

MUSEUM OF NEW MEXICO

OFFICE OF ARCHAEOLOGICAL STUDIES

ARCHAEOLOGICAL TESTING RESULTS FROM LA 115218, EAST
OF CAÑADA ANCHA ON THE SANTA FE RANCH LEASE, TAOS
RESOURCE AREA, BUREAU OF LAND MANAGEMENT,
SANTA FE COUNTY, NEW MEXICO

Stephen S. Post, Pamela J. McBride, and Mollie S. Toll

Submitted by
Timothy D. Maxwell
Principal Investigator

ARCHAEOLOGY NOTES 251

SANTA FE

[1999]

NEW MEXICO

ADMINISTRATIVE SUMMARY

In April 1997, the author conducted an archaeological testing project at LA 115218 in Santa Fe County. LA 115218 was an artifact concentration of unknown age with two probable thermal features that were exposed on the banks of an arroyo. The site is on the former Santa Fe Ranch lease land of the Taos Resource Area, Bureau of Land Management, east of Buckman Road along Cañada Ancha.

Archaeological testing was conducted to determine if accidental road construction traffic within the site limit had affected the properties that make LA 115218 potentially eligible for nomination to the *National Register of Historic Places*. Excavation focused on determining the nature, extent, condition, and data potential of any subsurface cultural deposits.

Excavation of a 1 by 1 m test pit and numerous auger test revealed no buried cultural deposit within the site area affected by the construction traffic. Two thermal features, Features 1 and 2, were exposed within the north and south arroyo banks. The exposed fill was removed. A C-14 sample from Feature 2 yielded a calibrated date range of 1660 to 1425 B.C. (2 sigma, 95 percent probability), placing it early in the Late Archaic. Feature 1 could not be dated but appeared to be a Late Archaic-style thermal feature.

Since excavation showed that the buried cultural deposit was not affected by the errant construction traffic and that it was unlikely to extend more than 4 or 5 m beyond the buried thermal features, the site was fenced from traffic for the duration of the construction project. Test excavation did show that LA 115218 was potentially eligible for nomination to the *National Register of Historic Places* under Criterion d (36 cfr 106.4). For this reason, LA 115218 should be afforded continued protection from any future land-disturbing or -altering activities that may be proposed for the general area.

CONTENTS

ADMINISTRATIVE SUMMARY	iii
INTRODUCTION	1
MODERN ENVIRONMENTAL SETTING	3
CULTURAL-HISTORICAL BACKGROUND	5
The Armijo Phase	5
En Medio to Basketmaker II Periods	6
SITE DESCRIPTION	9
LIMITED TESTING PLAN AND EXPECTATIONS	11
Field Methods	11
Summary of Testing Results Expectations	11
TESTING RESULTS	13
Test Pit 1	13
Auger Tests	13
Thermal Features	14
MACROBOTANICAL MATERIALS	19
Methods	19
Results	20
Summary	23
SUMMARY AND INTERPRETATION	25
RECOMMENDATIONS	27
REFERENCES CITED	29
APPENDIX 1: SITE LOCATION INFORMATION	33

Figures

1. Project location map	2
2. LA 115218 site map	9
3. Stratigraphic profile of Test Pit 1	14
4. Feature 1, plan view	15
5. Feature 1	16
6. Feature 2, plan view	17
7. Feature 2	17
8. Site location map (removed from copies for public distribution)	34

Tables

1. Flotation plant remains	20
2. Flotation wood species	20
3. Percent of samples found in comparative carbonized flotation remains from Santa Fe area sites of the archaic and other periods	21
4. Comparative carbonized wood remains from Santa Fe area sites of the Archaic and other periods	22

INTRODUCTION

LA 115218 was identified during the cultural resources inventory for a proposed road right-of-way that will provide access through Bureau of Land Management land to private land owned by the Santa Fe Ranch in Santa Fe County, New Mexico. LA 115218 was considered potentially eligible for nomination to the *National Register of Historic Places* according to criterion d (36cfr 106.4). Because the cultural property was potentially eligible, the access right-of-way was adjusted 25 m to the south of the site to avoid impacting the cultural deposits. Subsequent site inspection identified unauthorized construction traffic 1 to 2 m into the site limits, resulting in disturbed surface soil to a 5 to 8 cm depth. Limited testing was proposed to determine if the accidental road construction traffic within the site limit affected the properties that make LA 115218 potentially eligible for nomination to the *National Register of Historic Places*. Limited testing at LA 115218 was conducted under Cultural Resource Use Permit number 21-2920-96-T, expiration July 8, 1997. The archaeological investigation was funded by the Santa Fe Ranch.

LA 115218 is west of Buckman Road near Diablo Canyon in Santa Fe County (Fig. 1 and Appendix 1). The site is on the Santa Fe Ranch lease of the Taos Resource Area, Bureau of Land Management, in Santa Fe County.

Archaeological testing required 32 person-hours by the author and volunteer crew members Zannie Garcia and Erlinda Campbell of the Santa Fe Ranch, and Roland and Martha Mace, Friends of Archaeology, Museum of New Mexico Foundation, Santa Fe. The project was directed by Stephen S. Post, OAS project director. Timothy D. Maxwell was principal investigator.

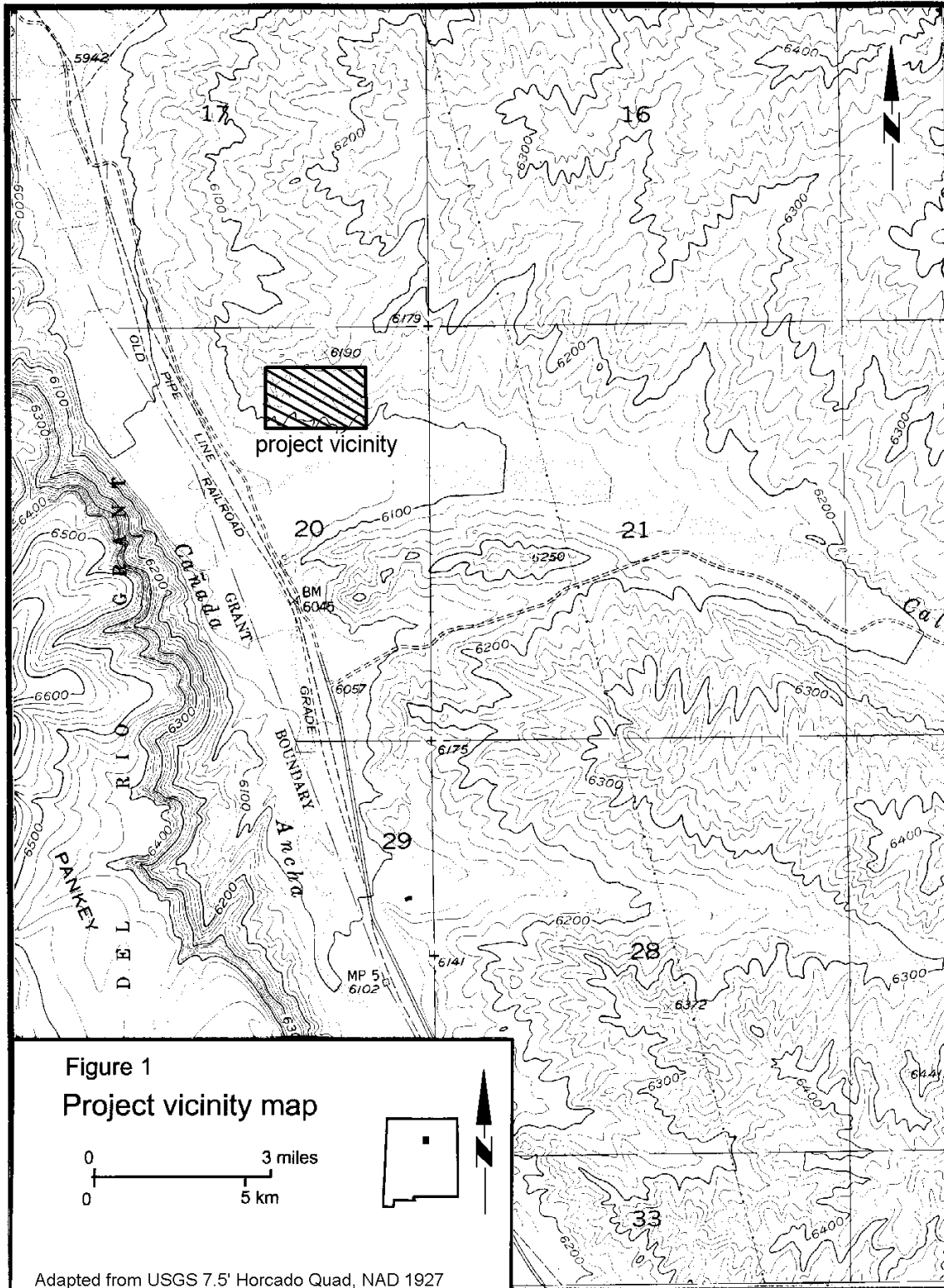


Figure 1
Project vicinity map

0 3 miles
0 5 km



Adapted from USGS 7.5' Horcado Quad, NAD 1927

MODERN ENVIRONMENTAL SETTING

The project area is in the Southern Rocky Mountain physiographic province (Folks 1975:110). The area is at the edge of two physiographic subunits: the westward sloping piedmont, which extends from the foot of the Sangre de Cristo Mountains, and the basalt flows of the lava mesas of the Caja del Rio and Pajarito Plateau.

