problems, it was clear that those problems could not be resolved by excavations at a single site. The information collected will have to be integrated with data from other survey and excavation projects in the region, an exercise well beyond the scope of our funding. For purposes of this project, these general research issues were therefore rephrased as a series of more basic questions that could be addressed by our limited investigations. When was the site occupied? By whom was it occupied? What was the nature of the occupation and of the activities conducted at this location?

RESEARCH DESIGN

Chronology was the first priority of the data recovery program. Although sherds recovered from the site during testing suggested an early Navajo occupation, more precise dating was critical. As previous excavations in the area have demonstrated (Brown 1991; Hogan 1989; Honeycutt and Fetterman 1994), the dating of protohistoric sites is far from a straightforward process. The interpretation of radiocarbon dates poses two primary problems. First, the resolution of radiocarbon dating is not well suited to the relatively short time span of the protohistoric period. Second, wood-charcoal dates from protohistoric sites may overestimate the occupation dates by as much as 200–400 years, owing to a combination of cross-sectional effect and the use of old wood for both fuel and structural elements (Fetterman 1996).

Dendrochronology potentially offers more precise dating, but the utility of this method is compromised by the predominant use of juniper in protohistoric structures (the irregular growth of juniper makes it difficult to date); the use of old wood for structural elements; and the fact that most residential structures are burned, which enhances preservation but removes the outer rings from structural elements. Other potential dating methods—archaeomagnetic dating, induced obsidian hydration dating, and thermoluminescence dating—have similar shortcomings (Hogan et al. 1991). Given these problems, the best results have been obtained by processing multiple dates using multiple dating methods.

During the excavations, all potentially datable materials were carefully collected. Regrettably, no usable dendrochronological samples were recovered. Nevertheless, we were largely success-

ful in achieving this research objective. Corn cupules from two features at the site provided AMS radiocarbon dates, and thermoluminescence dates were obtained for two sherds recovered from the structure floor. These dates suggest that the site was occupied in the early seventeenth century—that is, the late Dinetah phase.

The question of who occupied the site has two aspects, the first relating to cultural affinity. We tried to address this part of the question using ceramics, architectural and site-structure attributes, and subsistence data. The arguments used are probabilistic and, given the information currently available, are neither elegant nor conclusive.

As discussed in Chapter 6, the pottery from LA 110299 was tentatively classified as Dinetah Gray. The sherds are fully consistent with that type as currently defined, and there was no clear evidence of attributes cited as characteristic of Ute pottery—paddle-and-anvil thinning and micaceous temper. Although this evidence suggests an ancestral Navajo cultural affinity for the site, it is not conclusive as the type description for Dinetah Gray is indistinguishable from Buckles's (1971) description of Uncompahgre Brown, a Ute pottery type. Further, Schaafsma (1996:39–43) contends that the presence of fingertip-impressed decoration on pottery from protohistoric sites in the La Plata Mine area, from which recent descriptions of Navajo pottery were derived, is inconsistent with the original definitions of Dinetah Gray and Gobernador Indented. He therefore argues that there is no basis for interpreting these sites as ancestral Navajo occupations. In his opinion, the pottery is better regarded as a southern version of Uncompahgre Brown, evidencing a protohistoric Ute occupation. Resolution of this typological controversy will require systematic comparison of ceramic collections from accepted early Ute and Navajo sites to determine whether Dinetah Gray and Uncompahgre Brown are in fact distinctive. Until that research is completed, these types cannot be considered the definitive evidence for cultural affinity in the upper San Juan drainage.

Based on ethnographic information and archeological data from sites dating predominantly to the late nineteenth or early twentieth century, Sanfilippo (1998) developed a list of architectural attributes potentially useful in distinguishing Navajo hogans and Ute wickiups. Among those attributes are door form, structure covering, and whether the structures are free-standing or lean-to. Doors tend to be unelaborated in Ute structures, whereas Navajo hogans have rectangular entries with upright forked door posts supporting a lintel. Navajo hogans typically have an earth covering, sometimes over bark or brush; Ute wickiups, in contrast, have brush, bark, rush, or hide coverings. Almost all Navajo hogans are also free-standing, whereas a majority of Ute wickiups are lean-tos incorporating a living tree into the support structure.

More specifically, Brown (1996:63) argues that Dinetah phase hogans also exhibit a number of formal characteristics that distinguish them from Ute wickiups. These include floors excavated into shallow polygonal pits, a substantial earth covering over a forked pole superstructure, and, in at least one instance, a log-covered entryway. In contrast, Brown observes that known Ute structures evidence a more expedient construction technique, lack an earth covering, and have fewer intramural and extramural features than early Navajo sites. Complementing Brown's research is Greubel's (1999) analysis of site structure at two Ute sites on the Uncompahgre Plateau. This analysis suggests that the Ute wickiups were covered with juniper bark or bark and brush rather than earth. In addition, Greubel notes the presence of juniper-bark bedding in at least one of the wickiups, and the consistent occurrence of a large "table rock" or anvil stone adjacent to the hearth.

He believes that both of these latter attributes are characteristic of Ute occupations.

Brown and Greubel also view site orientation as a potentially useful criterion for distinguishing early Ute and Navajo occupations. Brown (1996:63) notes that Dinetah phase sites in the La Plata Valley have refuse areas and ash dumps southeast of the hogan, and hearth-centered activity areas south and/or east of the structure. Greubel, on the other hand, found that the interior hearths in the Ute wickiups he investigated were off center, from which he inferred that the doorways were oriented to the northwest or slightly east of north. This interpretation was further supported by the presence of refuse deposits and extramural hearths situated just beyond the inferred doorways. The placement of activity areas around the wickiups appears more variable. In one instance, highest artifact densities were to the west and northwest of the structure; in the second, they were north and south of the structure; and, in the third, they were to the southeast and northwest of the structure.

Although these data suggest that door orientation should be useful in distinguishing early Ute and Navajo occupations, Sanfilippo found considerable variability in the orientation of Ute and Navajo structures, and no clear differences between them. Her ethnographic data indicate that door orientation in Navajo hogans is predominantly to the east, southeast, or northeast; in Ute wickiups it is predominantly to the east, south, southeast, or northeast. Archeological data from Black Mesa indicate similar variability, with door orientation of Navajo hogans mostly to the east, but some to the southeast or northeast. Where doorway orientation could be determined at archeological sites on the Uncompahgre Plateau, about half of the Ute wickiups also had doorways opening to the east, one-third opened to the south, and the remainder opened to the southeast or northeast (Sanfilippo 1998:67).

Our attempt to use architectural and site-structural data to determine the probable cultural affinity of the residents at LA 110299 was largely unsuccessful. Our excavations yielded little data concerning the architectural attributes of the structure beyond the fact that there was a conical pole superstructure. There was no evidence of a prepared polygonal pit or earth covering, but there was also no evidence of a brush or bark covering, juniper-bark bedding, or a large table rock near the hearth. The structure depression was situated at the base of a large, living juniper raising the possibility that the tree had been incorporated into the structure framework. As lean-to structures are common at Ute sites but rare at Navajo sites, the tree was cored to test this hypothesis. Although only a partial ring count was obtained, it is doubtful that the tree was living when the site was occupied. The structure therefore appears to have been free-standing.

Efforts to assess the site orientation yielded equally ambiguous results. The hearth in the structure is located slightly west of center, there is an extramural hearth to the southwest of the structure, and an arc of postholes extends to the west. The highest density of artifacts was also west of the structure, although this concentration of materials is partly the result of slope wash. Nevertheless, the bulk of available evidence suggests that the structure opening and primary outdoor activity areas were to the southwest or west, an unusual orientation for either Ute or Navajo sites. In the end, the decision to classify the site as an ancestral Navajo occupation was based on the absence of any positive evidence for a Ute occupation, and on the presence of corn macrofossils, which are relatively common at early Navajo sites but rare at protohistoric Ute sites.

The second aspect of the "who occupied the site" question relates to group composition. The primary consideration here was determining if the

site represented a residential or logistical occupation; that is, was the site occupied by a specialized task group or a commensal/family group? This issue and the closely related problem of determining the range of activities conducted at the site were addressed using a combination of site-structure, artifact, and archeobiological data. The presence of the structure is itself suggestive of a residential occupation, as there is rarely any evidence of shelters at logistical sites in the Southwest. This interpretation is further supported by the variety of artifacts present, which include materials associated with food preparation and consumption—pottery and ground stone—as well as formal and expedient tools suggestive of diverse manufacturing and resource extraction activities. Subsistence remains also indicate that various wild plant resources and small game animals were procured, while the presence of corn macrofossils suggests that the residents were engaged in limited agriculture. Interestingly, the tool assemblage included three probable hide scrapers, although no faunal remains from large game animals were recovered from the site. This could indicate delayed processing of hides or retooling in anticipation of fall hunting.

The archeobotanical remains suggest a warm-season occupation, possibly from early summer to early fall. The facilities present are generally consistent with this interpretation. The structure is not elaborate; there are outdoor activity areas and a possible shade or windbreak; and there is relatively little fire-cracked rock debris. At the same time, the relatively small artifact assemblage suggests an occupation span of a few weeks rather than a few months. If the site was a farmstead, however, then many of the tool manufacturing and maintenance activities that produce large quantities of debitage may have been performed at the field location. Thus the debris at the site might be limited to that produced during food preparation and the manufacture or repair of curated personal gear.

EXCAVATION STRATEGY

The data requirements of the research design dictated an extensive excavation strategy directed toward the discovery of any additional features at the site, and full recovery of associated artifacts, datable materials, and archeobiological remains. This strategy was also consistent with the management objectives of the project—to recover relevant data from the site and obtain clearance for construction in this segment of the Highway 550 right-of-way. Emphasis was necessarily given to the excavation of features. Organic materials at shallow open sites are more likely to be preserved when charred, so thermal features and midden deposits consisting of debris from those features offer the best chance of obtaining archeobotanical and faunal remains, and material for radiocarbon dating. Archeomagnetic samples are also most likely to be obtained from areas where sediments have been intensively burned.

Preliminary activities at the site included preparation of the site map, establishment of a grid that encompassed the site area, and collection of the surface artifacts. Excavations then began in the areas of charcoal staining and highest artifact density. As noted in the testing report (Toll 1999:17), most of the artifacts at the site were in a small rill that channeled runoff from slightly higher ground to the east. The charcoal stain was also partly within this rill, slightly upslope from the main surface artifact concentration. Given this situation, there was some concern about the integrity of these cultural deposits. Priority during the early stages of excavation was therefore given to assessing the geomorphological history of the site as it related to the cultural deposits.

Test pits were opened within the charcoal stain and artifact concentration to expose the slope stratigraphy in profile. Two other test pits were then dug at the top of the slope to complete the stratigraphic section, and to probe for buried

features immediately east of the charcoal stain. Inspection of the profiles in these test pits indicated that a protohistoric occupation surface was present at the contact between an upper stratum of loose surface sediments (Stratum 1) and a lower stratum of compact, carbonate-cemented sediments (Stratum 2). The structure depression was cut into the upper surface of Stratum 2, and a lens of charcoal-stained sediments sandwiched between the two strata filled that depression. It therefore appeared that both the deposits associated with the structure and the artifacts associated with the extramural area to the west were largely in situ, although there had been some downslope movement of cultural materials in both areas.

This excavation unit was subsequently expanded to encompass the structure and adjacent extramural work areas. In excavating the structure, surface sediments were stripped from above the ash stain, with running profiles mapped along designated grid lines parallel and perpendicular to the slope. These profiles were maintained as the structure fill was excavated to the floor. All structural elements within the roof fall were exposed and mapped during the course of excavation. Floor fill, the 5–10 cm of sediment immediately above the floor, was excavated separately to recover any in situ artifacts on the floor. After mapping and final photographic documentation, the floor and first 5 cm of sediments below floor level were collected and bagged for flotation and fine-screening. Lastly, subfloor tests were excavated to insure that no other cultural deposits were present.

The excavation procedure for smaller features was a simplified version of the techniques employed for structures. Initially, surface sediments were removed to expose the feature in plan. Next, half of the fill was removed to expose a profile of the feature. The remaining fill was then removed, and the fully excavated feature was mapped in plan and photographed. Bulk soil samples of the feature fill, usually the entire contents of the pit, were collected during excavation for flotation and fine-screening.

At least a 2 by 2 m area encompassing each feature was excavated to identify any associated work surfaces. These excavations were expanded as necessary to fully expose the activity area. In all, a 59 m^2 area surrounding the structure was excavated to ascertain the relationship among the facilities and work areas associated with the occupation. These extensive excavations were needed to determine the character of the occupation and to insure that an adequate sample of artifacts was recovered. All excavated sediments from the site were screened through ⅛" hardware cloth. Artifacts and samples were provenienced in horizontal units no coarser than 1 by 1 m squares. Vertical provenience was by natural or cultural stratum.

During test excavations at LA 110299, two isolated artifacts had been recorded approximately 20–25 m southeast of the ash stain, and the site boundary was expanded to encompass those items. We had planned to systematically probe the area between the ash stain and these isolated artifacts by digging a series of 30–50 cm diameter shovel test pits at 2 m intervals along each grid line, staggering the test pits by one meter on every other grid line. Once we realized that the protohistoric occupation surface corresponded to the top of Stratum 2, that plan was abandoned. Deflation had already exposed Stratum 2 in the area immediately east of the structure, so any associated extramural features in that area would have been visible on the surface. Further to the southeast, erosion had removed Stratum 2, exposing the much older colluvial gravels. Testing in this area was therefore limited to the excavation of four test pits to verify our geomorphological observations. Where recent surface deposits were present, notably to the south of the main excavation area, shovel-stripping was employed to expose the upper surface of Stratum 2.

Although our geomorphological investigation suggested that Archaic and Formative age sediments were present in the site vicinity, we did not attempt to probe for deeply buried cultural deposits. We had considered using a backhoe to trench the site area, but LA 110299 lies outside of the active construction zone in an area that is being preserved as "viewshed." In consultation with Michael Dussinger at NMSHTD, it was therefore decided that the older deposits at the site were not endangered and should remain undisturbed.

Chapter 4

SITE DESCRIPTION

LA 110299 is a small, short-term residential site dating to the Dinetah phase. The site is situated on an elevated bench or terrace approximately 60 m above and 500 m west of the Animas River. The site was originally described as consisting of a single hearth and a small scatter of artifacts within a 6 by 8 m area. Cultural affiliation was listed as unknown. Subsequent testing of the site by OAS indicated that the ash stain ranged in thickness from 0 to 10 cm but the exact size was not determined. More artifacts were also noted on the surface than were originally recorded. In addition, two lithic artifacts were noted to the southeast of the original site boundaries, which increased the dimensions of the site to 14 by 27 m. Ceramics recovered from the two test pits suggested that two components may be present—a possible Anasazi component and an early Navajo component. A cobble alignment, located west of the site area but not associated with the primary occupation, was thought to have possible historical significance, but no testing was conducted in this area.

The data recovery program had three objectives. The primary focus was an investigation of the ash stain to determine its origin and to recover any associated cultural materials. Second, the enlarged site area was tested to probe for any additional cultural materials and/or features. Finally, the cobble alignment was tested to ascertain its age and possible cultural affiliation. In order to meet these objectives, the site area was divided into four study units (Figure 4).

STUDY UNIT 1

Using the datum set by OAS, a grid consisting of 1 by 1 m units was established to encompass the 6 by 8 m area containing the ash stain and major artifact concentration. This area was designated Study Unit 1 (SU 1). All surface artifacts (11 lithic and one ceramic artifact) were then collected. The lithic artifacts consisted of six flakes, two retouched flakes, a bifacial chopper, a one-hand mano, and a slab metate fragment. In addition, a scraper had been collected during the testing phase. The sherd was identified as Dinetah Gray. Most of the artifacts were concentrated in a linear pattern within a small drainage rill below the ash stain, suggesting some displacement had occurred.

Following the collection of the surface artifacts, the units were surface stripped by hand to remove the overburden in order to expose the stain and any additional features, and to recover associated subsurface artifacts. Fifty-nine 1 m^2 units were excavated. The overburden within these units ranged from 2 to 12 cm deep with an average depth of 6.07 cm or 3.54 m^3.

These excavations revealed the remnants of a small brush structure (Feature 1) and two outside activity areas consisting of a possible thermal feature (Feature 2), a second thermal feature (Feature 3), and a cluster of three postholes. Two possible postholes were also present. Feature 3

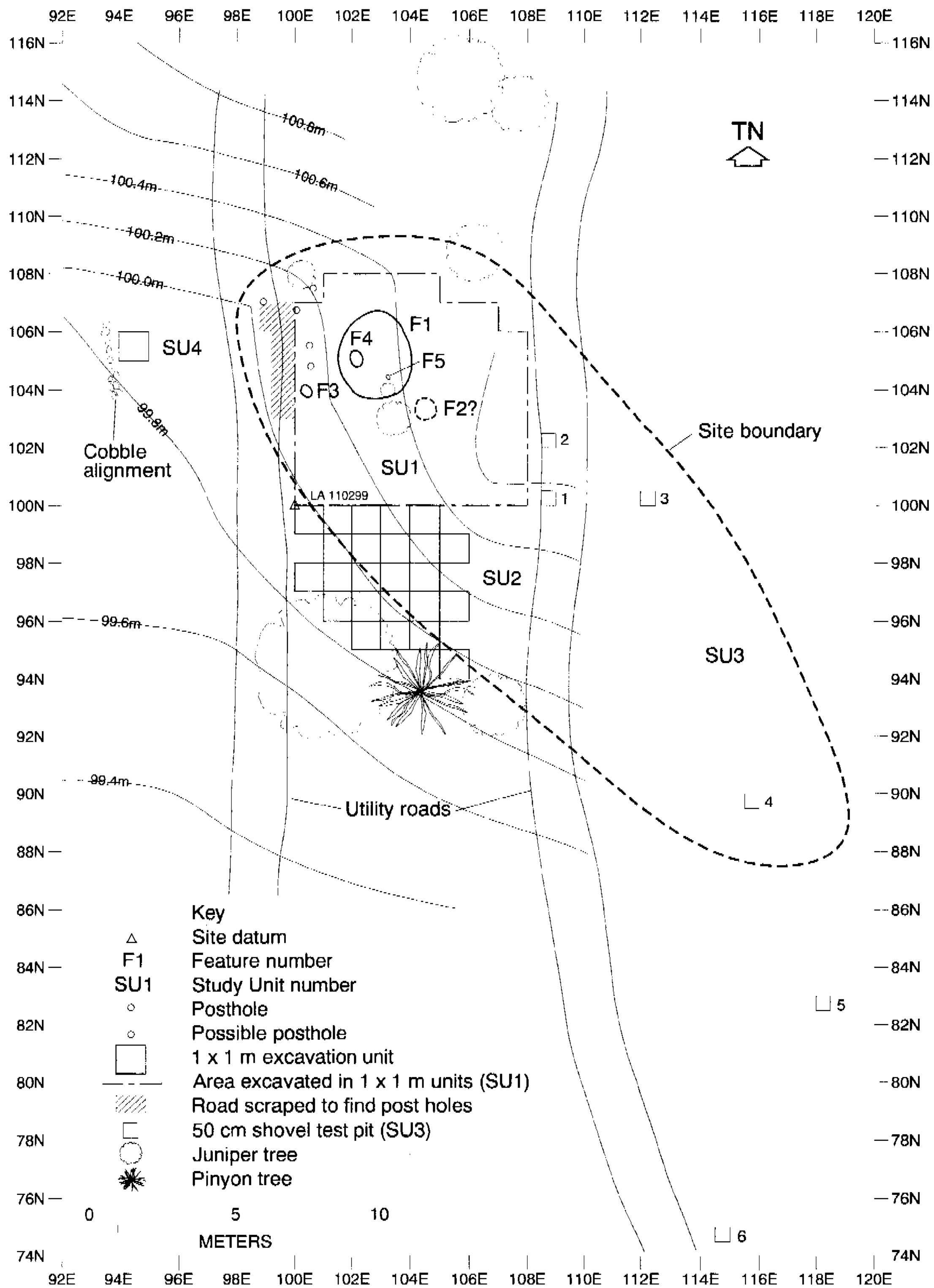


Figure 4. Location of data recovery units, LA 110299.

and the postholes were located to the west of the structure, while Feature 2 was found to the southeast.