The topography is dominated by a long east-to-west ridge system bounded on the north by an unnamed primary tributary of Cañada Ancha and on the south by Calabasa Arroyo and its confluence with Cañada Ancha. Cañada Ancha is bounded on the east by the piedmont ridges and hills of the Tewa Basin and on the west by the eastern escarpment of the Caja del Rio. Elevations in the area range from 1,951 m (6,400 ft) in the far east part of Section 16 to 1,829 m (6,000 ft) at the edge of the prehistoric floodplain of Cañada Ancha. The elongated ridge system is heavily dissected with finger-ridges separated by deeply incised channels and gentle swales that provided a sheltered setting for prehistoric occupation.

Alluvial materials consisting of ancient and modern gravel are found in all the arroyos and in slope wash and terrace deposits. Tertiary volcanic deposits, Cenozoic sediments, and Precambrian rock are exposed in surrounding areas and, combined with local alluvium, provide most of the materials needed for prehistoric lithic artifact production. In particular, chert is available in the Ancha formation (Kelley 1980:11-12), and sandstone, siltstone, andesite, basalt, and silicified wood occur in nearby formations (Hannaford 1986:4). Small amounts of obsidian are found scattered along the basalt-capped mesas to the west (Kelley 1980:12). The primary obsidian source for the study area was probably the Jemez Mountains.

Soils are of the Pojoaque-rough broken land complex (Folks 1975:43). The complex is 50 percent Pojoaque sandy clay loam and 40 percent rough broken land. The remaining 10 percent includes Panky, Fivemile, and Bluewing soils. The latter two series occur in the floodplain of the primary arroyos. Pojoaque soil is moderately permeable and prone to severe erosion, and it occurs in the west portion of the Section 17 parcel and in the north one-quarter of Section 16. Rough broken land consists of steep shallow soils on ridges and mesas that are broken by intermittent drainages. The surface soil is sandy to sandy loam with deep colluvium at the base of the escarpments. This describes most of the soil and depositional environment within the project area.

The biotic community is part of the Plains and Great Basin grassland (Brown 1982). This community is dominated by juniper, piñon, rabbitbrush, grama grass, cholla, and prickly pear cactus. Regional fauna include desert cottontail, black-tailed jackrabbit, and Gunnison's prairie dog. Kelley (1980) provides a complete list of flora and fauna found in the area.

The area has a semiarid climate. Most of the local precipitation occurs as intense summer thunderstorms that produce severe runoff and little usable moisture. The area receives an average of 229 to 254 mm of precipitation per year and a mean snowfall of 356 mm (Kelley 1980:112). The growing season ranges from 130 to 220 days and averages 170 days. The last spring frost usually occurs in the first week of May, and the first fall frost occurs around the middle of October. The mean yearly temperature is 10.5 degrees C.

CULTURAL-HISTORICAL BACKGROUND

A general cultural-historical overview was provided in the archaeological inventory report and will not be reproduced here (Post 1996b). The interested reader is referred to other general references such as Peckham (1984), Cordell (1979), and Stuart and Gauthier (1981). This overview will briefly focus on the Late Archaic period (1800 B.C. to 1 A.D.), which coincides with the C-14 sample recovered during the test excavation.

In the northern Southwest, the Archaic period (5500 B.C. to A.D. 400 or 600) is generally described in terms of two major material culture traditions: the Oshara Tradition (Irwin-Williams 1973) and the Cochise Tradition (Sayles 1983). These traditions are characterized by a hunting and gathering adaptation based on seasonal availability of critical resources, such as edible plants, game animals, and water. They are divided into phases or stages based on temporal changes in material culture, site structure, and settlement patterns. The Oshara and Cochise phases are generally recognized by temporally diagnostic projectile point styles.

In the upper Middle Rio Grande, sites with projectile points that are similar to Oshara and Cochise commonly occur (Lang 1977; Thoms 1977; Post 1996a). Early and Middle Archaic period materials are similar to the Jay (5500 to 4800 B.C.), Bajada (4800 to 3200 B.C.), and San Jose (3200 to 1800 B.C.) phases of the Oshara Tradition (Irwin-Williams 1973). The late Archaic-Basketmaker II period materials are defined by the Armijo (1800 to 800 B.C.) and En Medio (800 B.C. to A.D. 1) phases of the Oshara Tradition (Irwin-Williams 1973) and the Chiricahua (6000 to 1000 B.C.) and San Pedro (1000 B.C. to A.D. 1) stages of the Cochise Tradition (Sayles 1983). The following discussion focuses on the Armijo and En Medio phases of the Late Archaic period.

The Armijo Phase

The Armijo phase is dated between 1800 and 800 B.C. based on sites excavated in the Middle Rio Puerco River Valley (Irwin-Williams 1973). During the Armijo phase there were two major changes in settlement and subsistence. Settlement patterns showed the first evidence of seasonal aggregations as indicated by the dense and extensive occupation floors at the Armijo shelter (Irwin-Williams 1973:10). A change in subsistence is evidenced by the first indications of corn use and the presence of a stone tool kit that exhibited a wider selection of plant processing implements. The temporal indicator is the Armijo-style projectile point, which has an ovate blade with shallow corner notches and a concave or slightly indented base.

Locally, the best evidence for Armijo phase occupation is from the margins of the Santa Fe River, near the Santa Fe Airport at Tierra Contenta (Schmader 1994) and along Airport Road (Post in prep. a). The data from the Tierra Contenta and Airport Road sites suggest that during the Armijo phase in the Santa Fe drainage there were repeated seasonal occupations by small groups that coincided with the availability of abundant subsistence resources. Different occupation patterns are evidenced by shallow pit structures or dense clusters of hearths, roasting pits, and processing and discard areas. Sites with pit structures show evidence of generalized subsistence (Schmader 1994). Wood charcoal from pit structures and associated features yielded calibrated two-sigma date ranges between 1930 and 830 B.C. The tightest cluster of dates indicate occupations during the ninth and tenth centuries B.C. (Schmader 1994:92). The Airport Road site, LA 61282, had a cluster of 30 thermal and processing features and a high density biface manufacture discard area (Post in prep. a). Faunal remains indicated hunting and processing of deer and antelope at different times between the twentieth and fifteenth centuries B.C. The clustered spatial distribution of these sites indicates that a periodic, semipermanent water source was available. The occurrence of these sites suggest Armijo populations regularly moved in and out of the Santa Fe area. Site clusters were near water sources

and juniper grass plains and at the edge of the higher elevation piedmont.

En Medio to Basketmaker II Periods

Between 800 B.C. and A.D. 400-600, during the En Medio to Basketmaker II periods in the northern American Southwest, important changes in settlement patterns and subsistence strategies are recognized in material culture and subsistence data, site structure, and site distributions. Changes in mobility and the gradual adoption of cultigens were the strongest conditioners of settlement and subsistence strategies (Wills 1988; Vierra 1985). As a result of a less mobile lifestyle and an increased dependence on cultigens, occupation duration increased, technological organization focused more on expedient tool manufacture, and more formal facilities such as pit structures and storage pits were constructed (Vierra 1990; Stiger 1986; Fuller 1989; Irwin-Williams 1973; Schmader 1994). Chipped stone technology, which was dominated by biface manufacture before the En Medio phase, included increasingly greater evidence of local raw material use and manufacture of expedient or less formal tools (Kelly 1988; Andrefsky 1994). To date, how and when these changes occurred in the upper Middle Rio Grande Valley is poorly understood because of the small number of excavated sites with reliable absolute dates. Currently, most explanations and interpretations of upper Middle Rio Grande settlement and subsistence patterns rely heavily on the data from the Middle Rio Puerco Valley (Irwin-Williams 1973; Biella 1992).

The late Archaic-Basketmaker II site survey data for the Santa Fe area are presented in Post (1996a). They are all open-air sites consisting of lithic artifact scatters with or without hearth complexes or fire-cracked rock concentrations. Site clusters in the Airport Road area (Hannaford 1986; Schmader 1994), southwest of Santa Fe, along the Cañada de los Alamos to the south of Santa Fe (Lang 1992) and along the Santa Fe River, suggest that certain lowland locations were repeatedly occupied for short periods by small groups over a long period of time. Basketmaker II sites are reported in all environmental zones from the Santa Fe River Valley to the foothills of the Sangre de Cristo Mountains. This distribution suggests that late Archaic-Basketmaker II populations exploited resources available in all environmental zones. Because the Santa Fe River Basin and the surrounding montane and piedmont environments offer considerable resource diversity, it is possible that late Archaic-Basketmaker II groups were the first to occupy the area year round. A vertical mobility pattern was suggested by Chapman (1980) from the Cochiti Dam and Reservoir data. This spatially less extensive settlement pattern is in direct contrast to large area mobility patterns suggested for San Juan Basin Late Archaic-Basketmaker II populations (Elyea and Hogan 1983; Vierra 1990; Fuller 1989).

Most of the sites from the Santa Fe area were identified as limited or temporary base camps and limited activity sites. Characteristics typical of these two site types are little or no processing facilities and equipment, a low density artifact scatter or small artifact cluster, and very few unbroken tools. Brief occupation is suggested by low artifact counts and limited artifact variability. A number of characteristics that would suggest longer, more permanent settlement are lacking from the survey data. Facilities and equipment are usually associated with longer occupations or planned reoccupations (Binford 1980; Vierra 1980; Elyea and Hogan 1983; Camilli 1989; Nelson and Lippmeier 1993). Formal tools are minimally reported and can be considered personal gear, which was highly curated and rarely deposited at limited activity sites (Binford 1979; Kelly 1988). Reuse of a limited base camp or activity area may result in overlapping or refurbishment of features and a higher artifact density (Camilli 1989). Reoccupation may result in a more scattered feature and artifact distribution, but higher artifact counts. Most sites exhibit low surface artifact density with evidence of multiple occupations resulting in spatially extensive sites with low artifact densities.

Excavations in the last five years have furnished evidence for longer duration occupation and

common evidence of reuse or reoccupation of desirable locations. Pit structures have been excavated within the Tierra Contenta area (Schmader 1994:83-88), along the Arroyo Gallinas and Arroyo de las Trampas, north of the Santa Fe River (Post 1998), and in the Santa Fe-Tesuque divide (Post in prep. b). These shallow, roughly circular, basin-shaped structures often have intramural hearths, sometimes with multiple remodeling episodes, a suite of extramural roasting pits and hearths, and at LA 61315 (Post in prep. b) and LA 61286 (Post 1998) well-defined discard areas containing charred bone fragments, core reduction and tool manufacture debris, and abundant fire-cracked rock. Increased attention to placement of activity and discard areas reflects longer occupation and perhaps organization that facilitated annual or semiannual reoccupation. These sites have yielded radiocarbon dates ranging between 200 B.C. and A.D. 200. Excavations of pit structures in the Tierra Contenta and Las Campanas areas suggest that seasonal occupation of pit structures may have continued in the A.D. 800 or 900s, before full-scale year-round sedentism became the occupation pattern in the northern Rio Grande (Post 1996a; Schmader 1994).

From the Santa Fe Ranch inventory, 9 of the 15 sites had at least one component that could date to the Late Archaic period (Post 1996b:51). These sites have charcoal stains that may be remains of burned structures, hearths, and refuse areas. Low artifact frequencies and densities occur but can be attributed to the buried context of the deposits. Repeatedly, these sites are on moderate to gentle south, southwest, west, and northwest facing slopes. These slopes have natural swales or benches that provide shelter and differential solar exposure that may have been adjusted depending on the season. The sites are exposed by erosion channels that have cut through features and deposited ground stone in the drainages. Most of the nine sites have grinding implements and almost no evidence of hunting or gearing up for hunting. This pattern strongly suggests a subsistence strategy focused on plant gathering or processing. The unexpectedly high frequency of late Archaic sites combined with the unusually high occurrence of ground stone artifacts as isolated occurrences suggests heavy use of this area by hunting and gathering populations. The low occurrence of Archaic period sites on the Pajarito Plateau and at the western edge of the Tewa Basin seems to be a reflection of survey coverage and not past human occupation. The Santa Fe Ranch survey demonstrated that Archaic period sites are abundant, but buried.

SITE DESCRIPTION

LA 115218 is at 1,884 m (6,180 ft) on the gentle sloping terrace above the north floodplain of the Calabasa Arroyo, which is 60 m to the south. The gentle slope is southwest-facing. The soils are a mixed eolian and colluvial deposit of highly erodible sandy-gravelly loam. The juniper-piñon overstory is moderate with a sparse to moderate density grama grass cover.

LA 115218 is truncated by a drainage channel that has exposed and removed a substantial portion of the buried cultural deposit. The artifacts and deposit exposed on the channel banks will be washed away in the near future. The remaining cultural deposit is buried and should be relatively intact.

LA 115218 is an artifact scatter associated with a hearth and a buried cultural deposit on Bureau of Land Management land within the Taos Resource Area. The artifact scatter and hearth occur within an area measuring 30 m east to west by 25 m north to south (Fig. 2). The artifact scatter of five artifacts includes a tabular basalt basin metate on the west erosion channel bank, a burned rabbit long bone underneath the basin metate, two heat-treated chalcedony core flakes, and a small fragment of a vesicular basalt metate on the surface above the east bank of the channel. The hearth is a charcoal-stained 7 to 10 cm thick deposit of undetermined size. All artifacts visible in the channel cut are within 4 m of the channel edge. The cultural deposit is buried 40 to 60 cm below the modern ground surface and is evidenced by charcoal-stained soil.

The buried cultural deposit has been severely affected by erosion. The fact that some intact

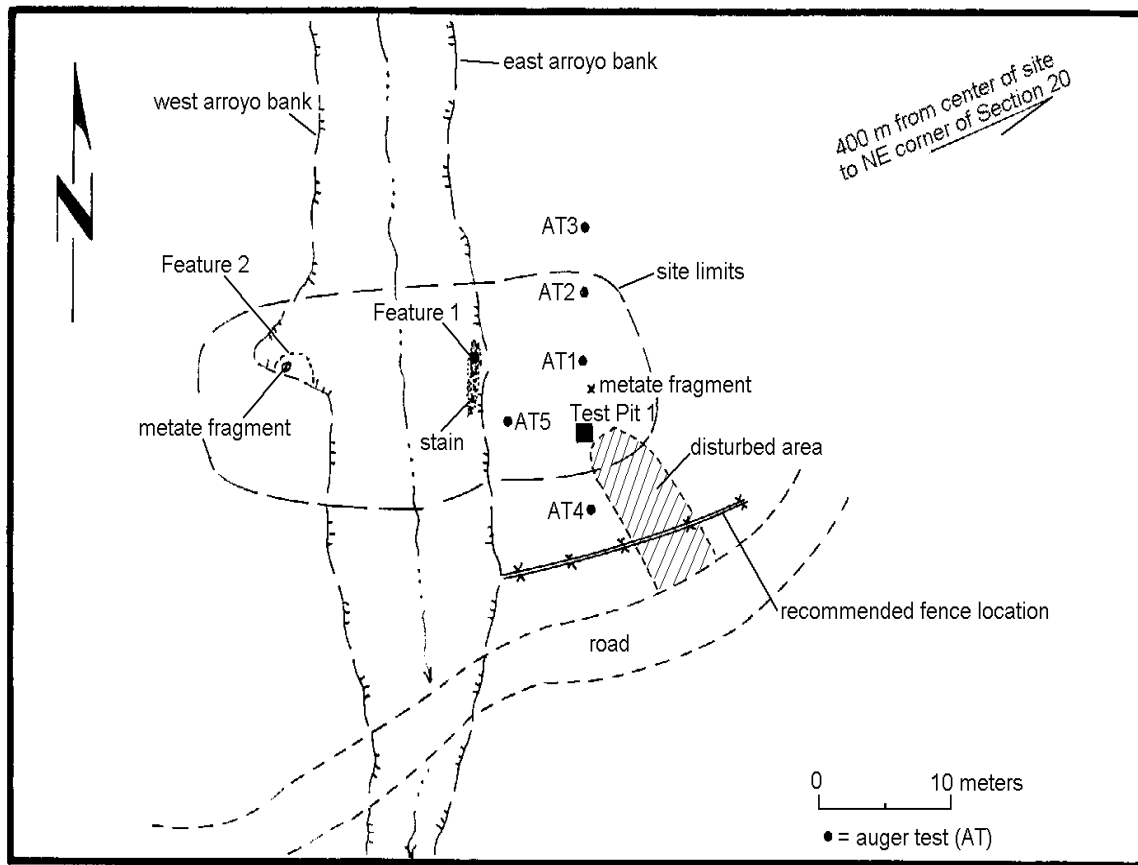


Figure 2. LA 115218 site map.

material remains indicates that it was a substantial cultural deposit accumulated from an intensive occupation. The 40 to 60 cm depth below the modern ground surface of the cultural deposit and the

presence of trough metate fragments, burned animal bone, and a lack of ceramics strongly suggest an Archaic period occupation. Grinding implements and faunal remains would be expected from a base camp rather than a limited-activity occupation.

LIMITED TESTING PLAN AND EXPECTATIONS

The purpose of the limited testing is to determine if properties that contribute to LA 115218's potential eligibility to the *National Register of Historic Places* have been affected by the unauthorized construction vehicle traffic. Additional data relating to site age, depth, and extent will be collected to provide a basis for future BLM management and protection of the cultural property.

Field Methods

LA 115218 has two subsurface charcoal-stained soil concentrations associated with artifacts and fire-cracked rock exposed at a 40 to 60 cm depth, on the banks of a 5 to 9 m wide arroyo. Two heat-treated chalcedony core flakes and a vesicular basalt metate fragment occur on the surface in the eastern site area. The unauthorized construction vehicle traffic came within 5 m of the vesicular basalt metate fragment but did not impact the cultural deposits exposed in the arroyo bank. Limited testing was intended to determine if cultural deposits extended into the area affected by unauthorized construction traffic.