The artifacts recovered from this surface stripping consisted primarily of debitage, much of which appear to be the by-product of tool manufacture and/or resharpening. Also recovered were 68 sherds, 7 pieces of ground stone, 3 cores, 3 hammerstones, 3 retouched flakes, 2 bifaces, 1 scraper, 1 pecking stone, 1 scraper plane, 1 arrowpoint, and 4 unidentifiable small mammal bone fragments, one of which is a possible bone bead. None of the bone fragments is burned. The arrowpoint appears to be protohistoric but the two sides of the base are broken, making typological assessment difficult. Most of the grids to the west of the structure also contained numerous pieces of fire-cracked cobbles.

Structure 1 (Feature 1)

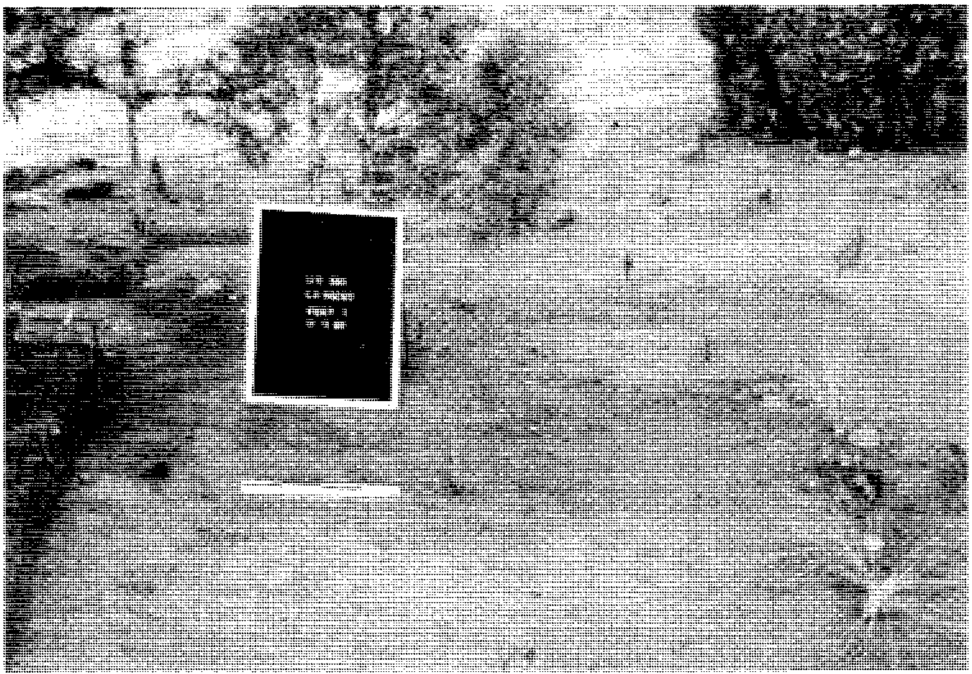
The structure was marked by a shallow depression that measured roughly 3 m north-south by 2.75 m east-west and ranged in depth from 2 to 13 cm. The greatest depth was along the eastern and southern edges of the perimeter. Most of the western and northwestern edges were badly eroded (Figure 5). It was not clear if the depression had been intentionally dug before the superstructure was erected, or had formed as a result of trampling and periodic sweeping of the structure floor.

Although no postholes were noted, burned structural elements were found in the southeast quadrant of the floor (Figure 6). These fragments indicate that the superstructure was a conical framework of juniper poles butted into the ground around the perimeter of the depression and leaned together at the top. There was no clear evidence indicating what materials had been used to cover this framework.

The presence of a large living juniper tree at the eastern edge of the structure depression raised the question of whether it had also been a support element for the structure. Because lean-to structures are common at Ute sites and rarely found at early Navajo sites, the tree was cored to test this hypothesis. The cores taken from the asymmetrical main trunk missed the pith by a considerable margin, so no ring count could be obtained. A third core, from the largest living branch, also fell short of reaching the pith, but yielded a count of 142 rings. This core could not be dated owing to the erratic ring pattern, but because the innermost rings lacked the curvature characteristic of the pith area, it was estimated that the stem at this level could be as old as AD 1800 (Jeffrey S. Dean, personal communication, 26 July 2000). Dean suggested that the base of the tree was probably a century or so older. While the latter estimate approaches the chronometric dates for the site's occupation, it is doubtful that the tree would have been large enough to support a structure. Structure 1 therefore was most likely free-standing.

The floor of the structure was a use-compacted surface with two features. A small, informally prepared hearth was in the southwestern quarter of the floor and a possible pot rest (Feature 5) was found 80 cm southeast of the hearth. The hearth (Feature 4) measured 55 cm north-south by 40 cm east-west and had a depth of 7 cm. Root and rodent disturbance was evident throughout the feature. The sides sloped downward to the undulating base, and the interior surfaces were heavily oxidized. The fill of the basin consisted of dark gray to black stained sediments with small flecks of juniper and piñon charcoal. A small obsidian flake was recovered from the fill, as were 16 unidentifiable small mammal bone fragments, 14 of which were burned.

The entire fill of the hearth was bagged for flotation to recover macrobotanical remains. This



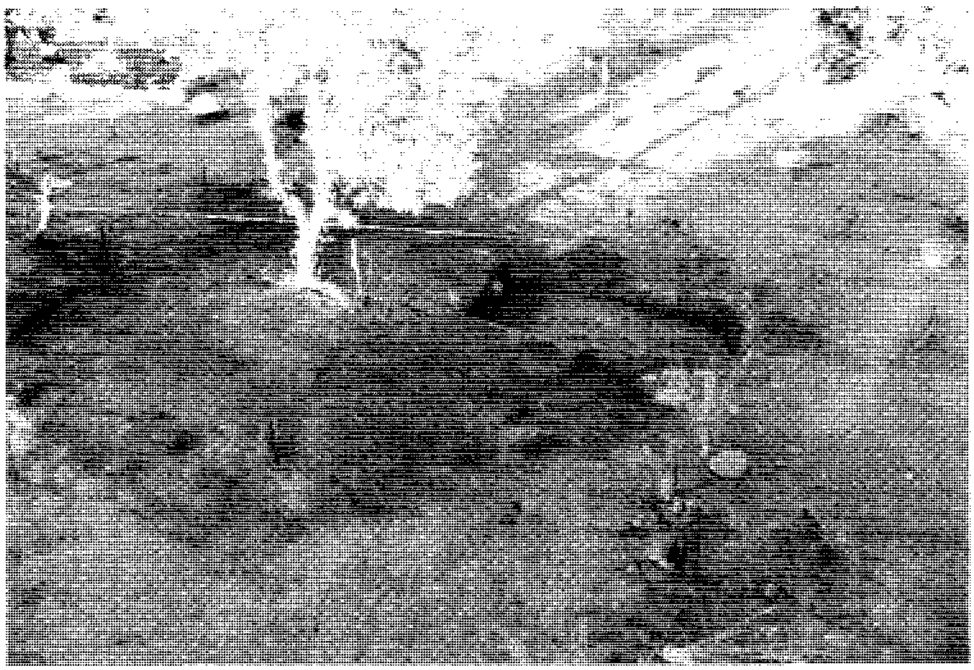


Figure 5. Structure before excavation (OAS test pit in upper center of stain).

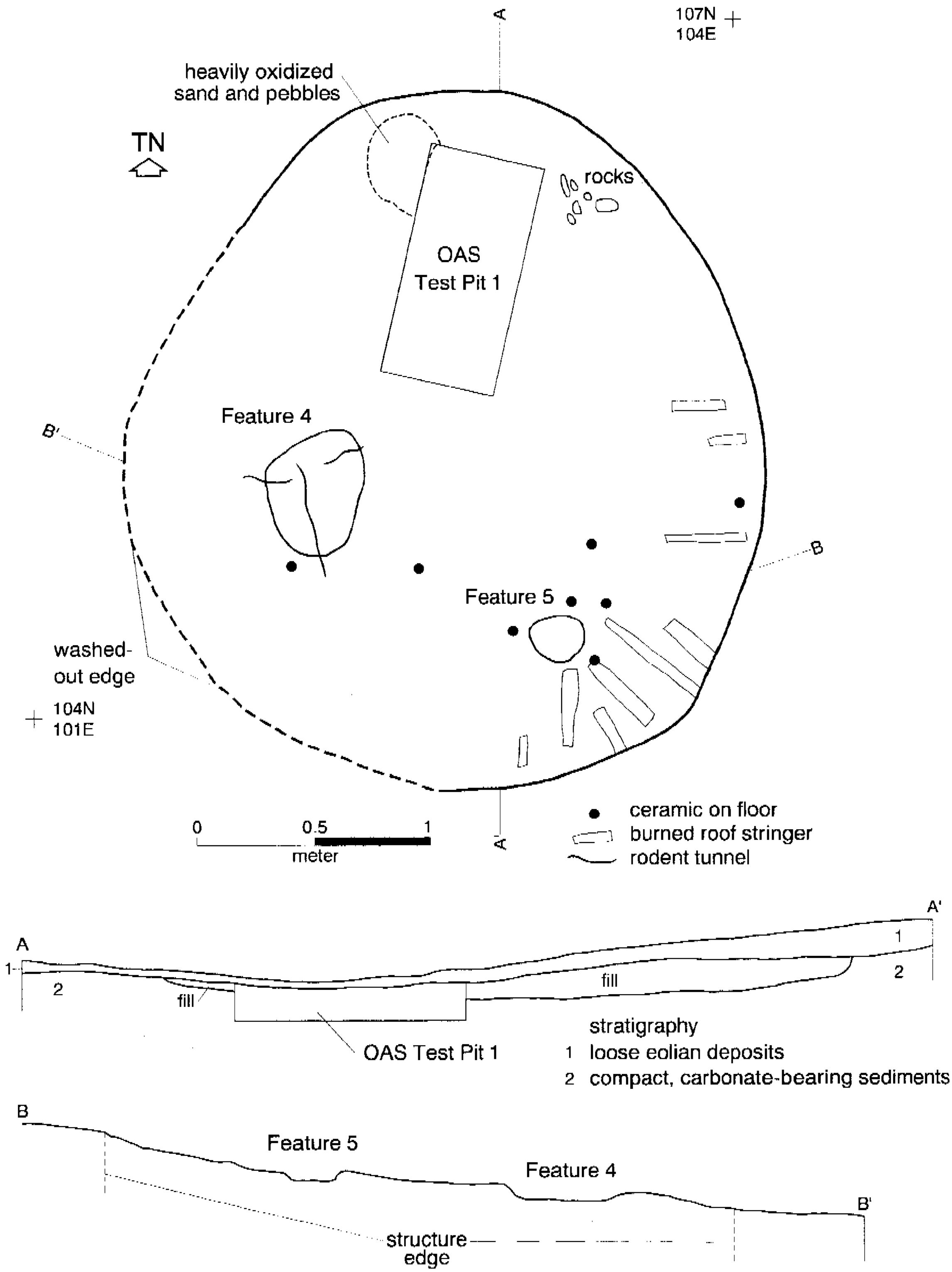


Figure 6. Plan and profile of structure after excavation.

sample yielded charred maize cupules, chenoams, and probable juniper seed fragments. One of the corn cupules was submitted for AMS dating and yielded a C13/C12 adjusted radiocarbon date of 340 ± 40 BP (Beta 131324) or cal AD 1515, 1590, 1620 with a 95% confidence interval of cal AD 1450 to 1650.

A small, shallow depression (Feature 5) was found approximately 80 cm southeast of the hearth. The depression measured 21 by 24 by 4 cm, and was filled with medium gray, ash-stained sediments. The size of the feature and its proximity to the hearth suggest that it probably served as a pot rest.

Numerous flakes and ceramics, a scraper, and a bone bead were recovered from the structure fill, as were 36 fragments of unidentified small mammal bone, 17 of which were burned. Soil samples taken from the fill immediately above the floor yielded charred maize cupules, and chenopod, chenoam, grass, and ricegrass seeds. These taxa suggest a warm season occupation.

Floor artifacts were limited to eight Dinetah Gray jar sherds, five of which were clustered around the pot rest. All appeared to fragments from the same Dinetah Gray jar. Two of the sherds clustered near Feature 5 yielded thermoluminescence (TL) dates of AD 1686 ± 32 (UW 481) and AD 1793 ± 98 (UW 482). James Feathers (personal communication 31 August 2000) reports that a relatively high scatter combined with a low equivalent dose created the high error for UW 482. To reduce this error, the four most outlying points—two from the additive curve and two from the regeneration curve—were arbitrarily removed. Removing the four data points from the growth curves of UW 482 produced a much older age, AD 1562 ± 41, suggesting that the original age is probably an underestimate. Although there is some age disparity between the two sherds, the dates overlap at two standard deviations, indicating that statistically they could come from the same vessel.

Western Activity Area

One thermal feature and several postholes were exposed during the hand stripping of the area west of the structure. The highest concentration of artifacts and fire-cracked rock was also noted in these western grids, suggesting that this was a primary activity area.

Feature 3, located 1.05 m to the southwest, was a well-defined pit measuring roughly 40 cm in diameter by 22 cm deep. The walls were fairly steep and tapered at the bottom (Figures 7 and 8). The fill contained dark stained sediments with chunks of charcoal and numerous fragments of fire-cracked cobbles. No oxidation was evident. A two-hand mano that also shows light use as a metate and two flakes were recovered from the fill.

Macrobotanical samples taken from the fill contained evidence of charred maize cupules, a kernel fragment, chenoams, and chenopods. One of the corn cupule fragments was submitted for AMS dating. This specimen yielded the same date as the cupule from the structure hearth, 340 ± 40 BP (Beta 141323).

The largest and most diverse sample of faunal remains also came from this feature. This sample consists of 56 unidentifiable small mammal, 5 cottontail (*Sylvilagus* sp.), 1 jackrabbit (*Lepus* sp.), and 1 pocket gopher (*Geomys* sp.). Except for 20 unidentifiable small mammal fragments, all the fragments were burned.

Directly north of Feature 3 was a series of postholes and possible postholes arrayed primarily in a north-south pattern (Figure 4). They ranged from 6–9 cm in diameter and between 4

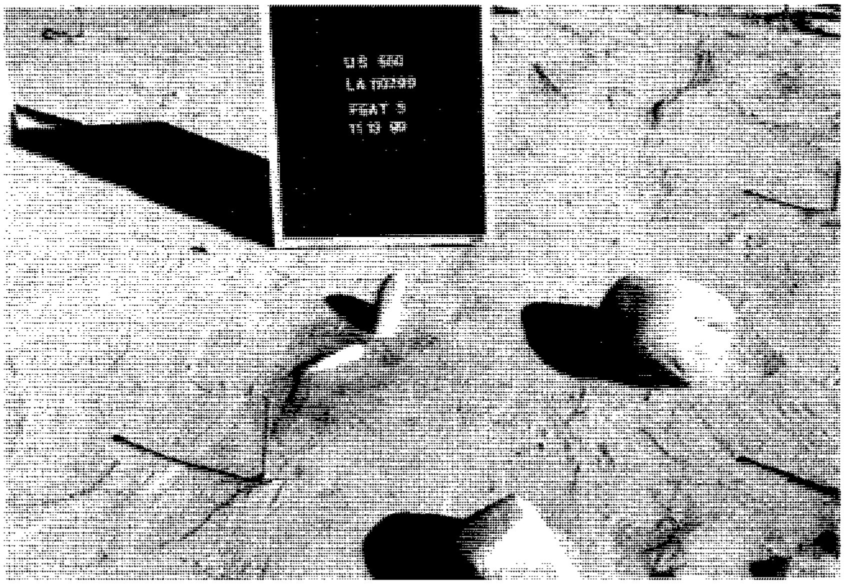


Figure 7. Feature 3 before excavation.

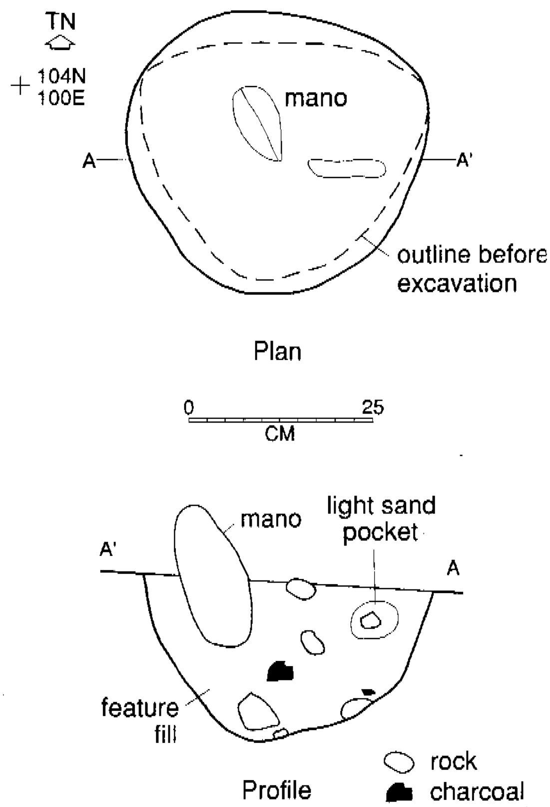


Figure 8. Plan and profile of Feature 3.

and 11 cm deep. These postholes may be remnants of a drying rack, a windbreak, or a shade. The arc of the holes suggests that more may have been present along the west, but the utility road has obliterated any evidence of additional postholes.

Eastern Activity Area

Hand stripping of the units to the east and southeast of the structure exposed a second possible thermal feature. Numerous small pieces of debitage and a scraper were also recovered from these units, but the quantity of fire-cracked rock was considerably less than that present in the western grids.