To determine if the cultural deposits extend to the east of the arroyo bank, a 1 by 1 m unit was placed where the tire tracks extend into the site area. Excavation through the deposit provided a soil profile that exposed the depth of the cultural deposit and its relationship to natural stratigraphic layers. Hand excavation was conducted in 10 cm levels with all soil screened through 1/4 inch steel mesh. Only one lithic flake was recovered, and there was no other evidence of a buried deposit, so sample collection was unnecessary. The excavated profile was recorded with a scale drawing and a description of the soil that included the color, texture, content, and nature of the cultural materials.

Additional information on the extent of the cultural deposit was obtained through systematic but limited auger testing. Five auger tests were placed at 4 m intervals radiating out in cardinal directions from the test unit. The soil types and depths were recorded. Starting and ending depth of the cultural deposit were recorded and used to more accurately define the natural stratigraphy.

The artifacts that were exposed in the arroyo banks were collected for permanent curation at the Museum of New Mexico, Archaeological Research Collections Unit. Because no charcoal suitable for C-14 dating was recovered from the 1 by 1 m unit, a 2 to 5 liter soil sample that included charcoal or charcoal-impregnated soil was collected from the two thermal features exposed on the arroyo banks. These samples were dry-screened in the laboratory, and the charcoal was culled for C-14 dating. The remaining soil was processed for ethnobotanical analysis.

Upon completion of the excavation, the site was transit-mapped from a permanent datum showing the excavation unit and auger test locations, the location of the exposed cultural deposits, and the location of the site relative to the road construction. The excavation unit and auger tests were backfilled.

Summary of Testing Results Expectations

Archaeological testing was expected to provide information on the spatial extent of the cultural deposit at LA 115218. This information will be used to protect the site during future road construction activities. The excavation unit and auger tests should provide information on the depth and horizontal extent of the cultural deposit. From this information, the site buffer may be extended, and location of temporary fencing decided. Cultural materials recovered from the test excavation may provide better site dating, and by extension, may help to interpret other buried cultural deposits in the Cañada Ancha–Caja del Rio area. Recovered artifacts may provide preliminary indications of site function and Archaic or Pueblo mobility patterns.

TESTING RESULTS

Archaeological testing included the excavation of a 1 by 1 m test pit; placement of five auger tests in the disturbed area and adjacent to the exposed, buried cultural deposit in the east arroyo bank; and the recovery of samples from the two exposed, subsurface thermal features (Features 1 and 2). The results will be divided into data collected from the test pit, auger tests, thermal features, and artifact collections.

Test Pit 1

Test Pit 1 was placed at the far edge of the mechanical disturbance on a north-south axis at 12 degrees east of magnetic north (Fig. 2). Test Pit 1 was surface-stripped to 5 cm below the modern ground surface and then excavated in 10 cm levels to 65 cm below the modern ground surface. At 65 cm below the modern ground surface, hand excavation was halted because no cultural materials were encountered. This ending depth was 15 cm below the bottom of Feature 1 and 71 cm below Feature 2 as determined by transit mapping. An auger test placed in the bottom of Test Pit 1 was bored to 135 cm below the modern ground surface, yielding no cultural materials.

The soil within Test Pit 1 reflected an active geomorphological history (Fig. 3). Stratum A was a 10 to 36 cm thick clay sandy loam with 2 percent intrusive pea gravel that represents a modern or recent deposit. A single angular debris fragment of brown chert was recovered from Stratum A. It may mark the perimeter of the cultural deposit. Stratum B was a coarse water-deposited sand with 20 percent pea gravel. This stratum represents a filled-in, and probably shallow, erosion channel that once cut through the site. This channel cut extended to 56 cm below the modern ground surface. No evidence of a cultural deposit was visible in this stratum. Stratum C was a coarse sandy colluvial deposit that probably originated from the ridge slope to the north and west. This deposit extends uninterrupted to a depth of 135 cm below the modern ground surface. No cultural materials were observed. Stratum D was an intrusive tongue of alluvial coarse sand and pea gravel that was 10 cm thick. Stratum D was visible in the test pit east wall. It represents an relatively recent erosion episode. Basically, Test Pit 1 exhibited characteristics of a lower hill slope that has been subjected to periodic erosion and aggradation.

The lack of a buried cultural deposit indicated that it was less extensive than was initially estimated. From the test pit excavation, it is clear that the cultural deposit is more closely associated with the thermal feature (Feature 1) exposed in the east arroyo bank.

The chipped stone artifact recovered from Stratum A was a brown chert piece of angular debris with 20 percent dorsal cortex. It measured 20 mm long by 15 mm wide by 12 mm thick. This would remain from early stage core reduction, or it may be a spall from a chert nodule hammerstone. The relatively high stratigraphic position suggests that it may not be contemporaneous with Feature 1.

Auger Tests

Five auger tests were placed at 4 m intervals radiating out from Test Pit 1 (Fig. 2). Four of the five auger tests confirmed the depositional history revealed in Test Pit 1. They revealed a continuous colluvial deposit at least 95 to 114 cm thick and consisting of Strata A and B (Table 1). None of these auger tests yielded evidence of a cultural deposit.

The fifth auger test, 4 m west of Test Pit 1, confirmed the presence of a rich organic deposit extending at least 2 m from the east arroyo bank. No charcoal or artifacts were recovered from this 25 cm thick deposit, which occurred from 50 to 75 cm below the modern ground surface at a level

commensurate with Feature 1. The charcoal-stained soil within the dark gray to dark brown sandy loam lacked artifacts but could have resulted from thermal feature maintenance or processing activities, or it may be a smear from general domestic activities and has been deflated and spread by erosion. This cultural stratum does not occur in the other auger tests and is therefore spatially restricted. Its presence suggests that a narrow strip of intact cultural deposit may remain along the east edge of the arroyo but well outside any area that might be affected by future construction.

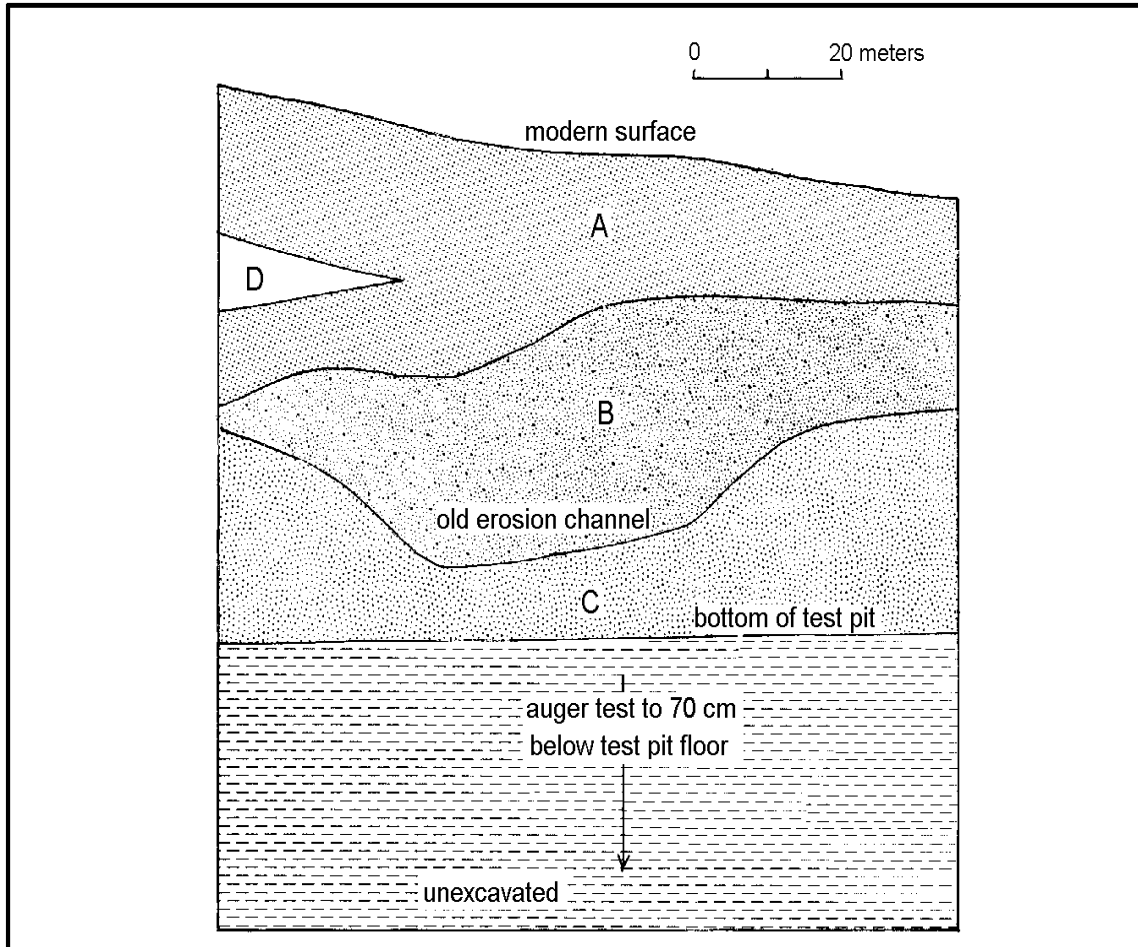


Figure 3. Stratigraphic profile of Test Pit 1.