Feature 2, located 55 cm southeast of the structure, is questionable. On the surface it appeared to be an oval patch of carbon-stained sediments measuring 85 cm by 45 cm. A small juniper was growing out of the middle. Subsequent hand excavation revealed an irregular pit with depths ranging from 3 to 12 cm and heavily disturbed by roots and rodents, making

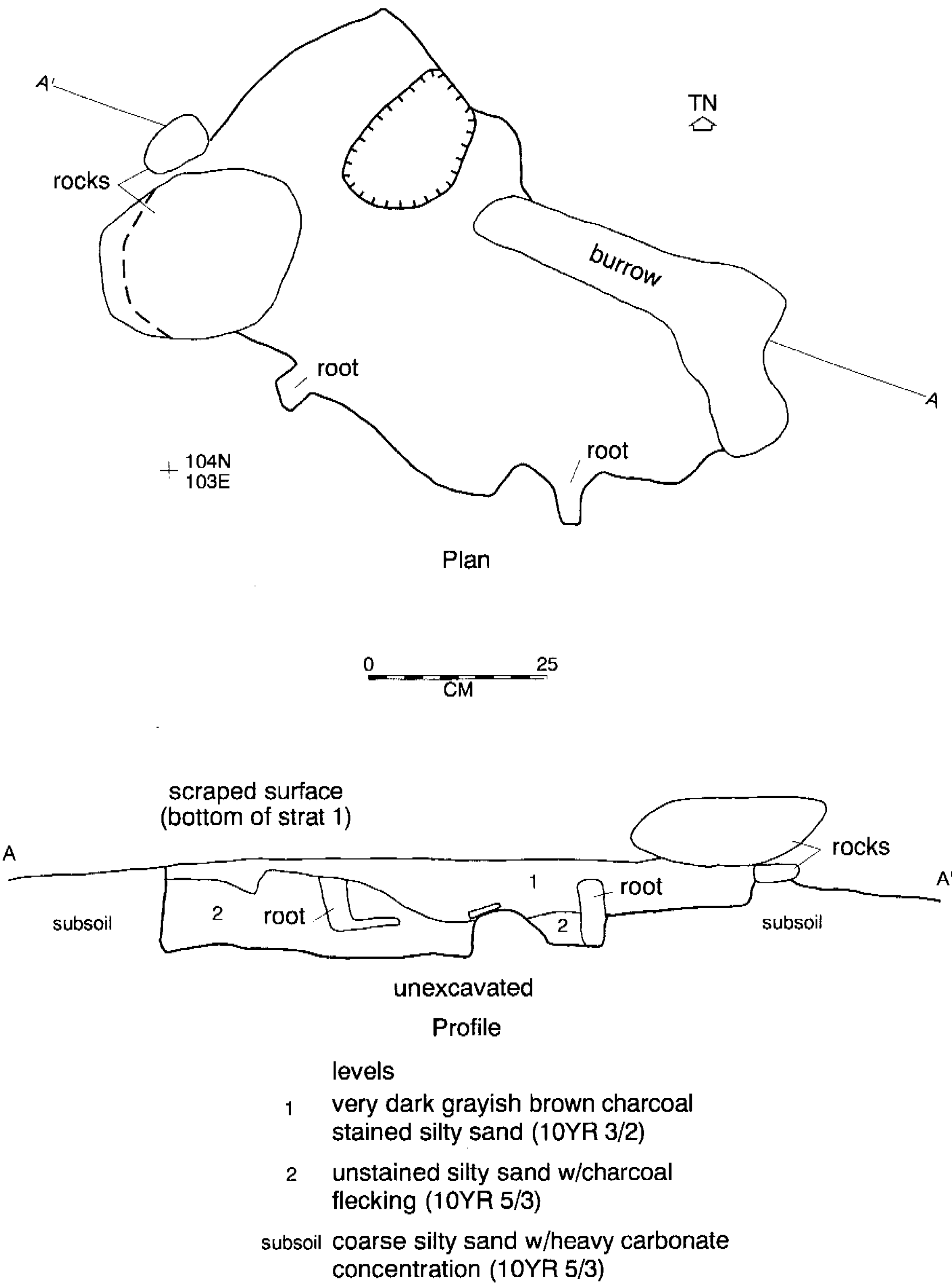


Figure 9. Plan and profile of Feature 2.

the sides hard to discern (Figure 9). The fill contained lightly stained sediments and small pieces of charcoal. A quartzite flake was recovered from the fill. No oxidation was evident.

The entire fill was bagged for flotation and macrobotanical analysis. No charred macrobotanical specimens were found, but one unburned fragment of unidentifiable small mammal bone was recovered. Given the rodent activity throughout this feature, it is highly probable that this small bone was not culturally deposited.

STUDY UNIT 2

Study Unit 2 designates the area between the 100N line and a group of trees to the south (Figure 4). This area has a similar geomorphic setting as Study Unit 1 and appeared to have the best potential to yield additional cultural remains. An area measuring 4 by 6 m was gridded with 1 by 1 m contiguous units and subsequently surface stripped by hand in a checkerboard fashion (Figure 10). Past experience has shown that this method is very effective for finding subsurface remains, especially when the overburden deposits are shallow. The overburden in the 15 excavated units ranged in depth from 3 to 8 cm with an average depth of 5.33 cm or 0.79 m^3. No features were found. Nine artifacts were recovered, primarily in the northern and southeastern-most units. Most were pieces of debitage, but a Dinetah Gray jar sherd, a chopper, and a metate fragment were also found.

STUDY UNIT 3

To probe for additional cultural remains along the eastern edge of the site, six shovel test pits (STP) were placed in areas that appeared to have potential for buried materials (Figure 4). These test units were hand dug and measured approximately 40 cm^2. STPs 1 and 2 were dug to depths of 37 and 40 cm, respectively, to assess the stratigraphy of the site. These two units showed that the occupational surface was immediately below the shallow overburden, with the features being dug into the carbonate-cemented stratum underlying the surface sediments. The remaining four STPs were excavated to depths between 8 and 26 cm with an average depth of 13.75 cm. No additional cultural materials were found.

STUDY UNIT 4

Study Unit 4 was a 1 by 1 m unit placed next to the cobble alignment (Figure 11). This unit was hand excavated to 17 cm below modern ground surface. The matrix consisted of churned deposits, likely from the blading of the utility road. An early, probably 1960s Coors beer can was found embedded into the south wall of the unit. It had been opened with a triangular punch, which indicates the can predates the mid-1960s when pull-tab cans were manufactured. No other artifacts were recovered. The alignment appears recent and is probably related to the utility road.

SUMMARY AND INTERPRETATION

The excavations at LA 110299 revealed a small single-component, short-term residential site consisting of a small brush structure, an extramural activity area located west of the structure, and a possible second activity area situated southeast of the structure. Radiocarbon assays obtained from corn cupules recovered from the hearth in the structure and the hearth in the western activity area indicate that the site dates between AD 1450 and 1650. The thermoluminescence dates for sherds from the floor of the structure indicate that the occupation probably occurred during the later part of that date range.

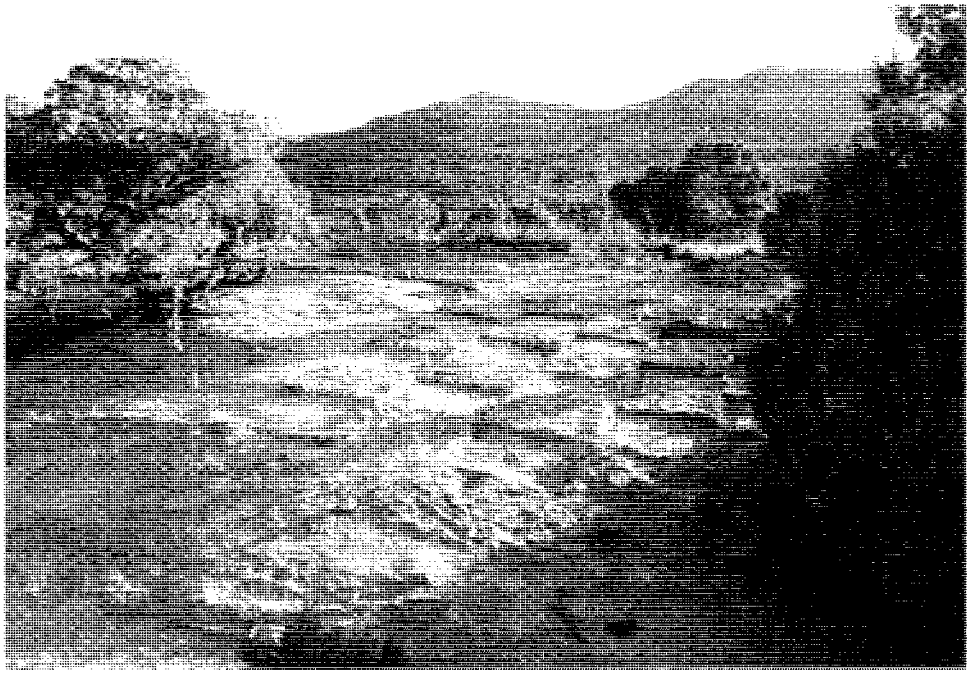


Figure 10. Overview of Study Unit 2 after hand stripping of Stratum 1.

The structure was marked by a shallow depression, which may have formed as a result of repeated sweeping of the unprepared floor. No postholes were found, but small juniper stringers found along the southwestern edge suggest this may have been a simple brush and earth or brush and hide structure.

The floor of the structure was use-compacted carbonate-bearing sands. A simple hearth basin was located just southwest of center and a small pot rest was found southeast of the hearth. No clear evidence of an entryway was found, but the position of the interior hearth, the location of the primary activity area, and the density of artifacts between the activity area and the structure all suggest that the doorway opened to the west-southwest.

The size of the structure indicates that it could accommodate up to four people. Occupation of the site by a family group is further supported by the artifact assemblage. The assemblage reflects a variety of domestic activities performed by males and females--hunting, plant processing, food preparation, and tool manufacture and repair.

The macrobotanical remains recovered from the structure and outside hearth consisted of maize, chenopods, chenoams, ricegrass, and grasses. These taxa indicate that although there was some reliance on corn, wild plants still played an important part in the subsistence of the occupants. The total suite of plant remains suggests a late summer/fall occupation. It is also possible that the maize and wild plant macrofossils reflect the consumption of winter stores.

The intensively used interior hearth in the structure suggests a colder season occupation. This interpretation is also supported by site's setting in a sheltered area with good solar exposure and a readily available supply of water and wood. Although no storage facilities were

Figure 11. Cobble alignment in Study Unit 4 and the excavated test pit.

found, food could have been stored in baskets, or cached elsewhere and brought to the site when needed.

The faunal assemblage also supports the interpretation of a somewhat stressed economic situation. Most of the remains are small, unidentifiable mammal bones; identifiable species include jackrabbit, cottontail, and pocket gopher. These were all highly fragmented and crushed, which suggests marrow and grease extraction. More than 60% of the fragments were burned.

Chapter 5

THE LITHIC ANALYSIS

The testing and data recovery program at LA 110299 recovered 197 lithic artifacts, most of which (81.22%) are pieces of debitage. The primary goals of the lithic analysis were *(a)* to determine the type and range of activities conducted at the site, *(b)* to assess subsistence strategies as evidenced by the tool assemblage, and *(c)* to ascertain cultural affinity, if possible.

ANALYSIS PROCEDURES AND ATTRIBUTE DEFINITIONS

Each lithic artifact was examined individually, and the attributes described below were recorded. This information was entered into an artifact database using a program written by Peter Eschman in Clipper (Version 5.3, Computer Associates © 1995). The data were then sorted and summarized using Statistical Analysis System for Windows (Version 6.12, SAS Institute © 1989–1995). The definitions for general artifact type and other attributes follow those used in the lithic analyses for the Bolack Land Exchange (Elyea 1992), Cortez CO_2 pipeline (Elyea and Eschman 1985), and MAPCO pipeline (Elyea 1998) projects.

Material

Material constitutes the type of rock or mineral from which an artifact is manufactured. Varieties of igneous and sedimentary rocks are further delineated on the basis of texture (i.e., fine-grained, coarse-grained), and varieties of chert and chalcedony, on the basis of color and/or inclusions.

Artifact Type

Initially the artifacts were sorted into five major categories: debitage, chipped stone tools, cores, massive impact tools, and ground stone. As used here, debitage refers to unused, unretouched waste flakes. Five categories of debitage were distinguished.

- Angular debris exhibits conchoidal fractures indicative of human manufacture but lacks definable dorsal and ventral surfaces. This debris is usually an unintentional by-product of core reduction.
- Flakes have distinguishable dorsal and ventral surfaces and may be the by-products of core, bifacial, or other reduction trajectories.
- Sharpening flakes are small, thin flakes that are the by-products of sharpening or resharpening a formal tool.
- Bifacial reduction flakes have a curvate longitudinal cross-section, a prepared platform, and bidirectional dorsal scars. These criteria dictate a conservative classification of bifacial reduction flakes; by-products of bifacial manufacturing processes that do not have these characteristics are classified as flakes.
- Flakes from hammerstones are debris incidentally removed from the impact surface

of hammerstones during use. They have wide battered platforms and exhibit battering use-wear on their dorsal surface.

Flaked stone tools were initially classified into general functional categories (e.g., retouched flakes, bifaces, unifaces, scrapers, projectile points) based on their overall morphology. Next, each utilized edge on the tool was recorded in more detail. Use wear was identified using a stereo microscope at 10–70x. The extent of use-wear or retouch from the edge of the tool was measured in mm, and the direction of use was recorded as toward the dorsal surface, the ventral surface, or both. The location of the utilized or retouched edge on the tool was coded as right, distal, left, or proximal (with the artifact placed ventral side down). The shape of the utilized area was recorded as straight, concave, convex, beaked, pointed, or wavy. Finally, a note was made as to whether the utilized edge was complete or fragmentary, and the length of the edge was measured to the nearest millimeter.

Core types are based on the direction(s) of flake removal. Irregular or multidirectional cores have flakes removed in three or more directions; unidirectional cores have flakes removed in one direction; and bidirectional cores have flakes removed in two opposing directions.

Massive impact tools consist of unifacial and bifacial choppers, pecking stones, and hammerstones. Choppers have long, acute impact surfaces. Hammerstones have rounded impact surfaces. Pecking stones have sharp, projecting impact surfaces, presumably used to sharpen or "dress" the grinding surfaces of metates. Recorded variables for these artifacts are the number of impacted areas and edge shape (straight, rounded, concave, convex, wavy, or pointed).

Ground stone artifacts include manos and metates. Manos can be one-hand, two-hand, or unknown fragmentary forms. Metates consist of basin-shaped, slab, or unknown fragmentary forms. The type of grinding surface—rotary, parallel, or perpendicular striations—was recorded.

Other Attributes

Other attributes recorded were condition, cortex, platform type, size, and tool edge angle. Condition is the portion of a flake or tool represented by an artifact. The variables for this attribute are complete, proximal, medial, distal, lateral, or unknown fragment.

Cortex information was coded for all flake debitage, cores, tools, and angular debris. The amount present was recorded in 10% intervals (1–10%, 11–20%, etc.), with absence recorded as 0%. On flakes and flake tools, these percentages reflect only dorsal cortex; for angular debris, bifacial tools, cores, and choppers, they indicate total cortex on all surfaces.

Eight types of striking platform types were distinguished during the analysis. These categories are cortical, single-facet (with one planar surface), multifacet (with two or more flake scars wider than 1 mm), retouched (with two or more flake scars less than 1 mm wide), stepped, ground, retouched and ground (in combination), and collapsed. Cortical and single-facet platforms are generally unprepared striking surfaces. Stepped, ground, retouched, and retouched and ground platforms generally indicate preparation of the striking platform prior to flake removal. Multifacet platforms may indicate platform preparation, but they are also produced incidentally during the later stages of core reduction.

Length, width, and thickness were measured to the nearest millimeter on complete flakes and tools. Thickness and maximum dimension were recorded for all flake fragments. Also measured were the grinding surfaces of ground stone and

striking platform size, when present on debitage. This latter measurement has proven useful for discerning lithic reduction technology (Elyea 1998).

The angles of utilized edges were recorded to the nearest degree. The median angle of three measurements taken along each utilized edge was documented for each tool. Cutting tools have an acute use edge of less than 54°.

ANALYSIS RESULTS

As noted above, the testing and excavation programs at LA 110299 recovered a total of 197 lithic artifacts. Most of the artifacts are pieces of debitage (81.2%) but the assemblage also includes 19 tools, 11 ground stone, and 3 cores (Table 1). Each of the primary artifact categories and their spatial relationship to the features are discussed below. This discussion is followed by a comparison of LA 110299 with other proto-historic sites in the San Juan Basin.

Material Types

The Animas region is characterized by tertiary age Nacimiento and San Jose formations. Locally available resources include outcrops of shale, sandstone, and quartzitic sandstone or ortho-quartzite. Quartzite, chert, chalcedony, and petrified wood are available in weakly cemented conglomerates, and as float or lag gravels, but the petrified wood is typically grainy, not siliceous. Also, the Animas River provides a variety of igneous, metamorphic, and sedimentary materials, including andesite, diorite, quartzite, sandstone, and siltstone. Assemblages from this area generally reflect reliance on local materials. Silicified wood is nonlocal, and obsidian is an exotic coming primarily from the Jemez Mountains (Kearns 1996).

Table 1. Lithic Artifacts from LA 110299

Artifact Type	N	%
Angular debris	2	1.0
Flake	119	60.4
Flake - bifacial thinning	2	1.0
Flake - sharpening	39	19.8
Flake - from hammerstone	2	1.0
Core - irregular	2	1.0
Core - unidirectional	1	0.5
Hammerstone	3	1.5
Pecking stone	1	0.5
Bifacial chopper	2	1.0
Retouched flake	5	2.5
Projectile point	1	0.5
Biface	2	1.0
Scraper	3	1.5
Scraper-plane	1	0.5
Adze	1	0.5
Mano - unknown	1	0.5
One-hand mano	3	1.5
Metate - unknown	4	2.0
Slab metate	1	0.5
Mano/metate combination	1	0.5
Other ground stone	1	0.5
Total	197	

Fourteen general raw material types were identified within the LA 110299 lithic assemblage, with finer distinctions being made on the basis of color, inclusions, or grain size (Table 2). The majority of the material types are consistent with the known resources of the area. Cherts (30.5%), quartzites (28.9%), and chalcedonies (21.8%) dominate the assemblage, and with the exception of silicified wood and

Table 2. Raw Material Types from LA 110299

Material Type	N	%
Chalcedony, black inclusions	4	2.0
Chalcedony, red inclusions	1	0.5
Chalcedony, clear	16	8.1
Chalcedony, opaque	6	3.0
Chalcedony, other	16	8.1
Silicified wood	6	3.0
Quartzite, fine grained	43	21.8
Quartzite, medium/coarse	14	7.1
Quartzitic sandstone	1	0.5
Chert, brown	7	3.6
Chert, tan	13	6.6
Chert, gray	14	7.1
Chert, black	2	1.0
Chert, red	9	4.6
Chert, pink	2	1.0
Chert, green	1	0.5
Chert, white	11	5.6
Chert, other	1	0.5
Obsidian	3	1.5
Andesite	1	0.5
Basalt	10	5.1
Rhyolite, fine grained	1	0.5
Rhyolite, coarse grained	2	1.0
Granite	2	1.0
Limestone	2	1.0
Siltstone	1	0.5
Sandstone	7	3.6
Altered sedimentary	1	0.5
Total	197	

obsidian, all of the raw materials appear to be from locally available resources. The obsidian was tentatively identified as Jemez based on visual attributes, and the origin of the silicified wood is unknown. These nonlocal materials, especially the obsidian, suggest that the occupants of the site may have maintained some form of exchange or procurement with areas to the south and east.

Cortex

Most of the assemblage (74.1%) lacked dorsal cortex (Table 3). Only 8.1% of the artifacts had greater than 80% cortex; most of these artifacts were the larger, massive impact tools and the cores. Expedient tools, formal tools, and most of the debitage exhibited little or no cortex, which suggests that the primary decortication of nodules being worked at the site had been done at another location.