Thermal Features

Test Pit 1 and the auger tests did not yield datable or retrievable cultural materials. Therefore, the two charcoal-infused stains exposed in the east and west arroyo banks were partly excavated to collect samples for paleobotanical analysis and radiocarbon dating. Each stain was cleared of mixed overburden, and a 2 to 3 liter soil sample was collected. The sample collection revealed that most of the interior fill had washed out of the features.

Feature 1 is a cobble- or rock-lined hearth in the east arroyo bank (Figs. 4 and 5). The rocks were heavily burned and stained, and the feature fill was black, but no charcoal was observed. Feature 1 is 58 cm below the top of the east arroyo bank. It measures an estimated 60 cm in diameter and 18 cm deep. The feature was abandoned and covered by Stratum 1, as in Test Pit 1. A single long bone fragment from a small or medium-sized mammal was culled from the flotation sample. The bone is lightly burned, indicating it was discarded into a low temperature part of the hearth. Ethnobotanical

analysis of a 3 liter sample yielded three charred goosefoot seeds. The primary identified fuel wood was juniper. The age of this feature is unknown. The hearth elevation is 56 cm lower than that of Feature 2, which may reflect original site topography or an older, more deeply buried component. Limited testing could not resolve which possibility was more likely.

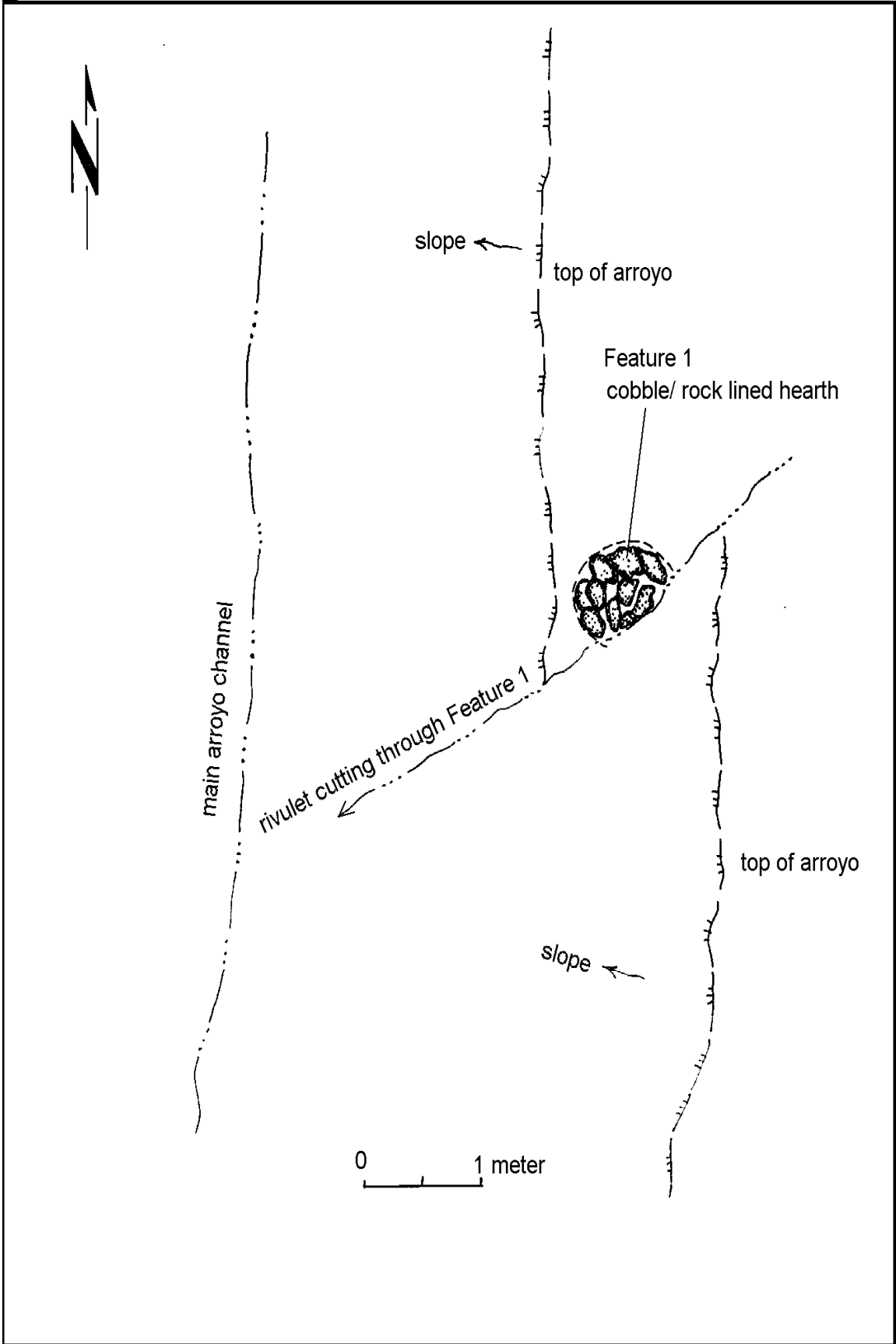


Figure 4. Feature 1, plan view.



Figure 5. Feature 1.

Feature 2 is an unlined hearth or thermal feature exposed in the west arroyo bank. It is 50 cm below the top of the arroyo bank. Seven fragments of a tabular basalt slab metate occur on the slope below the feature, and another fragment is embedded in the arroyo bank at the same elevation (Figs. 6 and 7). Feature 2 may have been oval-shaped and at least 40 cm wide and 20 cm deep. A vesicular basalt slab is embedded in the arroyo bank on top of Feature 2 and may have been placed on top of the feature when the site was abandoned. Feature 2 fill was dark gray brown to black and contained charcoal that yielded sufficient charcoal for radiocarbon dating. The C-14 sample was subjected to Accelerated Mass Spectroscopy (AMS) because the sample weight was less than .02 g. Analysis yielded a cal BC 1605 to 1490 (2 sigma, 5 percent probability) date range. This places tree death and fuel use secularly in the Armijo phase and certainly no later than the eleventh century B.C.

Ethnobotanical analysis of 3 liters of fill yielded one unidentified charred plant part. The predominant identified fuel wood was piñon, in contrast with Feature 1 fuel, which was predominantly juniper.

Flotation also yielded 10 tiny small to medium-sized animal bone fragments. These angular fragments remain from meat and marrow processing, which on late Archaic sites often leaves only micro-fragments of burned bone. Seven bone fragments were lightly to moderately burned, suggesting they were discarded into a dying fire. Three bone fragments are calcined and were probably discarded into the more active part of the thermal feature. It is possible that the differentially burned fragments reflect two consumption episodes.

One heavily patinated piece of fine-grained chert angular debris was recovered from the hearth