Table 3. Percentages of Cortex

Percentage of Cortex	N	%
N/A	11	5.6
None	146	74.1
1-10%	6	3.0
11-20%	4	2.0
31-40%	6	3.0
41-50%	1	0.5
51-60%	2	1.0
61-70%	3	1.5
71-80%	2	1.0
81-90%	12	6.1
91-100%	4	2.0
Total	197	

ARTIFACT DESCRIPTIONS

Debitage

More than 83% of the assemblage is lithic detritus from core reduction and tool manufacturing or

Table 4. Debitage by Material Type

Material Type	Angular debris	Flake	Bifacial Thinning	Sharpening Flake	Hammer-stone Flake	Total
Chalcedony, red incl.		1				1
Chalcedony, black incl.	1	3				4
Chalcedony, clear		5	2	7		14
Chalcedony, opaque		5		1		6
Chalcedony, other		6		9		15
Silicified wood		2		1		3
Quartzite, fine grain		31		6		37
Quartzite, med/coarse grain		7				7
Quartzitic sandstone					1	1
Chert, brown		4		3		7
Chert, tan		10		2		12
Chert, gray		10		3		13
Chert, black		1				1
Chert, red		8		1		9
Chert, pink		1		1		1
Chert, green					1	1
Chert, white		6		4		10
Chert, other		1				1
Obsidian		2		1		3
Andesite		1				1
Basalt	1	9				10
Rhyolite, coarse grain		1				1
Granite		1				1
Limestone		1				1
Siltstone		1				1
Sandstone		1				1
Altered sedimentary		1				1
Total	2	119	2	39	2	164

refurbishing activities. Cherts, quartzite, and chalcedonies are the predominant raw materials followed by lesser quantities of volcanics (Table 4). More than 84% of the flakes lack dorsal cortex; the median flake thickness is 2.0 mm; and the ratio of thin ($\leq$ 5 mm) to thick ($\geq$ 6 mm) is 3.5:1. Of the 119 flakes with platforms, 23.9% exhibit single-facet platforms, 19.3% have collapsed platforms, 3.6% have multifacet platforms, and 9.1% have platforms exhibiting some form of preparation. These debitage attributes suggest an overall emphasis on bifacial reduction and tool manufacture.

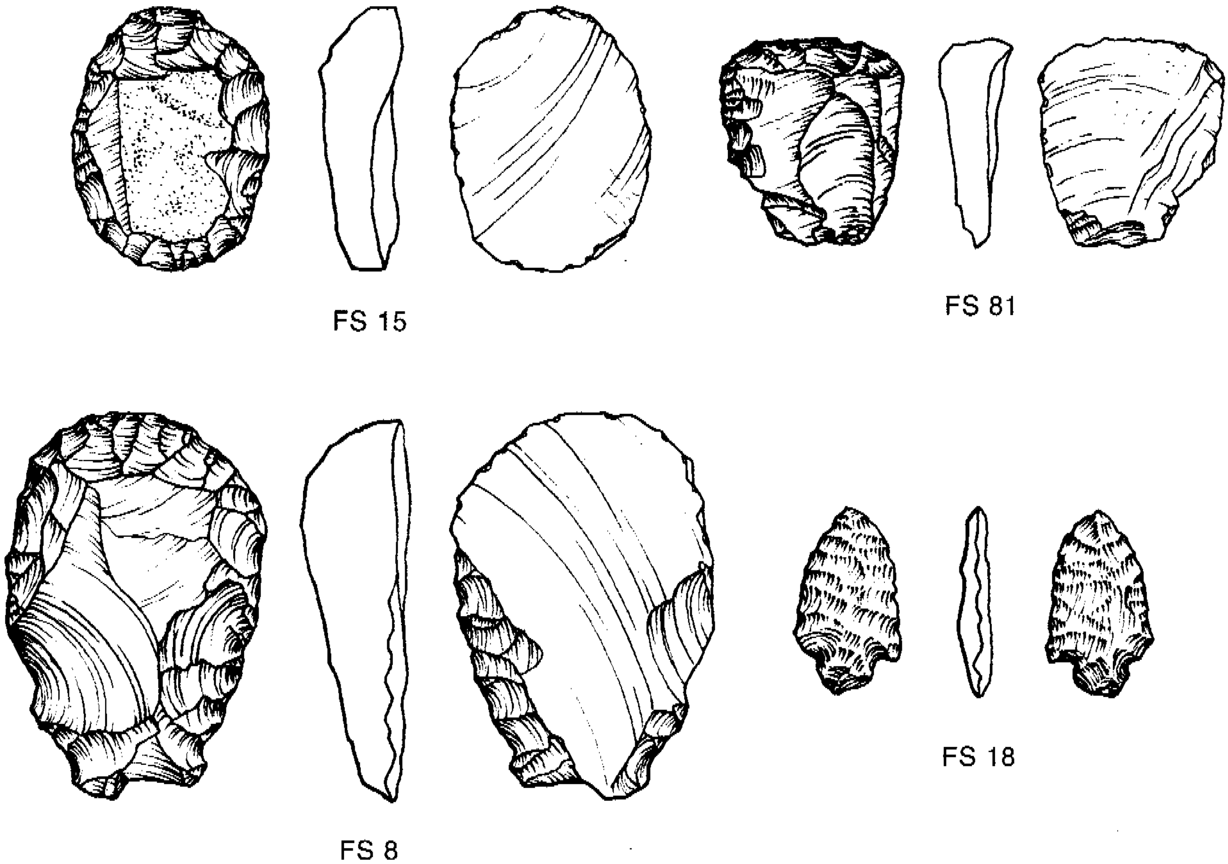


Figure 12. Scrapers and a point from LA 110299.

Formal and Expedient Tools

Eleven formal and expedient flaked tools were found at LA 110299. These tools consist of five retouched flakes, three scrapers, two bifaces, and one projectile point. Three items came from the surface, one from the structure fill, and the remainder came from the surface stripping of Stratum 1.

Projectile Point

One corner-notched arrowpoint (Figure 12, FS 18) was found in Stratum 1, approximately 60 cm southwest of the structure. Made from a fine-grained brown quartzite, the point measures 24 mm long and 3 mm thick. One of the small tangs is broken, as well as either side of the base, making typological assignment difficult. The edges are convex, and there is slight grinding on either side of the tip.

Flake Scrapers

Three flake end/sidescrapers were recovered—one from the testing program and two from the data recovery program. Made from flakes, these tools exhibit retouching on three or four sides, with two having steeply retouched distal ends and the third having a steeply retouched proximal end. This

style of tool seems to be a common artifact at early Navajo sites (Brown et al. 1991; Elyea 1992)

The one collected during the testing phase was found on the surface near Feature 3 (Figure 12, FS 81). It is made of black chert and measures 27 mm long, 24 mm wide, and 8 mm thick near the working edge. The proximal end is steeply retouched and, with the curving of the ventral side, the edge is even more abrupt. This edge has an angle of about 78° and exhibits slight crushing and rounding from use. The distal end tapers in both width and thickness, making the tool easy to handle between the thumb and first finger. One lateral edge also has unifacial retouching and slight rounding from use. This edge is thinner than the proximal edge and convex in plan.

The second scraper (Figure 12, FS 15) came from the surface stripping along the northern edge of the structure. It is made from white chert, oval, and measures 34 mm long, 26 mm wide, and 8 mm thick. All four edges are unifacially flaked on the dorsal side, with the steepest edge on the distal end. This edge has an angle of 93° followed by the proximal end with an angle of 74°. The edge angle of the right side is 40° and that of the left side is 25°. Small step fractures are evident along all four edges but are greater on the steeper distal and proximal edges; no rounding is present. The step fractures suggest the scraping of hard substances such as wood, an activity that is also borne out by the steep angles of the two edges.

The third scraper, recovered from the structure fill, is a teardrop shape manufactured from a large chalcedony flake (Figure 12, FS 8). It measures 52 mm long with widths ranging between 32 mm on the distal end and 19 mm at the proximal end. The thickness ranges from 13 mm on the distal end to 7 mm on the proximal end. Unifacial flaking is found on the dorsal side of the distal end and approximately half way up the two lateral edges. The remaining edges are bifacially flaked to the platform. Convex in shape, the distal end has a mean edge angle of 67°. Numerous step fractures are present around this edge, suggesting the scraping of a hard surface. No rounding is evident, however. The two bifacially flaked lateral edges have angles of 16° and 15°, which suggest cutting activities. Slight nibbling is evident along these edges, but no rounding.

Secondary use as a possible spokeshave is suggested by the removal of two large flakes on the ventral side of the left edge (viewed from the ventral side). The removal of these flakes has created two concave notches, both of which exhibit use-wear, suggesting it was probably used to shape and smooth a rounded piece of wood.

Bifaces

Bifaces exhibit retouch extending over one-third or more of the dorsal and ventral surfaces. Two biface fragments were found in Stratum 1 about 2 m north of Feature 3. Both are proximal fragments.

The first biface is made from quartzite and appears to be the tip of a finished tool or projectile point. Biconvex in shape, it is 5 mm thick and has a mean edge angle of 21°. The fragment has a snap fracture near the base, which, when combined with the lack of use-wear, suggests it was broken during the final stages of manufacture.

The second biface is of silicified wood and is in the first stage of manufacture. The thickness ranges from 9 mm at the proximal end to 3 mm at the broken distal end. This item appears to have been discarded during manufacture, possibly because the proximal end could not be thinned adequately.

Retouched Flakes

Five retouched flakes were recovered—two from the surface and three from Stratum 1. Four came from the activity area west of the structure and one was found about 2 m southeast of Feature 2.

All are flake fragments with small (<2 mm) flakes removed along a lateral edge—three on the dorsal side and two on the ventral side. These latter two items fit together and are made from chalcedony. Two of the other three are manufactured from silicified wood and the third is a gray chert.

The edge shapes consist of two straight (chalcedony fragments), two convex, and one wavy denticulate. Edge length ranges between 13.1 mm and 41.6 mm. All edges exhibit some form of use-wear. The edge angles range between 20° and 35°, which suggest cutting activities.

Massive Impact Tools

Six items were placed in this tool category. These artifacts consist of three hammerstones, two bifacial choppers, and one pecking stone.

Hammerstones

Tools exhibiting edge battering were classified as hammerstones. Battering use-wear consists of deep, irregular flake scars, multiple step fractures, or minute cones of percussion on a dull or rounded edge of a surface (Hogan 1998).

Three hammerstones were recovered, two on the east-southeast side of the structure and one about 2 m northwest of the structure. All three are medium- to coarse-grained quartzite cobbles with an average length of 88 mm and an average thickness of 42 mm. The battering on the edges of these three tools consisted of minute cones of percussion completely around one surface.

Bifacial Choppers

This category of retouched tool consists of very large flakes or small cobbles modified for use as hand axes. Two bifacial choppers were collected—one from the surface in the extreme southeastern edge of the site and the second from Stratum 1 about 4 m south-southeast of the structure. They are made from fine-grained rhyolite and tan chert, respectively, and average 79 mm long, 53 mm wide, and 29 mm thick. Portions of the lateral edges have been unifacially retouched to form an irregular, convex edge with an average angle of 54°.

Both choppers have use edges exhibiting impact scars and step fractures suggesting heavy use on hard materials. They were most likely used for cutting wood or in butchering activities, such as breaking bones.

Pecking Stones

Pecking stones are angular rocks or cores with step fractures and impact use-wear on the sharp edges. These tools were used to sharpen or roughen the grinding surface of milling stones. One complete pecking stone was found in Stratum 1 northwest of the structure. Made from quartzite, it measures 95 mm long, 80 mm wide, and 59 mm thick. Use is present around three edges on one end.

Other Tools

The two items in this category are adzes or scraper planes. These artifacts are large expedient tools made from blocky nodules or cobbles with at least one broad, flat surface. They are formed by removing a series of unidirectional flakes along the edge of the flat surface using one margin of this surface as a striking platform. The flaking produces a convex or straight edge with acute angles.

The first adze was collected from the surface of Test Pit 2 during the testing program. This test pit was placed just to the north of Feature 3, which is well within the western activity area. It is a split quartzitic sandstone cobble measuring 176 mm long, 101 mm wide, and 53 mm thick. Plano-convex in shape, both sides are sharp and steep with edge angles about 70°. One of the lateral edges and the distal end exhibit battering and retouch. The dorsal side of the retouched lateral

edge shows heavy polish and smoothing. Small step fractures are present along this edge suggesting use against a hard surface.

The second adze/scraper plane came from Stratum 1 about 1.5 m northwest of Feature 3. This item is a large flake from a quartzite cobble measuring 83 mm long, 67 mm wide, and 50 mm thick. Retouching is present along the straight lateral edge and the distal end. Some polishing is evident along the dorsal side of the lateral edge. Small step fractures are present along the retouched edges, as well as some bidirectional flaking on the lateral edge. The distal end has an edge angle of 79° and the lateral edge has an edge angle of 74°. Both angles are indicative of scraping activities; the step fractures suggest use against a hard surface.

Ground Stone

Ground stone constitutes 5.6% of the lithic artifacts. The assemblage consists of three one-hand manos, one unknown mano fragment, four unknown metate fragments, one slab metate fragment, one mano/metate combination, and one unidentified ground stone fragment. Sandstone is the most common raw material ($n = 6$) followed by quartzite ($n = 5$) and granite ($n = 1$); all are locally available materials. Six of the ground stone pieces were burned.

Two fragments came from the surface, eight from Stratum 1, and one, the combination mano/metate, was found upright in the fill of Feature 3. Four ground stone were found to the southwest of the structure and the remainder came from the activity area west of the structure.

Cores

Three cores were recovered, all from Stratum 1 in the activity area west of the structure. Two were classified as irregular and one was unidirectional. All three are small nodules or cobbles averaging 58 mm long, 49 mm wide, and 32 mm thick. The material types consist of rhyolite, quartzite, and limestone. The rhyolite core exhibits secondary use as a pounding instrument.

INTRASITE PATTERNING

Prior to the start of the data recovery program, it was initially thought that, given the slope and the small drainage rill bisecting the artifact concentration, the spatial integrity of the artifacts might have been compromised. The discovery of the extramural activity area within the concentration and west of the stain, however, suggests that the artifacts were primarily in place, though some slight movement probably has occurred. The distributions of the various artifacts and certain attributes were examined to see if there was any patterning, which might determine the location of different activities.

Material Types

The quantity of each material type was plotted within the grid system to ascertain possible reduction and/or manufacturing areas. Most of the material types, with the exception of quartzite and two of the chalcedonies, were found primarily west of the 104 E line with no clear patterning. More than half (57%) of the quartzite was concentrated west of the structure in the activity area. Two quartzite formal tools—a biface and the projectile point—were also found in this area, suggesting a possible manufacturing locus.

Most of the clear (57%, $n = 14$) and other (87%, $n = 15$) chalcedony flakes were recovered from the structure fill. The greatest concentration of these two materials was in the southeastern quadrant and could mark an internal activity area.

Table 5. Distribution of Debitage by Stratum and Feature

Debitage Type	Surface	Stratum 1	Stratum 2	Structure (Feature 1)	Features 2, 3, and 4
Angular debris	—	2	—	—	—
Flake	5	92	1	18	3
Bifacial thinning flake	1	1	—	—	—
Sharpening flake	—	—	—	38	1
Flake from hammerstone	—	2	—	—	—
Total	6	97	1	56	4

Debitage

Debitage was recovered from all strata and features (Table 5). Most of it came from Stratum 1 (60%) followed by the structure fill (34.6%). More than 77% of the Stratum 1 debitage was found west of the structure, whereas almost half (47%) of that found in the structure came from the southern half. There is a significant difference in the proportion of flakes lacking dorsal cortex ($Z = -3.233456$, $p = 0.00122$) recovered from Stratum 1 and from the structure (Table 6). There is no significant difference ($Z = 0.157389$, $p = 0.87939$), however, in the proportion of flakes exhibiting prepared platforms from these two areas (Table 7).

The size of the flakes in Stratum 1 and the structure (Tables 8–11) also showed significant differences in thickness for all flakes and length, width, and thickness for complete flakes (Table 12). The flakes recovered from the structure were smaller and thinner than those found in Stratum 1, suggesting that final stage manufacturing or refurbishment probably occurred in the structure.

Tools

Formal and informal tools—projectile points, bifaces, scrapers, and retouched flakes—were found primarily west and southwest of the structure (Figure 13). One scraper was recovered from Stratum 1 above the southwest quadrant of the structure and another scraper came from Stratum 1 just north of the structure. One of the retouched flakes was found about 2 m southeast of the structure. Thus it would appear that most of the cutting and scraping activities occurred in the extramural area west of the structure.

Massive impact tools were recovered from around, but not in, the structure. Two of the hammerstones came from east of the structure and the third was found northwest of the structure. The pecking stone came from just north of the structure, while the two choppers were found to the south-southeast and on the extreme southeast edge of the site, well away from the structure and activity area. Only the two woodworking tools—adze/scraper planes—were found within the western activity area.

The ground stone came primarily from two areas—west of the structure (64%) and southeast of the structure (36%). Of the seven found to the west, five were clustered near the extramural hearth. The four on the southeastern side were within 1 m of the possible second external hearth, suggesting that this may have indeed been a cultural feature.

Table 6. Distribution of Flake* Cortex by Stratum and Feature

	% of Cortex																Total	
	None		1–10		11–20		31–40		51–60		71–80		81–90		91–100			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Surface	2	33.3	—	—	1	16.7	1	16.7	—	—	1	16.7	—	—	1	16.7	6	3.8
Stratum 1	74	79.6	4	4.3	1	1.1	5	5.4	1	1.1	—	—	6	6.5	2	2.2	93	58.1
Stratum 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	100	1	0.6
Feature 1	55	98.2	—	—	—	—	—	—	1	1.8	—	—	—	—	—	—	56	35.0
Feature 2	1	100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	0.6
Feature 3	2	100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	0.6
Feature 4	1	100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	0.6
Total	135	84.0	4	2.5	2	1.3	6	3.8	2	1.3	1	0.6	6	3.8	4	2.5	160	100

Table 7. Distribution of Flake* Platform Types by Stratum and Feature

Platform Type	Surface	Stratum 1	Stratum 2	Structure (Feature 1)	Features 2, 3, and 4	Total
None	—	23	—	21	2	46
Collapsed	1	23	—	14	—	38
Cortical	—	7	1	—	—	8
Single facet	4	25	—	15	1	45
Multifacet	—	4	—	1	1	6
Retouched	—	1	—	1	—	2
Stepped	—	1	—	3	—	4
Ground	—	7	—	1	—	8
Battered	1	2	—	—	—	3
Total	6	93	1	56	4	160

* excluding flakes from hammerstones

Table 8. Thickness for All Flakes*

Provenience	N	Minimum	Maximum	Mean	Median	N ≤ 5 mm	N ≥ 6 mm	% Thin	% Thick
Surface	6	2	36	10.5	6.5	2	4	33.3	66.7
Stratum 1	95	1	36	4.5	2.0	68	27	71.6	28.4
Stratum 2	1	12	12	12.0	12.0	0	1	0.0	100.0
Feature 1	56	1	10	2.2	2.0	52	4	92.9	7.1
Feature 2	1	2	2	2.0	2.0	1	0	100.0	0.0
Feature 3	2	1	3	2.0	2.0	2	0	100.0	0.0
Feature 4	1	1	1	1.0	1.0	1	0	100.0	0.0
Total	162					126	36		

Table 9. Thickness for Complete Flakes*

Provenience	N	Minimum	Maximum	Mean	Median	N ≤ 5 mm	N ≥ 6 mm	% Thin	% Thick
Surface	4	4	36	13.8	7.5	1	3	25.0	75.0
Stratum 1	46	1	36	5.1	2.5	31	15	67.4	32.6
Stratum 2	1	12	12	12.0	12.0	0	1	0.0	100.0
Feature 1	29	1	10	2.3	2.0	27	2	93.1	6.9
Feature 3	2	1	3	2.0	2.0	2	0	100.0	0.0
Total	82					61	21		

* excluding flakes from hammerstones

Table 10. Length for Complete Flakes*

Provenience	N	Minimum	Maximum	Mean	Median
Surface	4	32	78	48.5	42.0
Stratum 1	46	5	65	20.4	14.5
Stratum 2	1	75	75	75.0	75.0
Feature 1	29	5	49	11.9	8.0
Feature 3	2	8	13	10.5	10.5
Total	82				

Table 11. Width for Complete Flakes*

Provenience	N	Minimum	Maximum	Mean	Median
Surface	4	24	70	39.3	31.5
Stratum 1	46	4	82	16.7	12.5
Stratum 2	1	60	60	60.0	60.0
Feature 1	29	3	40	10.0	7.0
Feature 3	2	6	14	10.0	10.0
Total	82				

Table 12. Comparisons of Flake Size Measurements between Stratum 1 and the Structure

Measurement	t	p	df
Thickness for all flakes	3.170993	0.0018	149
Length for complete flakes	3.398973	0.0011	73
Width for complete flakes	2.210577	0.0302	73
Thickness for complete flakes	2.387104	0.0196	73

* excluding flakes from hammerstones

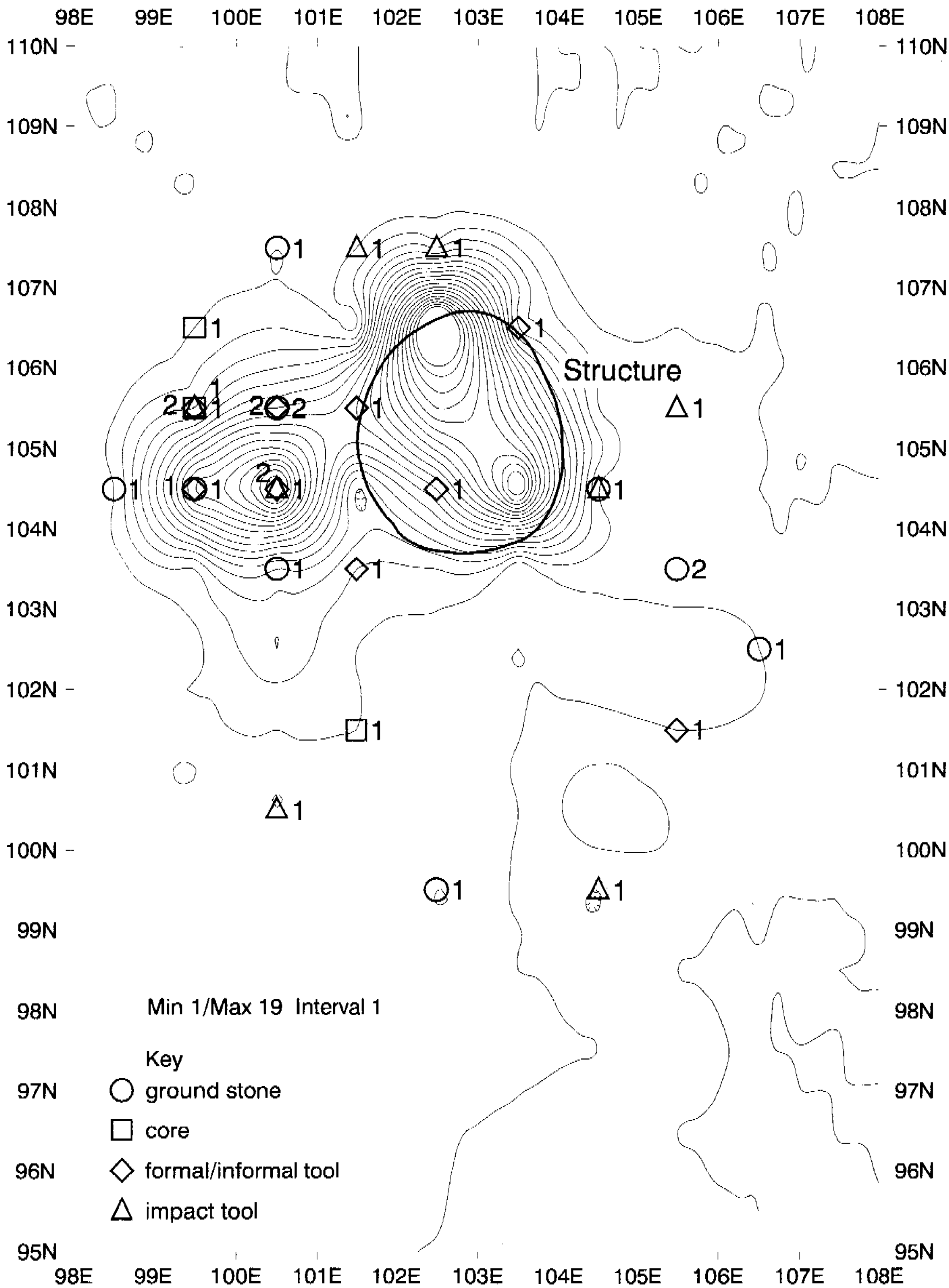


Figure 13. Spatial distribution of debitage and tools.

Table 13. Local vs Nonlocal Material Types on Dinetah Phase Sites/Components

Project	Site (LA) No.	Local* N	Local* %	Nonlocal N	Nonlocal %	Total Assemblage
US 550	110299	188	95.4	9	4.6	197
Arkansas Loop	80316	19	90.4	2	9.5	21
	80318	30	78.9	8	21.1	38
	80319	430	93.8	28	6.2	458
	80911	18	72.0	7	28.0	25
	81169	2	66.6	1	33.3	3
	81173	9	100.0	0	0.0	9
Bolack	16151	801	97.3	22	2.7	823
Cortex CO_2	38946	694	96.3	27	3.7	721
La Plata Mine	59954	41	100.0	0	0.0	41
	61828	84	84.8	15	15.2	99
	61838	107	99.1	1	0.9	108
	61848	242	97.6	6	2.4	248
	61852	254	97.7	9	2.3	263
	61882	83	100.0	0	0.0	83

* For the La Plata Mine sites, the local materials consist of those material types present in the project area and raw materials that are available in the general vicinity; non-local materials are exotic materials.

COMPARISON WITH OTHER EARLY NAVAJO ASSEMBLAGES

Time did not allow for any detailed comparisons with other early Navajo assemblages in the San Juan Basin. A few brief statements can be made, however, regarding types of raw materials found on the early sites and the composition of the lithic assemblages. The 13 sites/components examined were from the following projects: Bolack Land Exchange (Hogan 1992), Cortez CO_2 Pipeline (Marshall 1985), Arkansas Loop (Honeycutt and Fetterman 1994), and La Plata Mine (Brown 1991). Only the Arkansas Loop Project was located in the immediate vicinity of LA 110299, on the east side of the Animas River. The other three projects were closer to the Farmington area, north (La Plata Mine) and south (Bolack Land Exchange, Cortez CO_2) of the San Juan River. Nine of the sites/components are short-term, seasonal habitations containing 1–4 structures and associated activity areas; the remaining four are activity areas or camps consisting of thermal pits, artifact scatters, and/or fire-cracked rock scatters/concentrations. All date from the late fifteenth/early sixteenth to seventeenth centuries.

Material Types

The lithic assemblages found on these sites are dominated by locally available raw materials (Table 13). These materials consist of quartzite

Table 14. Predominant Raw Materials Found on Dinetah Phase Sites/Components in the San Juan Basin

		Chert		Quartzite		Chalcedony		Silicified Wood		Obsidian		Other*	
Project	Site No.	N	%	N	%	N	%	N	%	N	%	N	%
US 550	LA 110299	60	30.5	57	28.9	43	21.8	6	3.0	3	1.5	—	—
Cortez CO_2	LA 38946	72	10.0	326	45.2	66	9.2	243	33.7	7	1.0	—	—
Bolack	LA 16151	244	29.6	216	26.2	—	—	255	31.0	22	2.7	—	—
Arkansas Loop	LA 80316	3	14.2	12	57.1	1	4.0	—	—	2	9.5	—	—
	LA 80318	17	44.7	6	15.8	—	—	1	2.6	7	18.4	—	—
	LA 80319	300	65.5	72	15.7	27	5.9	23	5.0	28	6.1	—	—
	LA 80911	4	16.0	6	24.0	1	4.0	1	4.0	7	28.0	—	—
	LA 81169	1	33.3	1	33.3	—	—	—	—	1	33.3	—	—
	LA 81173	2	22.2	3	33.3	1	11.1	2	22.2	—	—	—	—
LA Plata Mine	LA 59954	5	12.2	6	14.6	—	—	6	14.6	—	—	23	56.1
	LA 61828	9	9.1	30	30.3	—	—	27	27.3	15	15.2	16	16.2
	LA 61838	12	11.1	34	31.5	—	—	44	40.7	1	0.9	14	12.9
	LA 61848	37	14.9	98	39.5	—	—	80	32.3	6	2.4	19	7.7
	LA 61852	17	6.5	25	9.5	1	0.4	187	71.1	9	3.4	8	3.0
	LA 61882	1	1.3	14	17.5	—	—	45	56.3	—	—	8	10.0

*Metamorphic and siltstone (LA Plata Mine assemblages only)

and chert for LA 110299 and the Arkansas Loop sites, silicified wood and quartzite for LA 38946 (Cortez CO_2) and LA 16151 (Bolack Land Exchange), and silicified wood, quartzite, and metamorphic/siltstone for the La Plata Mine sites (Table 14).

The primary nonlocal or exotic raw material for all of the sites is obsidian. Most of the obsidian came from the Jemez Mountains, although some of the obsidian found on the Arkansas Loop sites came from Government Mountain in Arizona.

Assemblage Composition

In her comparison of early Navajo sites, Elyea (1992) found an emphasis on bifacial reduction and formal tool manufacture at sites dating to the Dinetah phase. Evidence for this technology is found in the number of flakes exhibiting prepared platforms, the presence of bifacial and sharpening flakes, and the number of formal tools. These attributes, then, form the basis for comparing the 13 sites/components in this discussion.

Data for prepared platforms are available for only three sites—LA 110299, LA 16151, and LA 38946 (Table 15). Difference of proportion tests comparing LA 110299 with these sites showed no significant differences in the number of prepared platforms versus total platforms (Table 16).

Bifacial and sharpening flakes were present in 11 of the 13 assemblages, although for LA 80319 the number of these flakes was not an actual count (Honeycutt and Fetterman 1994:11–29). Difference of proportion tests comparing LA 110299 with the eight sites having comparable data showed significant differences in only three of the sites—LA 16151, LA 38946, and LA 61852 (Table 16).

Formal tools were also found in 11 of the 13 assemblages. Difference of proportions tests comparing the LA 110299 formal tool assemblage with sites having comparable data (Table 16) indicated significant differences with only one site—LA 61852, where formal tools constituted more than 60% of the tool assemblage.

Overall, the lithic assemblage from LA 110299 is quite similar to other Dinetah phase sites/components in the area. Although platform data is lacking for 10 of the sites, the presence of bifacial and sharpening flakes and formal tools on the majority of sites supports the inference of bifacial reduction and tool manufacturing as being a primary activity during the Dinetah phase.

SUMMARY

Though a small assemblage, the artifact types and tool classes recovered during the testing and excavation programs suggest a variety of activities occurred at the site. First and foremost is bifacial reduction and tool manufacture as evidenced by the prepared platforms, bifacial and sharpening flakes, and formal tools. These activities were centered primarily in the structure and in the western activity area. Cutting and scraping activities, suggested by the formal and expedient tools and the adze/scraper planes, also occurred, predominantly in the western activity area. Plant processing activities were evident predominantly around the two exterior hearths. No evidence of cutting, scraping, or grinding was found in the structure.

The LA 110299 assemblage is quite similar to other Dinetah phase sites in the area both in the predominant use of local materials and a lithic technology emphasizing bifacial reduction and tool manufacture. This type of technology suggests that hunting and gathering played an important part in the subsistence strategies of the site's occupants.

Table 15. Assemblage Characteristics on Dinetah Sites/Components

	US 550	Bolack	Cortez CO_2	Arkansas Loop*				La Plata Mine*					
	110299	16151	38946	80316	80318	80319	80911	59954	61828	61838	61848	61852	61882
Prepared Platforms	15	45	56										
Total Platforms	119	344	297										
Bifacial and Sharpening Flakes	41	47	53	3	1	**178	0	0	21	14	61	80	16
Total Flakes†	160	665	527	13	26	328	17	36	85	101	229	252	70
Formal Tools	6	18	28	1	0	6	0	5	5	3	13	38	5
Total Tools‡	19	71	60	1	4	22	5	20	17	14	22	63	7
Total Assemblage	197	823	721	21	38	458	25	41	99	108	248	263	83

* no platform data available for Arkansas Loop and La Plata Mine assemblages
** thought to be bifacial thinning flakes but not coded as such
† excluding flakes from hammerstones
‡ excluding ground stone

Table 16. Comparison of LA 110299 with Other Dinetah Phase Sites/Components

Characteristics	Bolack	Cortez CO_2		Arkansas Loop				La Plata Mine				
Z p s.d.	16151	38946	80316	80318	80319	80911	59954	61828	61838	61848	61852	61882
Prepared platforms to total platforms	-.1333656 0.89390 0.03572	-1.53127 0.12570 0.04082	—	—	—	—	—	—	—	—	—	—
Bifacial and sharpening flakes to total flakes	6.827131 0.0000 0.02718	5.018654 0.0000 0.03102	0.202883 0.83923 0.12559	—	—	—	—	0.157508 0.87485 0.05835	2.269691 0.02323 0.05183	-0.223424 0.82321 0.04532	-1.329519 0.18368 0.04604	0.447359 0.65462 0.06187
Formal tools to total tools (excluding ground stone	0.545151 0.58565 0.11422	-1.157561 0.24704 0.13034	—	—	0.302195 0.76250 0.14250	—	0.456357 0.64813 0.14416	0.140923 0.88793 0.15378	0.647073 0.51759 0.15687	-1.761625 0.07813 0.15617	-2.201913 0.02767 0.13052	—

.05 confidence level

Chapter 6

CERAMIC ANALYSIS

The ceramic analysis centered on the questions of chronology and cultural affinity. The primary attributes used to assign ware types were temper, construction methods, color, and surface treatment.

The testing and data recovery program recovered 183 sherds from two different vessels: 158 from a Dinetah Gray vessel and the remainder from an Unknown protohistoric plainware vessel. A few sherds from each vessel were refired and x-rayed by Paul Nugent to ascertain firing temperature, clay sources, and manufacturing techniques. The results are discussed below.

VESSEL 1

The first vessel is a large Dinetah Gray jar or olla (Figure 14a). It has a flared rim and an orifice diameter of 162 mm. The wall thickness ranges between 4.78 mm and 5.3 mm. The gray surface exhibits smoothed coils with small fingernail impressions circumscribing the vessel just below the neck/shoulder juncture. This type of decoration seems to be more prevalent on early Dinetah vessels than on later ones (Mike Marshall, personnel communication, April 2000). Light striations are evident on both the exterior and interior surfaces.

The temper is sand/quartz and the paste is dark gray to black. The sooting evident on most of the fragments may be a result of the vessel having been burned in the structure rather than its use as a cooking vessel although perhaps both cooking and the structure fire are responsible.

Most of the fragments are body sherds, primarily from the area just below the shoulder. No base sherds were recovered so the shape of the base could not be ascertained.

VESSEL 2

The second vessel, assigned to an Unknown protohistoric plainware category, is a small pot with a pinched, direct (neither inverted nor everted) rim (Figure 14b). The three rim sherds are too small to estimate orifice diameter. The few conjoinable fragments indicate a small, hand-held pot with a mean wall thickness of 4.43 mm (3.14 mm to 5.72 mm).

The temper is also sand/quartz but with a finer-grained sand than that of the first vessel. The paste is dark gray to black. Surface color is red/brown, though not uniform. Both the exterior and interior surfaces exhibit shallow striations from wiping.

Most of the sherds are small, thumbnail-size body fragments. No base fragments were evident. No exterior sooting is evident, but there is a small fire cloud on the interior. This vessel may have been used to hold seeds or some other culinary item. The size of the vessel could also indicate that it was a child's pot or a ceremonial vessel (Dave Brugge, personal communication, April 2000). A

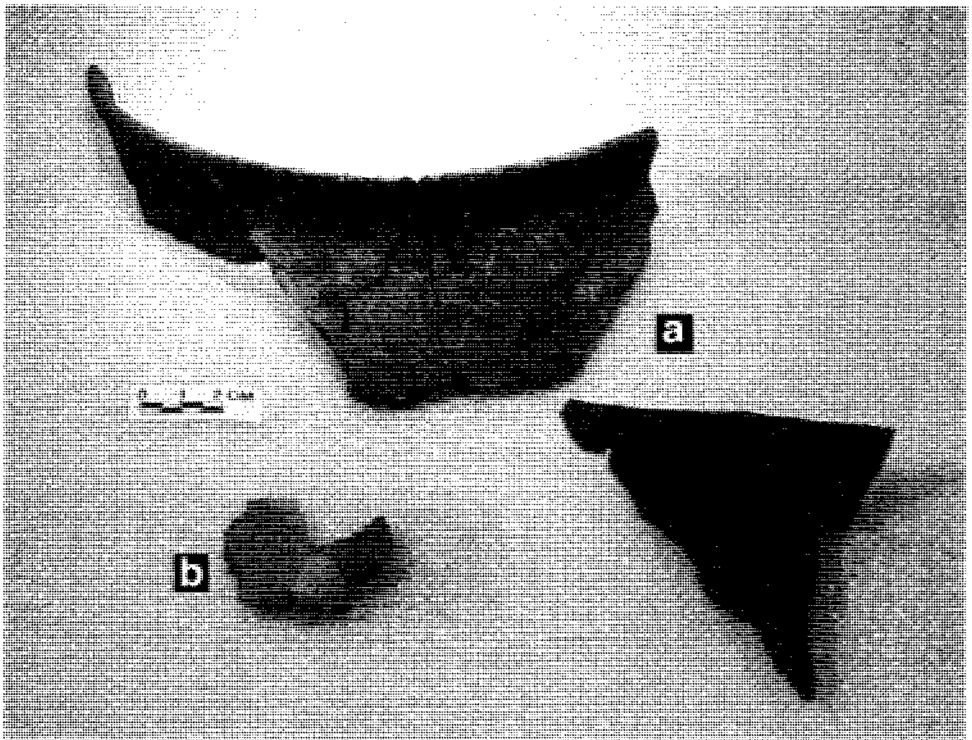


Figure 14. Partially reconstructed vessels from LA 110299: *(a)* Dinetah Gray jar, *(b)* Unknown protohistoric plainware vessel.

vessel of similar style and size was recovered at El Campo Navahu (LA 38946) (Marshall 1985).