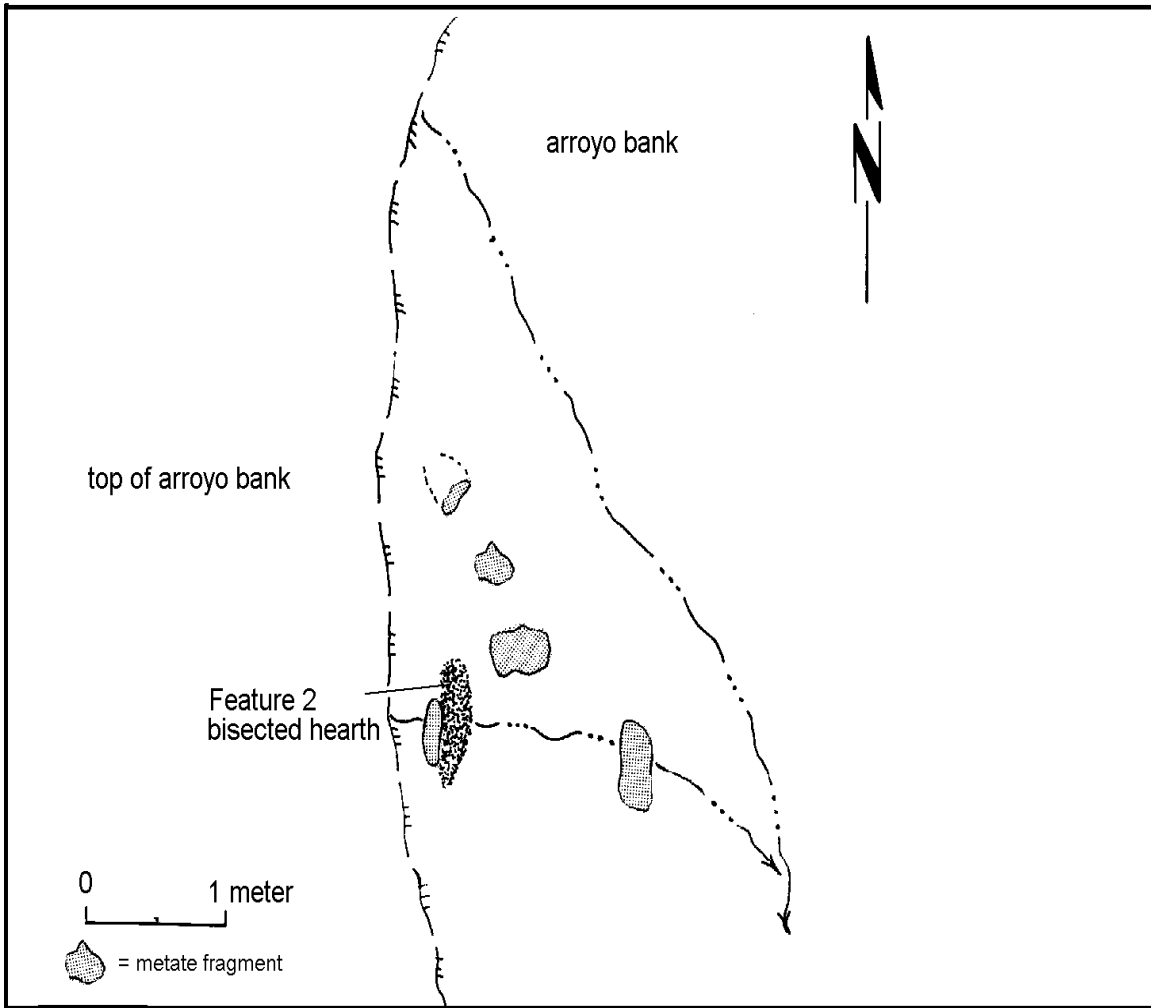


Figure 6. Feature 2, plan view.

fill. It is likely that the material originated in the Rio Grande axial gravel of the Santa Fe formation. It measures 18 by 16 mm by 8 mm thick. It is not heat fractured and therefore may have been swept or tossed into the pit during maintenance activities.

The eight loose tabular basalt metate fragments were collected and their locations were plotted relative to Feature 2. These eight fragments were partly burned and had spalled exteriors. Seven fragments were from the edge, and one fragment was internal. Together they weighed 26.2 kg. The internal fragment had a slight basin shape and was lightly ground. This metate did not exhibit heavy wear and may have served multiple purposes as indicated by the burned and spalled exterior. The tabular basalt is abundant on the slopes of the Caja del Rio and is found scattered throughout the ridges east of Cañada Ancha.



Figure 7. Feature 2.

MACROBOTANICAL MATERIALS

Pamela J. McBride and Mollie S. Toll

Flotation samples were examined from two features at LA 115218. A C-14 sample was also analyzed, and the conifer wood identified yielded a calibrated date of 1660 to 1425 B.C. , indicating the features are probably associated with the early part of the Late Archaic time period.

Previous studies in the Santa Fe area from similar occupation periods include the Tierra Contenta (Schmader 1994) and Airport Road (Post in prep. a) projects. Cultural plant remains from Airport Road were meager and difficult to interpret, consisting of one unidentifiable seed and two piñon nutshell fragments. The results from Tierra Contenta (Schmader 1994:12-14) were much more fruitful and document a broad-based subsistence regime, in which a rich array of weedy annual, grass, and perennial seeds were exploited. The data from both sites suggest that during the Armijo phase of the Archaic, seasonal occupations of the southwestern edge of the city along the Santa Fe drainage were taking place. Small groups moved in and out of the area, exploiting faunal and floral resources during times of resource abundance.

The presence of ground stone artifacts at most of the nine sites surveyed at Santa Fe Ranch suggests a plant-based foraging or processing economy (Post 1996b). During test excavations, eight fragments of a tabular basalt slab metate were found in association with the Feature 2 hearth, and a vesicular basalt slab was embedded in the arroyo bank on top of Feature 2. These artifacts seem to support the idea of a plant-based foraging economy. However, charred and partially charred bone fragments were also recovered during testing, indicating that plant processing was certainly not the only activity that took place during the use of the two thermal features.

Plant resources would have derived from the Plains and Great Basin grassland biotic community (Brown 1994) where the site is situated. Juniper and piñon are the dominant arboreal species and the most common understory taxa are four-wing saltbush, snakeweed, rabbitbrush, grama grass, cholla and prickly pear cactus.

Methods

The two soil samples collected during excavation were processed at the Museum of New Mexico's Office of Archeological Studies by the simplified "bucket" version of flotation (see Bohrer and Adams 1977). Each sample was immersed in a bucket of water and a 30-40 second interval allowed for settling out of heavy particles. The solution was then poured through a fine screen (about 0.35-mm mesh) lined with a square of "chiffon" fabric, catching organic materials floating or in suspension. The fabric was lifted out and laid flat on coarse mesh screen trays, until the recovered material had dried. Each sample was sorted using a series of nested geological screens (4.0, 2.0, 1.0, 0.5-mm mesh) and then reviewed under a binocular microscope at 7-45x.

From each flotation sample, a sample of 20 pieces of charcoal was identified (10 from the 4 mm screen and 10 from the 2 mm screen). Each piece was snapped to expose a fresh transverse section and identified at 45x. Charcoal specimens examined prior to submission for radiocarbon dating were examined in the same fashion, but selection was adapted to securing a minimal sufficient sample (the objective was 5 g) with the fewest pieces, rather than aiming to examine both large and small pieces. However, the charcoal was very fragmented, requiring the examination of all pieces to get the small number of grams (1.2) that were submitted for carbon-14 dating. Low-power, incident-light identification of wood specimens does not often allow species- or even genus-level precision but can provide reliable information useful in distinguishing broad patterns of utilization of a major resource class.

Results

Three charred goosefoot seeds and an unidentifiable plant part were the only cultural remains recovered from Features 1 and 2 (Table 1). In addition to the unknown plant part, four uncharred taxa were recovered from Feature 1, including goosefoot, purslane, hidden flower, and spurge. The two weedy annual taxa produce myriad tiny seeds that disperse broadly across the landscape. Spring greens and seeds of goosefoot and purslane have been widely utilized for food, but spurge and hidden flower have little nutritive value. Medicinal uses of spurge (Krenetsky 1964:45) and hiddenflower (Stevenson 1915:45; Whiting 1966:88) have been documented, but it is more likely that all of the uncharred seeds identified from the project result from natural deposition and not use.

Table 1. Flotation Plant Remains

Feature	FS 1 Feature 1, Hearth (East Side Arroyo)	FS 2 Feature 2, Hearth (West Side Arroyo)
CULTURAL		
Annuals: <i>Chenopodium</i> goosefoot		3*
Other: Unknown	1 plant part*	
NONCULTURAL		
Annuals: <i>Chenopodium</i> goosefoot	7	
<i>Portulaca</i> purslane	3	
Other: <i>Cryptantha</i>	2	
<i>Euphorbia</i> spurge	1	

Note: Plant remains are seeds unless indicated otherwise.

* = charred; + = 1-10 / liter.

Charcoal identified from flotation and C-14 samples was predominately coniferous, with only two unknown nonconifer fragments recovered (Table 2). Piñon, juniper, pine, and unknown conifer were identified. When charcoal specimens had resin ducts but were too fragmentary to identify to species, they were placed in the genus *Pinus*. Those specimens recorded in the unknown conifer category were too small to determine the presence or absence of resin ducts and could be pine or juniper. The majority of the charcoal fragments were placed in the unknown conifer category, emphasizing the fragmentary nature of the charcoal from the site.

Table 2. Flotation Wood Species (pieces/weight in grams)

Feature	FS 1 Feature 1, Hearth (East Side Arroyo)	FS 2 Feature 2, Hearth (West Side Arroyo)
CONIFERS:		
<i>Juniperus</i> juniper	4/.1	
<i>Pinus</i> pine	6/.1	
<i>Pinus edulis</i> piñon		3/<.1
Unknown conifer	8/.1	17/.1
NONCONIFERS:		
Unknown nonconifer	2/<.1	
Total	20/	20/

Discussion and Summary

Poor preservation or site function could have affected the recovery of scant botanical remains at LA 115218. In the past, the meager recovery of plant remains from flotation samples has been attributed to poor preservation. Dean (1993a, 1993b) has suggested that the disappointing recovery of plant remains from ephemeral sites encountered in the Santa Fe area may be a reflection of site function rather than poor preservation, but that these sites were an important component in the regional use of the landscape prehistorically. Smaller, ephemeral sites, like most of those encountered at Las Campanas, could have been used when in transit from one location to another or during the collection of wild plants or other resources which were then carried back "home" to be processed.