INTRASITE DISTRIBUTION

More than 60% of the ceramics came from the structure–56.8% from the fill (Table 17). The majority of the sherds found in the structure were from Vessel 1; the majority of the fragments from Vessel 2 came from the area west of the structure. Most of the structure ceramics were concentrated in the areas of the hearth and pot rest, suggesting the activities in this portion of the structure focused around cooking. Eight sherds from Vessel 1 were also found on the floor, primarily in the vicinity of the pot rest (Figure 15). Two of the sherds were submitted for thermoluminescence dating.

Within Stratum 1, the greatest density of sherds is found along the western edge of the structure (Figure 16). If this area indeed marks the location of the door, then this concentration could represent part of a door dump.

MICROSCOPIC, X-RAY, AND REFIRING ANALYSES

Paul Nugent

To address the question of cultural affinity, the physical properties of 22 sherds (11 from each vessel) were examined using three different techniques—binocular microscope examination of fresh breaks to identify tempering materials, x-ray refraction to assess formation techniques, and graduated temperature refiring in a kiln to

Table 17. Distribution of Ceramics by Stratum

	Dinetah Gray		Unknown Protohistoric Plainware		Total	
	N	%	*N*	%	*N*	%
Surface	—	—	1	4.0	1	0.5
Stratum 1	49	31.0	20	80.0	69	37.7
Structure Fill	101	63.9	3	12.0	104	56.8
Structure Floor	8	5.1	—	—	8	4.5
Structure Hearth	—	—	1	4.0	1	0.5
Total	158		25		183	

determine original firing temperature and atmosphere.

Binocular Microscope Examination

Each sherd was cut to expose a fresh surface for examining the paste color and inclusions. Vessel 1 sherds had a slightly darker paste, ranging from very dark gray to gray (10YR3/1 to 5YR4/1). Vessel 2 sherds were also in this color range but the hues were more red and brown (7.5YR to 2.5YR).

To quantify the amounts of visible temper, a very simple, but subjective, classification system was used: (A) at least 50% aplastic inclusions, (B) less than 50% but too many inclusions to be counted individually, (C) sufficiently few inclusions to be counted individually. The Vessel 1 sherds were all assigned to category A, with more than half in the 70–80% range. The size ranged from coarse (n = 6) to coarse and fine (n = 3) to fine (n = 2). Seven of the sherds in this group had large white or opaque inclusions; the remainder had a combination of white and other materials. All the inclusions were angular (Table 18). In most of the sherds the inclusions were fairly well distributed throughout the paste, although a few exhibited a very noticeable clumping of aplastics at one end of the cut area. The reason for this clumping is unknown.

The Vessel 2 sherds contain less aplastics overall. About 50% exhibit category B and a little more than 25% fall into category C. By and large the inclusions are the same as in Vessel 1 but are either angular or rounded. The aplastic inclusions are unevenly distributed throughout the sample, although there appears to be less clumping. Some of the sherds do exhibit areas where no aplastics are visible.

X-Ray

Following the binocular examination, the samples were x-rayed to examine the particle orientation. One forming technique sometimes employed by Ute potters but not Navajo potters was paddle and anvil, which causes the clay particles to align themselves "weakly parallel" to the vessel wall. This alignment should be detectable by x-ray (Carr and Riddick 1990).

A box x-ray machine was used on the sherds at four different exposure settings. The first was at 20 kVp (peak kilo voltage) for 60 seconds. This setting resulted in an image that was completely opaque with no penetration of the sherds; only an outline of the sherds was visible. The second exposure, at 50 kVp for 60 seconds, showed the beginning of particle definition in the Vessel 1 sherds. The third exposure was at 50 kVp for 90 seconds, which showed more particles, especially in the Vessel 1 sherds. The last exposure, at 50

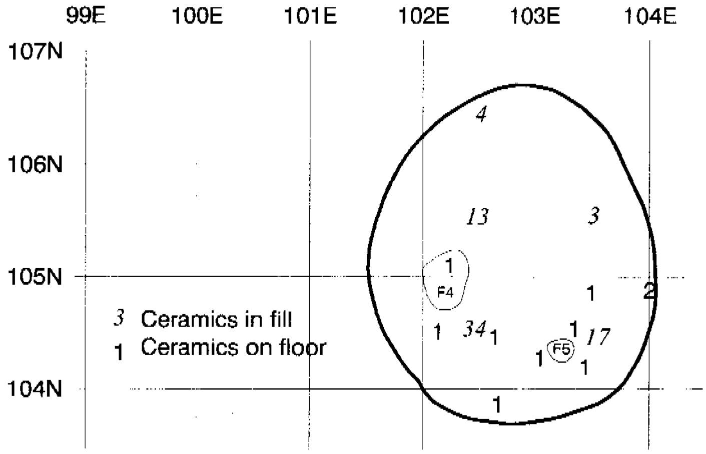


Figure 15. Distribution of ceramics in the structure.

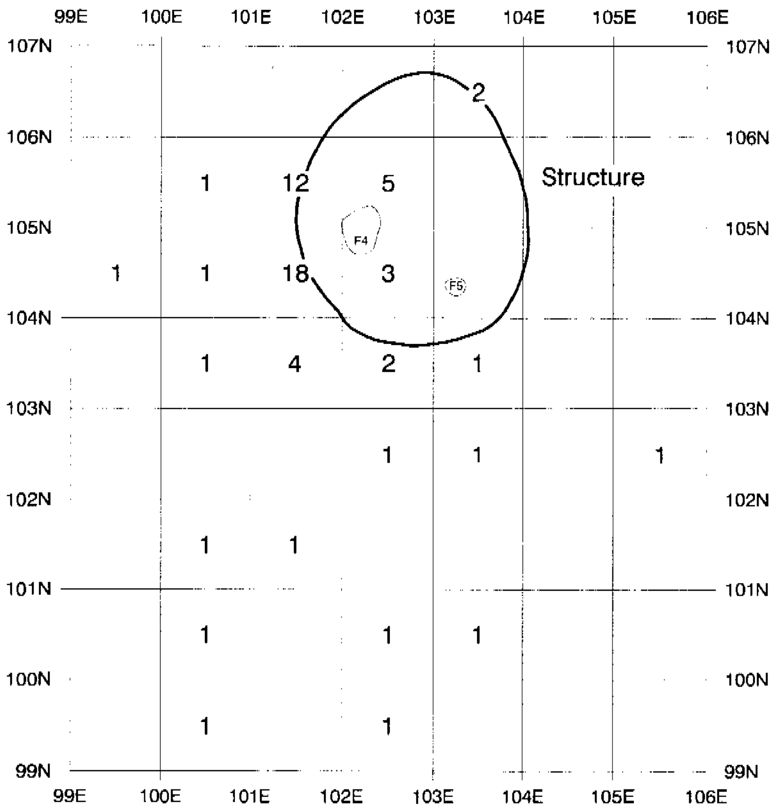


Figure 16. Distribution of ceramics in Stratum 1.

Table 18. Characterization of Nonplastic Inclusions

FS No.	Amount Category	Size	Shape	Color
Vessel 1				
64a	A	Coarse	Angular	White
64b	A	Coarse	Angular	White
64c	A	Coarse	Angular	White
64d	A	Coarse and fine	Angular	White and shiny
66a	A	Coarse and fine	Angular	White and shiny
66b	A	Coarse	Angular	White, brown, gray
68a	A	Coarse	Angular	White
68b	A	Fine	Angular	White
76	A	Fine	Angular	White, brown, shiny
19	A	Coarse	Angular	White
8	A	Coarse and fine	Angular	White
45a	B	Coarse and fine	Semi-angular	White
Vessel 2				
45b	B	Coarse and fine	Rounded	White
15a	A/B	Coarse and fine	Angular	White, brown, black
15b	C	Fine	--	--
67a	A	Coarse	Angular	White, brown, gray
67b	C	Fine	Rounded	White
36	A	Coarse	Angular	White
43	A	Coarse	Angular	White and brown
48	C	Coarse and fine	Rounded	White
28	B	Fine	Angular	White
38	B	Fine	Angular	White and black

kVp for 120 seconds, successfully penetrated all the sherds, showing both the particles and internal structure.

The x-rays did not reveal any parallel orientation of the clay particles, which suggests at least two possible explanations—(1) that the paddle and anvil technique was not used for either vessel, or (2) that the orientation of the sherds should have been perpendicular to the plate rather than flat in order to view the particle orientation. The x-rays did, however, reveal a network of internal cracks or stress fractures in the Vessel 2 sherds, which could have been caused by striking the vessel wall with a paddle. Owing to the size of the sherds, this inference is speculative.

The x-raying of the sherds did support the identification of the sherds as representing two different vessels. Vessel 1 sherds proved to be easily penetrated beginning at the 60-second exposure interval. The less dense, coarser-grained tempering materials require lower exposure intervals. The Vessel 2 sherds were not successfully penetrated until the 120-second exposure interval, which can be attributed to the denser and finer-grained tempering materials found in this sample.

Table 19. Variations in Paste Color after Refiring

FS No.	Original Color	Color after 600° C	Color after 750° C
Vessel 1			
64a	10YR 4/1	2.5YR 5/3	10R 5/6
64b	10YR 4.5/1	2.5YR 5.5/3	10R 5/6
64c	10YR 3.5/1	2.5YR 5.5/3	10R 5/6
64d	10YR 5/1	2.5YR 6/3	10R 6/6
68a	7.5YR 6/3	2.5YR 6/3	10R 6/4
68b	10YR 5.5/1	2.5YR 6/2.5	10R 5/6
66a	5YR 4/1	2.5YR 6/3	10R 5/6
66b	5YR 4/1	2.5YR 6/3	10R 6/6
76	7.5YR 4/0	2.5YR 6/3	10R 6/6
19	10YR 3/1	2.5YR 6/3	10R 5/6
8	5 YR 4.5/1	5YR 6/3	10R 5/6
45a	10YR 4/1	5YR 6/3	10R 5/6
Vessel 2			
45b	7.5YR 4/0	7.5YR 7/3.5	7.5YR 7/6
15a	10YR 4/1	5YR 6/4	7.5YR 6/6
15b	10YR 5.5/2	5YR 6/3	7.5YR 6/6
67a	7.5YR 4/2	2.5YR 3.5/6	5.5YR 5/6
67b	7.5YR 3/0	5YR 7/3	5.5YR 7/4
36	10YR 5/2	5YR 6/3	5.5YR 6/3
43	2.5YR 5/4	5YR 6/2	7.5YR 6/6
48	7.5YR 3.5/0	7.5YR 7/2	7.5YR 7/3
28	10YR 5/2	5YR 6/3	7.5YR 6/6
38	7.5YR 3/0	7.5YR 7/3	7.5YR 7/4

Refiring

All the sherds were refired in a reduced oxygen atmosphere for 15 minutes at 600° C. A Munsell color reading was taken on all the sherds prior to refiring and again after refiring (Table 19). This firing temperature produced a color change in all but two of the Vessel 2 sherds. The two sherds were refired at 650° C for another 15 minutes, which resulted in a color change. The color change indicates that the original firing temperature had been exceeded for the bulk of the sherds at 600° C; the other two reached between 600° C and 650° C. The difference in the original firing temperatures may be due to the sherds' location on the vessel, or the vessel's position within the firing pit and the possible unevenness of the original firing temperature, or they may in fact represent a third vessel.

The sherds were refired again at 750° C for 30 minutes to ensure that all the carbon was removed from the samples and to begin oxidation of the irons in the clays. At the end of 30 minutes, the samples were allowed to cool down to 450° in the oven. Once they reached that temperature, they were removed from the oven and allowed to cool in the air. A color reading was taken once again to monitor any change that may have occurred. The Vessel 1 sherds changed more consistently that

those of Vessel 2, although all the samples became lighter and brighter on the Munsell color scale (see Table 19).

Summary

The various tests and analyses indicate at least two different vessels are represented in this assemblage. A possible third vessel may be present, as suggested by the refiring experiments, but the limited number of sherds within the sample groups and variations in the original firing of the pots make this interpretation speculative.

Although both vessels were fired at a low original firing temperature of about 600° C, the various tests were able to uncover several distinctions between the two. The paste texture of Vessel 1 was a coarser, less dense sand with predominantly angular white (possibly quartz) inclusions, whereas the paste texture of Vessel 2 was a medium- to fine-grained, denser sand with small angular and/or rounded white inclusions. Both sample groups exhibited smaller amounts of other inclusions that may be organic and may have originated within the clay sources.

The x-ray analysis did not reveal any alignment of the particles that would indicate a paddle-and-anvil technique. It did, however, show that Vessel 2 contained internal cracks or stress fractures, which may or may not be attributable to the paddle-and-anvil technique. Probably the best way to assess formation technique would be through the use of an electron microscope. The x-ray analysis did verify the presence of at least two different vessels based upon the density of the paste and the amount of kVp power and exposure time needed to penetrate the sherds.

Finally, the color changes observed during the refirings indicate that two different clays, as well as two different tempering sources, were used for these vessels. The source of either material remains unknown.

Likewise, the question of cultural affinity is unclear. The one attribute that may have hinted at cultural affinity—the paddle and anvil technique—was inconclusive in the x-ray analysis.

DISCUSSION

As noted at the beginning of the chapter, the primary focus of the ceramic analyis was on the questions of chronology and cultural affinity. The lack of Puebloan tradewares or Gobernador wares suggests that this site predates AD 1700. This premise is further supported by the two radiocarbon assays obtained from corn cupules, which yielded a date of cal AD 1450 to 1650.

The small ceramic assemblage suggests that ceramic vessels were not used as extensively during the early Dinetah phase as they were in later periods. If these earlier populations were still primarily mobile hunters and gatherers, then extensive numbers of ceramic vessels would be burdensome. On the other hand, the size of the assemblage could also indicate that these earlier occupations were fairly short-term, and thus the breakage of vessels was minimal.

The question of cultural affinity may not be as easy to address. Initially, the assemblage was thought to consist of two different ware types—Dinetah Gray and Unknown protohistoric plainware. Sherds of the latter type were shown to various experts—Dave Brugge, Patricia Hancock, Mike Marshall, and Dean Wilson. All four identified them as an oxidized Dinetah Gray. Thus, it would appear that the entire assemblage is Dinetah Gray, and, based upon the rim sherds, represents the remnants of two vessels. While we do not dispute the Dinetah Gray identification for the second vessel, analyses by other experts

suggest that the distinction between early Navajo and Ute pottery is not great.

Stiger (1998:13) states that Uncompahgre Brown Ware, the principal Ute ware, "is virtually indistinguishable from Dinetah Gray." He also notes that, in 1990, brownware sherds from Gunnison, Colorado, were examined by six different analysts in Santa Fe. The subsequent identifications of the same sherds were Apache, Dinetah Gray, Dinetah Utility, Penasco Micaceous, and Uncompahgre Brown.

This statement is further supported by Schaafsma (1996), who notes that the protohistoric and early historic pottery of the Southern Paiute, Ute, Apache, and Navajo are quite similar. Although the pottery can sometimes be distinguished on the basis of vessel shape and minor surface texturing, such as fingernail indentations, for the most part the basic technology of the utility wares made by these groups overlaps in such attributes as tempering, surface treatment, and surface, paste, and core colors. Thus, assigning cultural affinity has, in many instances, been reflective of the geographical location of a site.

Brown (1996) states that Dinetah Gray pottery is distinguishable from Ute pottery on the basis of temper and possibly construction techniques (paddle and anvil). However, the description of Dinetah Gray almost mirrors that of Uncompahgre Brown. The earliest of the Navajo wares, Dinetah Gray, is the utility ware made between AD 1500 and 1750/1800. The ware may have been produced in the 1400s, but chronometric data are lacking for that period. To date, the earliest tree-ring-dated Navajo site in northwestern New Mexico, LA 55979, yielded cutting dates of 1540 and 1541 (Hancock 1997, as cited in Reed and Goff 1999).

Dinetah Gray is a grayware with surface colors of gray, dark gray, black, brown, or reddish brown. Tempering materials consist of coarse, quartz sand (granitic) or sandstone in the Dinetah area and crushed igneous rock in the La Plata area. Occasionally, mica may be present in the temper. The paste texture is coarse, but soft and friable, and ranges from dark gray to black or occasionally orange to reddish brown.

Surface treatment of Dinetah Gray can be rough, bumpy, scored (striations), fingertip impressed or indented, and sometimes punctated or incised. Vessels are predominantly wide-mouthed jars used for cooking and storage. The bottoms can be rounded or conical. Wall thickness is usually thin and averages between 4.0 and 5.5 mm (Brugge 1981; Eddy 1966; Marshall 1985; Wilson and Blinman 1993).

As described by Buckles (1971:507–527), Uncompahgre Brown was constructed using the coiling method and exhibits smoothed, scraped, wiped, and possibly paddle-and-anvil finishing techniques. The vessels were apparently fired in poorly controlled, mixed reducing and oxidizing atmospheres. Fire clouds are rare on interior surfaces but are more common on exterior surfaces. Vessel wall thickness ranges from 2.5 mm to 10.0 mm and the surface usually registers 4–5 on the Mohs scale of hardness, but this may vary.

The temper consists of variations of quartzitic sands and micaceous sands, with larger inclusions ranging from granitic rocks to limestone. The most common tempering materials are quartzitic sands with different amounts of micaceous materials, although a few have no mica present. There is no evidence of sherd, organic, or other tempering materials. Sand grains are angular to round and range from fine (¼ to ⅛ mm diameter) to coarse granules (up to 4 mm diameter). The granule-sized sands are sparsely distributed, however.

Interior surfaces can range from a yellowish brown (10YR5/2) to olive gray (5Y4/1). The

exterior surface is similar to or slightly lighter than the interior and can be dull to lustrous, depending on the mica content. Core color ranges from black to gray with a gradational color change to the surface.

Uncompahgre Brown is divided into two types based upon surface decorative techniques—Plain and Finger Impressed. The Plain type generally lacks any form of surface decoration save for striations resulting from wiping the coils, although some vessels have no visible striations. Bases for vessels of this type are mostly round.

The Finger Impressed type exhibits fingertip impressions over the complete exteriors of the vessels. The impressions are usually within parallel rows and are made by fingertips, fingerprints, or fingernails. Vessels may or may not be scraped or wiped prior to impressing. Bases of this style are predominantly conical.

Ethnographic accounts of Ute pottery manufacture also show a variable range of techniques. Pots were made by coiling, but finishing and thinning techniques include paddle and anvil, hand smoothing, or scraping. Tempering agents consisted of sand, vegetable matter, and sometimes micaceous sand. Surface color ranged from red to black, and decoration could be absent, incised, stamped, or painted (Stiger 1998). Thus, it would appear that there are very few traits (paddle and anvil and possibly micaceous sand) that could distinguish Ute ceramics from early Navajo ceramics.

To further complicate the question of cultural affinity, the Utes also obtained pottery through trade or other sources. Pottery was acquired from Mexicans, the Apaches and Pueblos, the Navajo, and from archeological sites (Schaafsma 1996).

Clearly, more detailed studies comparing early Navajo and early Ute ceramics from well-dated sites are needed in order to identify differences between the wares. In addition to attribute descriptions, clay sourcing and refiring could aid in determining origins of clays, petrographic analysis could identify tempering materials and their geological sources, and electron microscope or x-ray analysis could assess manufacturing techniques. Until more distinguishing attributes can be defined for these ceramics, the question of cultural affinity for early protohistoric sites in the area north of the San Juan River may remain a puzzle for years to come.