Table 3. Percent of Samples Found in Comparative Carbonized Flotation Remains from Santa Fe Area Sites of the Archaic and Other Periods

Project/Site	No. of Samples	Annuals	Grasses	Trees	Other Perennials	Cultivars
ARCHAIC: Airport Road	17	Undetermined 6%		<i>Pinus edulis</i> nutshell (macrobotanical sample)		
Tierra Contenta ¹	40	<i>Amaranthus</i> 3% Cheno-am 30% <i>Chenopodium</i> 50% <i>Corispermum</i> 8% <i>Portulaca</i> 10% <i>Croton</i> 3%	Gramineae 3% <i>Sporobolus</i> 5%	<i>Juniperus</i> seeds 30%, twigs 25% <i>Pinus edulis</i> nutshell 3%, umbos 8%	<i>Platyopuntia</i> 3% <i>Opuntia</i> 3%	
LATER SITES: Agua Fria ²	5	Cheno-am 80% <i>Chenopodium</i> 40% <i>Portulaca</i> 20% <i>Cycloloma</i> 20% <i>Cleome</i> 20% Undetermined 40%	Gramineae 20%	<i>Juniperus</i> twigs 100% <i>Pinus</i> needles 80%, nutshell 40%, umbos 60% <i>Pseudotsuga</i> needle 20% <i>Quercus</i> acorn cap 20%	<i>Echinocactus</i> 20% <i>Equisetum</i> stem 20%	<i>Zea</i> 80% (Cucurbita pollen)
Arroyo Hondo ³	174	cheno-am 34% <i>Portulaca</i> 16% <i>Cycloloma</i> 9% <i>Physalis</i> 5% <i>Cleome</i> 5% <i>Helianthus</i> 3%	<i>Oryzopsis</i> 7%	<i>Juniperus</i> berry 1% <i>Pinus</i> nutshell 4%, umbos also present	<i>Echinocereus</i> 10% <i>Mammillaria</i> 2% <i>Opuntia</i> 2% <i>Yucca</i> 3% <i>Prunus</i> 1%	<i>Zea</i> 82% <i>Cucurbita</i> 5% <i>Phaseolus</i> 7%
Dos Griegos ⁴	5			<i>Pinus</i> barkscapes 60%		<i>Zea</i> 40%
Santa Fe Bypass ⁵	3			[unburned <i>Pinus</i> needles]		
UNKNOWN AGE: Santa Fe Bypass ⁵	4			<i>Pinus</i> bark 25% [unburned <i>Juniperus</i> twigs 75%, seeds or berries 50%		<i>Zea</i> 25%
Arroyo Frijoles ⁶	2			<i>Pinus edulis</i> needles 50%, <i>Juniperus</i> scale leaves 50%		

Specimens are seeds unless otherwise specified.

¹McBride 1994

²Cummings 1989

³Wetterstrom 1986: Table 34

⁴Cummings and Puseman 1992

⁵Toll 1989: Table 1

⁶Dean 1993b

Carbonized plant remains recovered from Santa Fe area sites are compared in Table 3. Recovery of cultural botanical materials is generally poor in the earlier sites. Both density and diversity of economic plant remains increase dramatically in sites of the Developmental, Coalition, and Classic periods. Until we explore the differences in preservation between shallow, early sites and deeper, later sites, we're not fully able to distinguish differences in economic adaptation from preservation bias. Cultivars have been recovered to date in the Santa Fe area only from post-Archaic period sites.

From smaller, open sites, crop remains consist simply of low frequency, fragmentary corn. Signs of farming become far more abundant (whole storage rooms stacked knee-deep with burned ears of corn) and diverse (including squash or pumpkin stems, rind, seeds, and flesh, and several hundred beans) in the deep rooms of the large, late pueblo at Arroyo Hondo. This pattern reflects partly a site-type difference in the conditions that allow for the deposition and preservation of more fragile remains, and partly a distinctly greater emphasis on the agricultural basis for sustaining a concentrated human population.

Sites of all periods reflect the desirable food and fuel resources of the ambient piñon-juniper woodland. Juniper seeds, berries, twig fragments, pine nutshell, umbos (conescales), and needles are found at nearly all area sites (less-so at lower elevation Airport Road, where vegetation approaches a Great Basin grassland formation, sacaton-saltbush-juniper association; Donart et al. 1978). Charcoal was collected largely from burn features at these sites and generally represents fuel use (Table 4). We get some insight into availability and selection of construction materials from Arroyo Hondo tree-ring specimens, which show definite signs of depletion of prime construction elements (including ponderosa pine and douglas fir) over time. Age at cutting (and presumably size) decreases from an average of 75 years in the first component to 34 years in the second (Creamer 1993:139). We know from the detailed wood data from Chaco that fuel and construction wood are likely to have wildly different selection trajectories (Toll 1985, 1987; Windes and Ford 1993), so that lumping of wood specimens from all functional contexts at Arroyo Hondo (Creamer 1993: Table 7.1) obscures some important details. Knowing that over 95 percent of the site's juniper specimens come from a single Component II trash lens (likely originating as fuel, not building timbers), it's clear that trends in construction material use over time cannot be read from this single table. With the exception of a tiny fraction of riparian (cottonwood-willow) wood at Dos Griegos, coniferous wood reigns supreme as fuel in all time periods. Even at Airport Road, where present-day junipers and especially piñons are considerably sparser, there is no sign of saltbush use, suggesting that density and duration of population pressure was not sufficient to impact availability of preferred fuel types.

Table 4. Comparative Carbonized Wood Remains from Santa Fe Area Sites of the Archaic and Other Periods

Project/Site	N of Samples (total weight or pieces)	<i>Juniperus</i>	<i>Pinus</i>	Other Species/ Comments
ARCHAIC: Airport Road	12 [27.38g]	38%	54%*	8% undetermined conifer
Tierra Contenta ¹	3	dominant in 2 samples	dominant in 1 sample	
LATER SITES: Agua Fria Schoolhouse ²	4	dominant in 2 samples; codominant in 1	dominant in 1 sample; codominant in 1	
Arroyo Hondo ³	[1108 pieces]	21%	37%*	33% ponderosa pine, 4% Douglas fir, 6% other
Dos Griegos ⁴ [site 283-3]	5 [108 pieces]	18%	80%*	2% Salicaceae
UNKNOWN DATE: Santa Fe Bypass ⁵	2 [40 pieces]	43%	53%*	4% undetermined conifer

* *Pinus edulis* (piñon)

¹McBride 1994

²Cummings 1989

³Creamer 1993:Table 7.1

⁴Cummings and Puseman 1992

⁵Toll 1989: Table 1

Summary

Cultural plant materials at Santa Fe Ranch consisted only of charcoal from hearths, two or three

charred goosefoot seeds, and a single fragmentary and unidentifiable carbonized seed. This paucity of informative plant remains reminds us that preservation of perishables tends to be poor at early sites, especially when they are shallow and disturbed, and that extra effort may be required to recover very low-frequency botanical artifacts. Given generally poorer spatial definition and differentiation in the earlier periods, that extra recovery effort will most likely take the form of larger volumes of soil processed for flotation. Fuel at LA 115218 was wholly coniferous, despite local availability of saltbush and other shrubs, which formed a major segment of fuelwood in areas of the Colorado Plateau and Rio Grande Valley, where conifers are less abundant.

Other Santa Fe area sites show broad similarities regardless of chronological period in the heavy presence of conifers for fuel, food, medicinal, and ceremonial purposes. Valuable perennial resources, including piñon nuts, a variety of cacti, yucca, and one instance of chokecherry, are more prominent (in terms of diversity and ubiquity) than in lower elevation areas of the Southwest. Goosefoot is the most widespread economic annual, with regional appearances of purslane, winged pigweed, and bugseed in the Archaic era, and the addition of beeweed, groundcherry, and sunflower later on. Grasses are limited to *Sporobolus* (dropseed or Alkali sacaton) on the south end of town and Indian ricegrass in the Arroyo Hondo foothills. To date, all evidence of farming derives from the Developmental or later periods in the Santa Fe area.

SUMMARY AND INTERPRETATION

Archaeological testing of LA 115218 was intended to determine the extent, nature, and condition of the cultural deposit and to collect artifacts and samples that would provide baseline temporal and functional information. This information can be used to manage the cultural resource and increase our understanding of prehistoric land use on the western fringe of the Tewa Basin.

Excavation showed that the subsurface cultural deposit was limited to a 4 to 6 m wide zone along the east bank of the arroyo cut. This was primarily determined from Auger Test 5, which revealed a 25 cm thick organic deposit, probably cultural. It occurs at the same depth as the top of Feature 1, and they are probably temporally associated. Test Pit 1 did not yield evidence of a cultural deposit, though a chipped stone artifact was recovered from Stratum A. The artifact and subsurface cultural deposit are probably not related. The subsurface cultural deposit does not extend to the area disturbed by the accidental construction traffic. The site limit along the west arroyo bank was not examined and remains uncertain.