While we were not able to conduct a suite of extensive studies and analyses on the ceramic assemblage, we were able to obtain good dates for the occupation of the site. Even though the assemblage consists of two partial Dinetah Gray vessels, the various attributes described for those vessels and the refiring and x-ray tests conducted on a sample of the sherds provide much needed data to help address the question of cultural affinity.

Chapter 7

ARCHEOBOTANICAL REMAINS

Lisa W. Huckell

In November of 1999, personnel from the Office of Contract Archeology (OCA) of the University of New Mexico conducted excavations at LA 110299, a small protohistoric site located along U.S. 550 nine miles north of Aztec. The site is on the west side of the Animas River on a terrace overlooking the river. The dominant local vegetation is piñon/juniper woodland. The occupation consists of a small structure, two extramural thermal pits, and a cluster of postholes.

Seven samples taken from the structure, intramural hearth, and two thermal pits were submitted for analysis. Despite poor preservation and extensive bioturbation, the samples produced a modest record consisting of five carbonized economically significant taxa: maize, goosefoot, cf. juniper, ricegrass, and at least two unidentified species of grasses.

Because archeobotanical data from this late period of Southwestern prehistory are not abundant, research issues to be addressed by this project were basic: (1) to document plant-based subsistence; (2) to address seasonality of occupation; and (3) to obtain annual plants suitable for AMS dating.

METHODS

In response to recognized patterns of poor preservation at protohistoric sites, a collection strategy was adopted in which all or most of the contents of critical features such as hearths and house floors was collected for flotation to maximize recovery. As a result, sample sizes varied considerably, ranging from 5.0 to 24.5 liters. Flotation samples were processed by water separation by OCA laboratory personnel using the bucket method. A 2.0 liter increment of sediment is added to a bucket of water and briefly stirred to release plant macrofossils into suspension. The liquid is decanted into a chiffon square anchored over a screen that catches the buoyant material. This process is repeated from 3 to 8 times or until the water is clear and no longer contains plant materials. This component, the light fraction, is gently rinsed and then placed on clean paper in racks to dry. The remaining sludge, or heavy fraction, is screened and rinsed and then allowed to dry.

After the light fraction has dried completely, it is put through a graduated series of geological screens, creating five size classes: (1) greater than 4.0 mm; (2) between 2.0 and 4.0 mm; (3) between 1.0 and 2.0 mm; (4) between 0.5 and 1.0 mm; and (5) less than 0.5 mm. This strategy enhances the ease and reliability of microscopic sorting and identification and is useful when subsampling is necessary for large samples. Each size class was weighed and placed into labeled coin or manila envelopes, which were stored together in ziploc sample bags. The heavy fraction was not examined for plant remains.

The full sort analysis method was used for all samples, with counts made of the number of items assigned to each taxonomic category. Size classes 1–3 were completely analyzed; for the smaller two size classes, when a large volume made complete examination impractical, subsampling enabled estimates of the total number of items in the sample to be calculated. Although the smallest size class is often ignored because of assumptions of poor productivity, in this analysis it was investigated using subsampling followed by rapid scanning of the remainder in order to insure that diagnostic fragments or tiny seeds largely or completely restricted to that size class would not be overlooked.

Sorting was carried out using an Olympus binocular stereozoom microscope with a magnification range of 10× to 110×. Carbonization was the primary criterion used to distinguish those plant parts with the highest probability of affiliation with the protohistoric occupation from recent contaminants (Minnis 1981). Uncarbonized plant parts were also identified and counted as a means of evaluating the nature and degree of disturbance present in sampled loci. Additional evidence of disturbance was obtained from other biotic components such as microvertebrate bones, fecal pellets, mollusks, and insect exoskeletal fragments. Specimen measurements were taken by means of the microscope's ocular micrometer. Seeds were measured with the hilum or seed attachment scar in the basal position. All carbonized items other than wood charcoal were removed and placed in labeled polyethylene vials that were then stored in ziploc bags.

Wood charcoal was also analyzed. Sampled contexts include the structure fill and floor contact fill, the hearth within the structure, and two extramural pits. Samples were obtained from flotation sample light fractions. Ideally, 30 fragments were analyzed from each float, although this ideal was rarely achieved owing to poor preservation. Fragments were judgmentally selected, with 20 taken from the 4.0 mm screen and 10 taken from the 2.0 mm screen. Fragments had to be of sufficient size to display a complete growth ring or unequivocal diagnostic features and to permit effective handling (which usually involved snapping the specimen transversely to expose a fresh cross-section and, where needed, radial and tangential views).

Identifications of recovered materials were confirmed by comparison with modern seed and wood specimens in the author's collection. The taxonomy used in this study follows Martin and Hutchins (1980–1981).

RESULTS

Seven flotation samples were submitted for analysis, with 94.5 liters of soil processed. Thirteen taxa could be identified to the family, genus, and/or species level. Table 20 presents the taxa, their common names, and the plant part(s) recovered. Table 21 provides individual sample data on carbonized and uncarbonized plant parts and additional biotic remains that provide insights into disturbance activities. Owing to the often large quantities of uncharred and disturbance materials that are present in samples, time-consuming individual counts were replaced with estimates by category based on frequency ranges denoted by the letters A (1–10) through F (>1000). Taxa categories represent seeds or disseminules unless otherwise indicated. Entries in which numbers are paired with parenthetical figures present the actual count followed by the estimated sample total in parentheses. No attempt has been made here to estimate the minimum number of individuals represented by fragmented remains. The term "cf." is used to denote a lower level of identification confidence in which the identification is probable but not definite, resulting from unexplored alternatives or insufficient criteria for an unequivocal identification. It is part of the specimen name and

Table 20. Plant Taxa Recovered from LA 110299

Taxon	Common name	Part
Cactaceae	Cactus Family	
Echinocereus sp.	Hedgehog cactus	Seed[2]
Chenopodiaceae	Goosefoot Family	
Chenopodium spp.	Goosefoot; Quelites	Seed[1/2]
Cupressaceae	Cedar Family	
Juniperus sp.	Juniper	Wood[1/3]; Leaf[1/2]; Seed[1/2]; Resin gland[1]
J. osteosperma (Torr.) Little	Utah juniper	Seed[2]
Euphorbiaceae		
Euphorbia sp.	Spurge	Seed[2]
Fagaceae		
Quercus sp.	Oak	Pericarp[2]
Gramineae spp.	Grass Family	Caryopsis[1/2]
Oryzopsis hymenoides (R. & S.) Ricker	Indian Ricegrass	Caryopsis[1/2]
Zea mays L.	Maize; Corn	Caryopsis[1]; Cupule[1]; Glume[1]
Liliaceae	Lily Family	Bulb[2]
Pinaceae	Pine Family	
Pinus edulis Engelm.	Piñon pine	Wood[1]; Bark[1]; Leaf[1]
Polygonaceae		
Rumex sp.	Dock; Sorrel	Fruit[2]

1 = Carbonized; 2 = Uncarbonized; 3 = Incompletely burned

must be included with the name whenever it is used.

Overall, the samples were characterized by abundant rootlets, juniper branchlets and leaflets, insect parts, and fecal pellets, all reflections of the generally shallow nature of the deposits and their vulnerability to bioturbation. Modern seeds were present in all samples, again symptomatic of bioturbated deposits in which rodents, microvertebrates, and seed-gathering insects have maintained an active presence. Five of the seven samples yielded identifiable charred remains. Preservation was poor, with 45 carbonized items representing an estimated total of 139 items recovered.

Site features include a small structure (Feature 1), a thermal pit (Feature 3), a possible thermal pit (Feature 2), and a series of small postholes. Feature 1 was a shallow oval depression that probably supported a brush superstructure. Measuring 3 m by 2.75 m, the structure ranged in depth from 2 to 13 cm. Two intramural features were identified, a pot rest and a hearth (Feature 4). Four samples from the floor and one from the hearth were analyzed. One of the floor samples was essentially sterile, yielding a single small unknown fragment. The composite floor record contained maize cupules and the seeds of chenopods, chenoams, grasses, and ricegrass. The hearth sample also contained multiple taxa,

Table 21. Plant Remains Recovered from LA 110299 Flotation Samples

	Feature 1 Structure				Feature 2 Extramural Pit	Feature 3 Extramural Pit	Feature 4 Structure Hearth	Total
	FN 66 15.0 L.	FN 67 11.0 L.	FN 68 5.0 L.	FN 71 13.5 L.	FN 62 24.5 L.	FN 61 17.5 L.	FN 70 8.0 L.	94.5 L.
CARBONIZED								
cf. *Zea* cupule							1	1
Zea cupule		1	1			2	2	6
Glume			2					2
Kernel fragment						1		1
Chenopodium			1			3 (16)		4 (17)
Chenoam			1			3 (16)	1	5 (18)
Gramineae				4 (72)				4 (72)
cf. *Juniperus* sd frag							2	2
Oryzopsis				2				2
Unknowns	1	3	1	5		2	6	18
TOTAL	1	4	6	11(79)	0	11 (37)	12	45 (139)
Pinus leaf segments		A	B					
Bark plates	D					D		
Juniper leaf		A	D	B				
Resin glands	C	A		D		D		

Continued

	Feature 1 Structure				Feature 2 Extramural Pit	Feature 3 Extramural Pit	Feature 4 Structure Hearth	Total
	FN 66 15.0 L.	FN 67 11.0 L.	FN 68 5.0 L.	FN 71 13.5 L.	FN 62 24.5 L.	FN 61 17.5 L.	FN 70 8.0 L.	94.5 L.
UNCARBONIZED								
Chenopodium	B	A	B	A	D		B	
Juniperus seed	B	A	A	A	A	A	A	
Leaf, branchlet	C	C	B		D			
Echinocereus		A						
Euphorbia				A			A	
Gramineae						C		
Liliaceae bulb							A	
Oryzopsis floret					A			
Quercus shell	A							
Rumex fruit	A		A		A			
Unknowns	A		D				A	
DISTURBANCE								
Insect parts	F	D	D	F	F	D	D	
Bones- unburned	A						A	
Bones- burned		A					A	
Snails	A	A	A		B	A		
Fecal pellets	F	F	F	F	F	F	F	

N = Number observed (Estimated total); A = 1–10; B = 11–50; C = 51–100; D = 101–500; E = 500–1000; F >1000

including maize cupules, chenoams, and probable juniper seed fragments.

Located a meter to the southwest of the structure, Feature 3 was a circular thermal pit with a diameter of 40 cm and a depth of 22 cm. One sample was analyzed. Maize cupules and a kernel fragment were present, as were chenopod and chenoam seeds.

A second possible thermal pit (Feature 2) was found 55 cm southeast of Feature 1. It was identified initially as an ovoid discolored area 85.45 cm in maximum dimension. Excavation revealed extensive rodent bioturbation of the fill and the presence of a small tree within the feature boundary, all of which made it impossible to define the pit limits and shape with certainty. Its status as a feature remains equivocal. The single sample analyzed was found to be sterile.

A series of small postholes was found just to the north of the structure. They may be remnants of a windbreak, drying rack, or shade (ramada). No flotation samples were taken from them.

Twelve taxa were identified at the site. Maize was the sole cultigen recovered. Of the remaining taxa, five *(Echinocereus, Euphorbia,* Liliaceae, *Quercus, Rumex)* are found only as modern uncarbonized specimens. Although all are known to have ethnobotanical uses, the probability of their presence being the result of human activity is remote; they are considered to be post-occupational introductions and will not be discussed further. Five taxa *(Chenopodium,* Chenoam, *Juniperus,* Gramineae, *Oryzopsis)* are present in both charred and uncharred condition, which makes the linkage of the carbonized specimens with human activity somewhat equivocal. However, although the fill is shallow above and within the features, and natural fires are likely to have transpired since the occupation, those carbonized items are considered to be associated with the occupation. Piñon pine needle segments were found only as carbonized specimens.

Maize (*Zea*)

Maize was recovered in the form of cupules, glumes, and a kernel fragment. Cupules are vertically stacked indurated pockets arranged in adjoining columns that are fused together to form the rachis or cob. Each cupule subtends a pair of grains. Two cupules were found in the structure floor fill, the hearth, and the Feature 3 pit. An additional possible cupule was present in the hearth. All are dissociated single specimens that have sustained varying degrees of damage. As a result, no morphometric measurements were possible. Shapes tend to be strongly rectangular, but the lack of width and height data precludes determining whether the late large Puebloan type maize with very broad, short cupules that has been grown historically by Navajo farmers was present.

Glumes are bracts that partially enclose each maize grain; they are better known as chaff. Two fragmentary lower woody glumes were recovered from the structure floor. The kernel fragment obtained from the structure hearth is a small cap fragment that is badly damaged. The exterior surface retains patches of a fine reticulum characteristic of the aleurone layer, but no traces of the overlying pericarp were evident. A small portion of the smooth facet against which the embryo would adhere is visible. The glossy endosperm exhibits abundant radial fissures and large bubbles, features observed in carbonized kernels with floury endosperm (Doebley and Bohrer 1983). The small size and poor condition of the specimen preclude an absolute identification of endosperm texture.

Maize could easily have been cultivated by site residents in suitable spots on the Animas River floodplain. The cupules reflect the in situ production of maize, as it is unlikely that corn would have been transported over the landscape

for any great distance while still on the bulky cobs. The recovery of the cupules from the house floor, hearth, and Feature 3 probably reflects the common practice of using the lignified cobs as fuel, thereby greatly enhancing the survival of the remains over time.

Goosefoot/Chenoam (*Chenopodium*/Chenoam)

Chenopod seeds were found in the structure and Feature 3. Intact Centrospermae embryos lacking diagnostic seed coats were also recovered from the same contexts and are almost certainly chenopod seeds as well. However, in the absence of unequivocal evidence, these specimens are referred to as chenoams, a term that is applied to the seeds of some members of the Chenopodiaceae and Amaranthaceae families. Close similarities in seed size and structure that make them difficult to distinguish, along with similar plant growth habits and environmental preferences, prompted the adoption of the convenient term. Multiple species are present; time did not permit additional identification efforts. The largest complete chenopod is 0.7 mm long, 0.75 mm wide, and 0.45 mm thick. The chenoams consist of an expanded central perisperm disc that is encircled by a linear embryo. The largest measurable specimen has a diameter of 0.6 mm.

Chenopods can be found from early summer well into the fall (Martin and Hutchins 1980–1981: 614–625). The more common species prefer disturbed soils such as fields and active floodplain margins and point bars. The plants provide two important foods: the young leaves can be cooked as potherbs and the small but abundant seeds are widely utilized to make meal and flour (Castetter 1935; Ebeling 1986). Their widespread popularity as a food is indicated by their virtually ubiquitous distribution in the prehistoric record, for chenoams are the most commonly found plant macrofossil in Southwestern paleoethnobotanical assemblages. They were usually parched and ground into meal. Parching on an open sherd or basket tray near an open fire often results in seed losses as they pop from the explosive expansion of the endosperm, a process that could easily account for the two seed forms found in the structure. Seeds in the exterior thermal pit could be the result of steaming the seed-bearing plants for greens or from the common use of the plants as buffers to protect the roasted foods.

Juniper (*Juniperus*)

Juniper was obtained from six samples. The intramural hearth yielded two small, thick-walled seed fragments with extremely dense cell structure that are probably juniper, but the pieces are too small to rule out other possibilities. Short branchlet segments and individual leaflets were found in the structure. They may indicate the use of juniper boughs for thatching. Tiny ellipsoidal structures less than 0.5 mm in size bearing a raised, rough reticulum were found in Features 1 and 3. Although they appeared to be very small seeds, they were invariably found to be hollow. They were ultimately discovered to be leaf resin glands, one of which occupies much of the space in the base of the leaflet. The volatile contents were apparently lost during the carbonization process. Uncarbonized juniper remains were also present, with foliage in four samples and seeds in all seven. Many of the seeds were heavily damaged and degraded, making identifications difficult. The range of seed sizes and shapes suggests that multiple species may be present in the site vicinity; the largest seeds are Utah juniper.

Junipers provide several useful products, including excellent fuel and construction wood; medicines, construction materials, dyes, and ritual items made from the foliage; cordage and tinder from bark; and food from the female cones or

"berries" (Dunmire and Tierney 1997:126–129, Whiting 1966). The durable thick-walled seeds are frequently recovered from archeological contexts (Lentz 1984), a reflection of wide spread consumption of the fruits. Fruits become available in late summer and early fall, and, the case of Utah and one-seed juniper *(J. monosperma),* remain available on the tree for as long as two years (Schopmeyer 1974:462). When not eaten fresh, the fruits were prepared by boiling, roasting, and baking, after which the seeds were discarded (Lentz 1984:Table 2). The probable seed fragments obtained from the structure hearth may indicate the preparation of the cones over the fire, the discard of the seeds into the fire, or the filling of the hearth with secondary trash.

Ricegrass *(Oryzopsis)*

One complete and one fragmentary caryopsis or ricegrass "seed" were found in the Feature 1 fill. The complete specimen is globose, and is 2.0 mm long, 1.3 mm wide, and 1.2 mm thick. An uncharred floret from Feature 2 suggests the local presence of the grass.

Owing in large measure to its large grains and readily freed chaff, ricegrass has been widely used as a food by prehistoric and more recent peoples in the northern Southwest (Doebley 1984; Dunmire and Tierney 1997:194–196). Available in the spring and early summer, the plants are found in sandy soil, often forming extensive stands that facilitate efficient recovery of large quantities of seeds. A second smaller production pulse may also take place during late summer in response to abundant summer rainfall.

Gramineae (Grasses)

Four grass caryopses were found on the structure floor. At least two species may be represented. The smallest seed is ovate with a thin, elliptical cross-section. It is 0.55 mm long, 0.35 mm wide, and 0.25 mm thick. The embryo reaches up to about half the caryopsis length. It resembles the tiny seeds of dropseed grass and may belong to the genus *Sporobolus,* which contains several common and widely distributed species. The second form is also elliptical but more elongated; the cross-section is almost round. The embryo extends up approximately one-third the seed's length. It is 0.7 mm long, 0.25 mm wide, and 0.3 mm thick. The third specimen is represented by the basal portion. It appears to be similar in form to the preceding seed but is significantly larger. It has an incomplete length of 0.6 mm, a width of 0.5 mm, and a thickness of 0.3 mm.

Grasses have provided valuable food to foragers throughout the Southwest. At least 52 species are documented as important to aboriginal economies (Doebley 1984). Grasses become available in the spring and early summer (cool season) and during the late summer and early fall (warm season) (Bohrer 1975), providing a valuable source of carbohydrates and calories through most of the growing season and a commodity that can be easily stored for future use. The grains are generally parched and ground into meal for mush and breads.

Piñon pine *(Pinus edulis)*

Piñon pine is represented by a few needle fragments found on the structure floor and small bark plates found on the floor and in Feature 3, one of the thermal pits. The needles are plano-convex in cross-section, indicating that they originated in two-needle fascicles, a feature that identifies them as piñon pine. The bark plates are tabular exfoliated scales that exhibit a distinctive, fine surface reticulum. They lack diagnostic features but are most likely from the same source, although ponderosa pine also produces similar bark. Both may be inadvertent inclusions or they may reflect the use of dry bark and needles as tinder.

Table 22. Wood Charcoal from LA 110299 Flotation Samples

	Juniper (*Juniperus*)	Pine (*Pinus* sp.)	Piñon pine (*Pinus edulis*)	Unknown	Total
Feature 1; FN 71 Structure	10				10
Feature 1; FN 67 Structure	19				19
Feature 1; FN 68 Structure	11				11
Feature 1; FN 66 Structure	12				12
Feature 2; FN 62 Extramural pit	24		2		26
Feature 3; FN61 Extramural pit	22		7	1	30
Feature 4; FN 70 Feature 1 Hearth	6	2	2		10
TOTAL	104	2	11	1	118
(% of Total)	88.1%	1.7%	9.3%	0.9%	100%

Wood

Wood charcoal from six flotation samples was investigated, with a total of 118 fragments identified. The results are presented in Table 22. The site assemblage is overwhelmingly dominated by juniper wood, which appears in all samples. At 104 pieces, it accounts for 88% of the total. Piñon pine was recovered in very small quantities from the three pit features; the 11 specimens comprise 9.3% of the total. The remainder of the assemblage consists of two pieces of pine lacking the unequivocal diagnostic axial resin canal morphology necessary for distinguishing ponderosa *(Pinus ponderosa)* from piñon pine (Minnis 1987), and a badly degraded fragment in which basic cell structure was completely obscured.

The woods of juniper and piñon pine have been extensively expoited for fuel and structural needs by prehistoric and subsequent Southwesterners. Both are excellent fuels, with the dense and aromatic juniper continuing to be in especially high demand. The insect-resistant quality of juniper has also acted to make it a preferred construction element for centuries, particularly for posts and roof elements. Its durability can frequently be seen in the presence of the wood in an unburned or incompletely burned state, often as intact in situ post stubs. Several pieces of wood from the structure fill (FN 66) were partially burned, with the color grading from black to a dark caramel brown. The location of LA 110299 in piñon/juniper woodland ideally situated the occupants for access to high-quality, readily available woods. As the record shows, juniper appears to have been the wood of choice for the habitation's pole and brush structural framework as well as for fuel. The occurrence of piñon wood in the thermal features may simply represent the expedient collection of locally available, suitably sized pieces of wood. The sample is too small to ascertain whether this reflects a true bias for juniper over piñon.

DISCUSSION

LA 110299 appears to be an ephemeral, seasonally occupied farmstead used by a small group of people at the nuclear or small extended family size who exploited the agricultural potential of land along the Animas River. In addition to producing maize, the occupants gathered locally available wild resources for food. Goosefoot could have been found naturally along the margins of the active floodplain or may have been encouraged to grow in fields or other anthropogenic habitats as an additional crop.

Ricegrass, dropseed, and other grasses should also have been locally available; the ricegrass grains may be an indication of the early summer arrival of the farmers. The rest of the taxa either appear in the summer or are equivocal in terms of their period of availability. The absence of subsurface storage features suggests a temporary occupation limited to the summer growing season.

The recovery of a Dinetah Gray jar suggests a Navajo affiliation for the site. A pair of AMS radiocarbon dates on two maize cupules yielded identical uncalibrated dates of 340 ± 40 BP with calibrated dates of AD 1450–1650, placing the occupation in the Dinetah phase, the earliest period during which a Navajo presence can be identified.

Previous investigations in the area (Honeycutt and Fetterman 1994) have provided an interpretive framework into which the project results may be placed. Plotted distributions for Navajo sites in the vicinity of Aztec (Honeycutt and Fetterman 1994:Fig. 1-15) reveal extensive use of the area, with Dinetah phase sites figuring prominently in the occupation. Two structure forms can be found at residential sites: forked-stick hogans or pole-and-brush shelters. Excavated sites indicate a consistent pattern of one or two small structures, a modest artifact inventory that often includes grayware ceramics, and a small number of associated features such as hearths, middens, various types of pits, and postholes that represent activity areas.

Plant-based subsistence information is available from 12 sites. Preservation of plant macrofossils at these sites is generally poor, with taxa recovered in low frequencies. Maize, squash, and tobacco have been recovered (Brandt 1994; Honeycutt and Fetterman 1994:Table 31-41), forming a minimal inventory as other cultigens and tended plants could have been raised. A large suite of local wild perennial and annual taxa was also exploited for food, fuel, and other needs (Brandt 1994). In assessing the importance of particular plant resources, the Navajo sites can best be considered as a single group, as dating problems significantly affect the confidence with which phase assignments can be made. In terms of site ubiquity, the frequency of sites in which a taxon appears, both maize and chenopods/chenoams are present in eight of the sites, values that are exceeded only by juniper, which appears in ten (Honeycutt and Fetterman 1994:Table 31-41). Like the remaining taxa, grasses and ricegrass have low values of three and two, respectively.

Wood use at Navajo sites indicates the dominance of juniper, a pattern that extends back through previous time periods. Brandt (1994) found that 75% to 81% of her project's charred fuelwood assemblages were composed of juniper and other conifers. Juniper consistently had the highest sample ubiquities for Archaic, Anasazi, and Navajo assemblages, with conifers a distant second (Brandt 1994:Table 26-15). Shrubby hardwood taxa formed a small portion of the record. The LA 110229 data reflect the same targeting of juniper as the preferred wood resource. The absence of shrub woods from this assemblage may be the result of sample bias.

SUMMARY

The results from LA 110229 conform to the emerging area pattern in site structure, composition, artifact assemblage components, and macrobotanical record. The modest archeobotanical assemblage supports the trend of high visibility for chenopods and maize, providing additional evidence for the widespread practice of maize agriculture and, potentially, the concomitant encouragement/management of a useful associated agrestal. Evidence was also found for the use of several grasses, including ricegrass. Low ubiquities for these and other plants in the local record may be attributable to some degree to preservation biases, particularly in

the case of ricegrass, which has often served as a staple food and would have been available during a time of year when other options were not yet available. Wood fuel selection is also consistent with observed patterns of juniper dominance in the area and reflects optimal settlement location in the piñon/juniper woodland. Additional excavation and appropriate flotation sampling will help to define the roles of wild plants in the subsistence economy of dispersed, mobile Navajo populations that pursued a mixed foraging-farming strategy along the Animas River and its tributaries.

Chapter 8

SUMMARY AND CONCLUDING DISCUSSION

The data recovery program conducted at LA 110299 revealed the remains of a small brush structure and possibly two extramural activity areas. One of activity areas was located to the west of the structure and encompassed a small hearth and an alignment of postholes that could represent a windbreak, ramada, or drying racks. The second activity area consisted of a possible hearth situated southeast of the structure. This feature was badly disturbed by rodent activity and a small tree growing in its center. Although no macrobotanical remains were present in the fill, several fragments of ground stone and a retouched flake were found in close proximity, which suggests this may have been a cultural manifestation.

The data recovery plan outlined three basic research questions, which this site had the potential to address—chronology, settlement and subsistence, and cultural affinity. For the most part, the excavations yielded sufficient data to address chronology and settlement and subsistence. Data to address the question of cultural affinity are somewhat limited, however.

CHRONOLOGY

Two samples of charred corn cupules were submitted for AMS radiocarbon dating, one from an exterior hearth (Feature 3) and one from the hearth in the structure (Feature 4). Both samples were dated to 340 ± 40 BP or cal AD 1520, 1590, and 1620 with a one standard deviation range of cal AD 1480 to 1635 and a two standard deviation range of cal AD 1450 to 1650. Although the dating of annuals avoided the problems of old wood use and cross-section effect associated with radiocarbon dates on wood charcoal, the calibrated age range has relatively poor resolution owing to overlap in the dendrocalibration curve for the protohistoric time period.

The two dates were averaged using the Average routine included in Radiocarbon Calibration Program 2000, Rev 4.2 (© 2000, Quaternary Isotope Lab, University of Washington) in an effort to increase the resolution. Averaging was justified because there was clearly no statistically significant difference in the two dates, and the archeological evidence indicated that the site represents a single occupational episode. The average date, 340 ± 29 BP, has a possible intercept at cal AD 1515 with a one standard deviation range of cal AD 1485 to 1530; possible intercepts at cal AD 1590 and 1620 with a one standard deviation range of cal AD 1546 to 1634; and a two standard deviation range of cal AD 1466 to 1642 (Figure 17). The probability distribution for this date is bimodal, with two-thirds of the relative area of the probability curve falling after AD 1560. Thus, the correct calibrated age for this radiocarbon date is most likely one of the two later intercepts.

Thermoluminescence dates of AD 1686 ± 32 (UW 481) and AD 1793 ± 98 (UW 482) were obtained

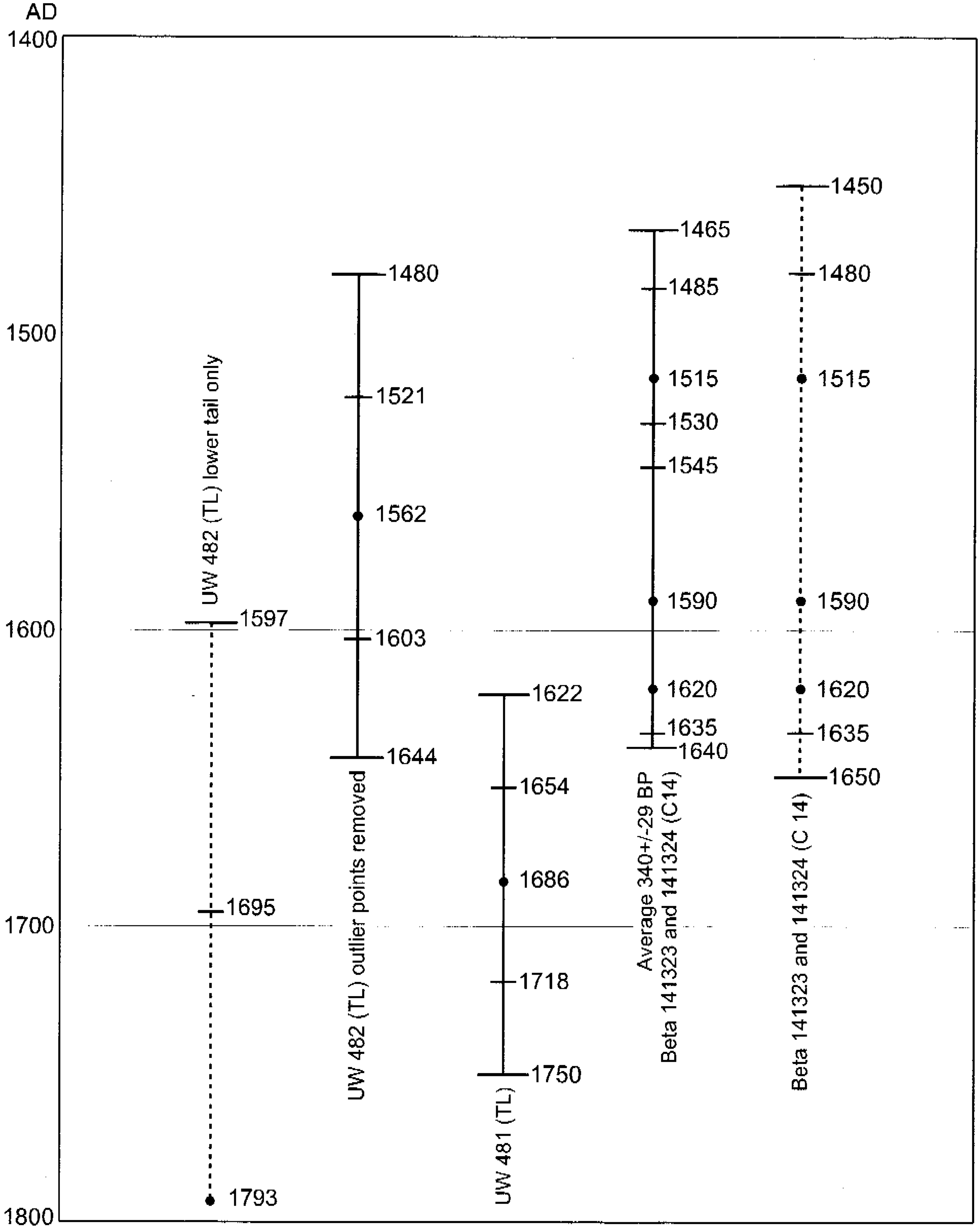


Figure 17. Summary of chronometric data from LA 110299.

from two sherds collected from the floor of the structure. As discussed in Chapter 4, four outlier points were removed from the growth curves of the latter date to reduce the error in the age estimate. The removal of these points produced a much older date for UW 482, AD 1562 ± 41, suggesting that the original age is probably an underestimate. The age range for that revised date closely matches that of the average radiocarbon date (Figure 17), and both overlap the lower end of the two standard deviation range of the AD 1686 ± 32 TL date. If LA 110299 does represent a single occupational episode, as the archeological data suggest, and if the pottery manufacture and harvesting of the corn occurred during that occupation, then the best age estimate for the occupation is the area of overlap between the average radiocarbon date and the TL dates. That is, between about AD 1600 and 1650. This places the occupation in the late Dinetah phase as currently defined.

SUBSISTENCE

All of the fill from the hearth features and the darkest fill from the structure were bagged for macrobotanical analysis. With the exception of Feature 2, the possible extramural hearth southeast of the structure, these samples yielded good macrobotanical evidence. Wild plant taxa recovered include chenopods, chenoams, ricegrass, and other grasses, all of which indicate some reliance on the gathering of wild plants for food. Small amounts of corn cupules, glumes, and a kernel fragment were also recovered, which suggests some limited agriculture was practiced as a supplement to the diet. All of these taxa are suggestive of a warm season, possibly late summer/early fall, occupation.

The lithic assemblage consists of artifacts and debitage indicative of a technology emphasizing bifacial reduction, formal tool manufacture, and expedient tool production. These characteristics suggest that hunting and gathering played a major role in the subsistence system of the site's occupants. Edge angles on the tools indicate cutting and scraping activities, as well as woodworking activities. Rounded use-wear on some of the tool edges suggest the scraping of soft materials such as hides or fibrous plants.

The faunal remains are primarily unidentifiable small mammal. Identifiable species consist of cottontail, jackrabbit, and pocket gopher. Most of the bones were badly fragmented and burned. No large mammals, such as deer, were present, which also implies a warmer season occupation as these larger animals would have been at higher elevations during the summer and not within the immediate vicinity at the time of occupation.

SETTLEMENT STRUCTURE

The site appears to be a short-term, single-component site encompassing one structure and associated activity areas. The structure appears to be a small brush facility that did not require much expenditure of labor to construct. Unfortunately, the only evidence of the superstructure was several juniper poles found in situ along the eastern and southeastern edge of the structure. Their patterning suggested that the structure was supported by a conical pole framework.

The floor was use-compacted sand and had two features dug into the carbonate-bearing substrate—a hearth and a pot rest. The hearth was located in the southwest quadrant and the pot rest was about 1.5 m to the southeast. Fragments of a large Dinetah Gray olla were found on the floor, primarily around the pot rest. The greatest concentration of lithic debris was also found in the southern half of the fill. The locations of these artifacts and the features suggest that this area of the structure served as a work area, making the northern half of the structure a sleeping area.

Although no entryway was found, the orientation of the internal hearth and the activity area to the west suggest a western doorway. This premise is supported by the concentration of both ceramics and lithics along the western edge of the structure, which could represent a door dump.

The approximate size of the resident group can be inferred from the area of the floor. Bullard's (1962) observations suggest that an adult requires approximately 1.5 m^2 of floor space for sleeping. Using this constant, the floor area could have easily accommodated at least three adults or two adults and some small children—in other words, a nuclear family unit. The presence of ground stone, a pecking stone, and ceramics is consistent with domestic activities associated with women, while the debitage attributes and formal tools suggest tool manufacturing activities normally associated with men. Thus it is highly probable that the site's occupants were a family unit rather than an all-male task group.

The occupation of the site appears to be fairly short-term as suggested by the small quantity of artifacts and the non–labor intensive structure. As noted above, the macrobotanical and faunal remains suggest a probable warm-season occupation. It may be that the occupants were only here for a short time to tend the fields or to harvest the corn.

CULTURAL AFFINITY

The question of who occupied the site proved to be more difficult to address. In fact there appear to be many more questions regarding cultural affinity than there are answers. Schaafsma (1996) states that this area north of the San Juan River was the southern boundary of the Utes, possibly as early as AD 1626, and that Dinetah phase sites north of the San Juan River are actually Ute sites. He bases this argument on Spanish historical accounts and the presence of fingertip-impressed decorations on pottery from the La Plata sites (Brown 1991), which he contends is not a decorative characteristic of Dinetah Gray but is more similar to the decoration on brownware from Ute sites on the Uncompahgre Plateau.

Brown (1996) disagrees with Schaafsma's southern boundary of Ute territory and contends that, based upon current archeological evidence, the boundary is probably just north of the Colorado–New Mexico line. He further states that Dinetah phase sites north and south of the San Juan River are distinguishable from Ute sites on the basis of temper and construction methods of Dinetah Gray pottery, grooved shaft abraders, forked-pole hogans, and formalized house and site layouts. He describes the hogans as being constructed in shallow polygonal pits and having a substantial earth covering over the forked-pole superstructure with at least one instance of a log-covered entry tunnel. Structure hearths are centrally placed and refuse areas or trash dumps are situated southeast of the structure, while hearth-oriented activity areas are found to the south and/or east.

Clearly the layout of LA 110299 does not correspond to the above pattern. The structure is a simple one with probably a superstructure of brush, although evidence for this is lacking in the archeological record. Similar non–labor intensive structures have been found on both Ute and Navajo sites, especially those of short-term occupation (Brown 1991; Honeycutt and Fetterman 1994; Stiger 1998).

While centrally located hearths appear to be prevalent on many sites, hearth locations have also been found in a variety of locations within a structure (Brown 1991; Hogan and Munford 1992; Honeycutt and Fetterman 1994; Marshall 1985). Thus there appears to be no set patterning for the hearth location.

The same holds true for the extramural activity areas. While most Navajo sites are oriented towards the east, activity areas have been found to the north, northwest, west, and southwest of the structure (Brown 1991; Hogan and Munford 1992; Honeycutt and Fetterman 1994; Marshall 1985). Although the artifact density at LA 110299 is more concentrated in the western activity area, there appears to be a limited use activity area around the second possible hearth, which is located southeast of the structure. A fairly heavy concentration of artifacts was found in Stratum 1 above the east side of structure. If these artifacts washed in from the area to the east, then there could have been a third activity area on the east side of the structure.

The orientation of the site primarily to the west may be a function of the topography rather than a cultural standard. The small structure is built into the slope of a west-facing rise on the terrace, which more than likely influenced the placement of the primary activity area.

The lithic assemblage contained no true diagnostic artifacts. Brown (1991) contends that scrapers are typical Navajo tools, but they have also been found on Archaic sites. Certain assemblage characteristics, such as prepared platforms, bifacial and sharpening flakes, and formal tools, occur in similar proportions in other early Navajo assemblages, but they are more indicative of subsistence strategies than cultural affinity.

The ceramic fragments were eventually all identified as Dinetah Gray. However, the attributes of these fragments fit the published descriptions of both Dinetah Gray and Uncompahgre Brown. Without other trade wares present, the identification could have gone either way. After consultation with various ceramic experts, the unanimous opinion was that these sherds were Dinetah Gray.

Probably the one culturally diagnostic trait was the presence of corn. Farming appears to be more of a Navajo subsistence strategy than a Ute one, as the Utes maintained a more mobile hunting strategy throughout the protohistoric period. Thus, based upon the corn, LA 110299 is probably a short-term habitation site dating to the late Dinetah phase.

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