An important aspect of LA 115218 were the two thermal features that were exposed on the arroyo banks. These exposed features are the remains of a buried cultural deposit of unknown age. Sample collection resulted in excavation of the truncated feature remnants, revealing feature morphology and construction and retrieving datable charcoal. Feature 1 could not be dated but is stratigraphically lower than Feature 2. Feature 1 was cobble-lined and is similar to thermal features associated with Late Archaic occupations along the Santa Fe River (Post 1998). This small hearth did contain a single charred animal bone and was at least used to cook meat. Feature 2 was a basin-shaped, unlined thermal feature that contained datable charcoal and charred bone fragments from two small to medium-sized mammals. Associated with Feature 2 were eight fragments from a fire-cracked shallow-basin tabular metate fragments. The ground stone and charred animal bone indicate a wide range of activities were associated with thermal feature use. Charcoal recovered from Feature 2 yielded a date range that corresponds with the middle portion of the Armijo phase or between the eleventh and seventeenth centuries B.C.

Based on the C-14 date, occupation of LA 115218 occurred during the Armijo phase. This date is important because it strongly supports the interpretation that the buried deposits found at the nine sites from the Santa Fe Ranch inventory are also at least of Late Archaic and perhaps Armijo phase age. It is clear from these data that the potential for other buried deposits within the 18,000 acre lease is good. Furthermore, it reemphasizes the fact that these early sites will be buried, probably only recognizable in eroded areas, and that they can only be found through careful examination of arroyo banks and erosion channels. These sites typically have few associated artifacts and therefore may appear as natural or noncultural burns or organic lenses. Evidence from the this project and excavations along the Santa Fe River conclusively show that these subsurface soil stains are cultural and may be at least 3,000 years old.

RECOMMENDATIONS

Test excavation of LA 115218 has been completed. Examination of the subsurface deposits has determined that subsurface cultural deposit identified during the inventory did not extend to the area disturbed by accidental construction traffic. Auger testing indicated that a buried deposit does extend 4 to 8 m east of the arroyo bank but will not be affected by construction traffic. An area greater than the corresponding site limit along the access road has been fenced as a protective measure. This fence should remain in place as long as there is construction traffic.

Test excavation exposed two thermal features and recovered samples that provided functional and temporal information. Features 1 and 2 by association date to the Armijo period of the Oshara Desert Culture tradition. This 1800 to 800 B.C. period appears to have experienced an increased frequency of seasonal settlement and use of the Tewa Basin and northern Rio Grande, in general. The formal construction of the features, combined with evidence of plant processing and meat consumption, reflect a range of activities expected for a limited base camp occupation. The age of the site and the potential of buried intact deposits suggest that LA 115218 is eligible for nomination to the *National Register of Historic Places* under Criterion d (36 cfr 106.4).

REFERENCES CITED

- Andrefsky, William, Jr.
1994 Raw Material Availability and the Organization of Technology. *American Antiquity* 59(1):21-34.
- Biella, Jan V.
1992 *LA 70029: An Archaic Basketmaker II and Coalition Phase Site on the Pajarito Plateau*. SW 266. Southwest Archaeological Consultants, Santa Fe.
- Binford, Lewis R.
1979 Organization and Formation Processes: Looking at Curated Technologies. *Journal of Anthropological Research* 35(3):265-283. University of New Mexico, Albuquerque.
1980 Willow Smoke and Dogs' Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation. *American Antiquity* 45(1):4-20.
- Bohrer, Vorsila L., and Karen R. Adams
1977 *Ethnobotanical Techniques and Approaches at the Salmon Ruin, New Mexico*. San Juan Valley Archeological Project, Technical Series 2. Eastern New Mexico University Contributions in Anthropology 8(1).
- Brown, David E.
1982 Biotic Communities of the American Southwest: United States and Mexico. In *Desert Plants*, vol. 4, nos. 1-4, edited by David E. Brown. University of Arizona for the Boyce Thompson Southwestern Arboretum, Tucson.
- Camilli, Eileen
1989 The Occupational History of Sites and the Interpretation of Prehistoric Technological Systems: An Example from Cedar Mesa, Utah. In *Time, Energy, and Stone Tools*, edited by R. Torrance, pp. 17-26. Cambridge University Press.
- Chapman, Richard C.
1980 The Archaic Period in the American Southwest: Facts and Fantasy. Ph.D. dissertation. Department of Anthropology, University of New Mexico, Albuquerque.
- Cordell, Linda S.
1979 *A Cultural Resources Overview of the Middle Rio Grande Valley, New Mexico*. USDA Forest Service and USDI Bureau of Land Management, Santa Fe and Albuquerque.
- Creamer, Winnifred
1993 *The Architecture of Arroyo Hondo Pueblo, New Mexico*. Arroyo Hondo Archaeological Series 7. School of American Research Press, Santa Fe.
- Cummings, Linda Scott
1989 Pollen and Macrofloral Analysis at LA 2, Agua Fria Schoolhouse Site, Northern New Mexico. In *Limited Excavations at LA 2, the Agua Fria Schoolhouse Site, Agua Fria Village, Santa Fe County, New Mexico*, by Richard W. Lang and Cherie L. Schieck. Southwest Report 216. Southwest Archaeological Consultants, Santa Fe.
- Cummings, Linda Scott, and Kathryn Puseman
1992 Pollen and Macrofloral Analysis at Site 283-3, near Santa Fe, New Mexico. In *Archaeological Excavations at Dos Griegos, Upper Cañada de Los Alamos, Santa Fe*

County, New Mexico: Archaic through Pueblo V, by Richard W. Lang. Southwest Report 283. Southwest Archaeological Consultants, Santa Fe.

Dean, Glenna

1993a Pollen and Flotation Analyses of Archaeological Samples from Estates I, Estates II, and the West Golf Course at Las Campanas de Santa Fe, Santa Fe County, New Mexico. Ms. on file, Southwest Archaeological Consultants, Santa Fe. Archeobotanical Services Technical Series 933.

1993b *Flotation Analyses of Two Archeological Samples from LA 101101 and I.O. 59, Frijoles Survey, Santa Fe County, New Mexico.* Archeobotanical Services Technical Series 934.

Donart, Gary B., Donell Sylvester, and Wayne Hickey

1978 A Vegetation Classification System for New Mexico, U.S.A. In *Proceedings of the First International Rangeland Congress*, pp. 488-490.

Elyea, Janette, M., and Patrick Hogan

1983 Regional Interaction: The Archaic Adaptation. In *Economy and Interaction along the Lower Chaco River*. Edited by Patrick Hogan and Joseph C. Winter. pp 393-402. Office of Contract Archeology and Maxwell Museum of Anthropology, University of New Mexico, Albuquerque.

Folks, James J.

1975 *Soil Survey of the Santa Fe Area, New Mexico.* United States Department of Agriculture, Soil Conservation Service.

Hannaford, Charles A.

1986 *Archaeological Survey of the Tierra Contenta Subdivision, Santa Fe County, New Mexico.* Laboratory of Anthropology Notes 356. Museum of New Mexico, Santa Fe.

Fuller, Steven L.

1989 *Research Design and Data Recovery Plan for the Animas-La Plata Project.* Four Corners Archaeological Project Report Number 15. Complete Archaeological Services Associates, Cortez, Colorado.

Irwin-Williams, Cynthia

1973 *The Oshara Tradition: Origins of Anasazi Culture.* Eastern New Mexico University Contributions in Anthropology 5(1). Portales.

Kelley, N. Edmund

The Contemporary Ecology of Arroyo Hondo, New Mexico. School of American Research, Santa Fe.

Kelly, Robert

1988 The Three Sides of a Biface. *American Antiquity* 53(4):717-734.

Lang, Richard W.

1977 *Archaeological Survey of the Upper San Cristobal Arroyo Drainage, Galisteo Basin, Santa Fe County, New Mexico.* School of American Research Contract Program.

1992 *Archaeological Excavations at Dos Griegos, Upper Cañada de los Alamos, Santa Fe County, New Mexico: Archaic through Pueblo V.* SW 283. Southwest Archaeological Consultants, Santa Fe.

1980

McBride, Pamela

- 1994 Macrobotanical Analysis. In *Archaic Occupations of the Santa Fe Area: Results of the Tierra Contenta Archaeology Project*, by Matthew F. Schmader. Final report to Archaeological Review Committee, City of Santa Fe Planning Department.

Nelson, Margaret C., and Heidi Lippmeier

- 1993 Grinding-Tool Design as Conditioned by Land-Use Pattern. *American Antiquity* 58(2): 286-305.

Peckham, Stewart L.

- 1984 The Anasazi of the Northern Rio Grande Rift. In *New Mexico Geological Society Guidebook, Rio Grande Rift: Northern New Mexico*, edited by W. Scott Baldrige, Patricia Wood Dickerson, Robert E. Riecker, and Jiri Zidek, pp. 275-282. Thirty-fifth Annual Field Conference, New Mexico Geological Society, October 11-13, 1984.

Post, Stephen S.

- 1996a *Las Campanas de Santa Fe Sunset Golf Course, and Estates IV, Estates V, and Estates VII Excavations: Small Sites in the Piñon-Juniper Piedmont North of the Santa Fe River, Santa Fe County, New Mexico*. Archaeology Notes 193. Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

- 1996b *An Archaeological Inventory of 800 Acres of the Midway Pasture for the Santa Fe Ranch and 7.5 Acres of Bureau of Land Management Land, near Diablo Canyon and East of Buckman Road in Santa Fe County, New Mexico*. Archaeology Notes 206. Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

- 1998 Clearance Report for the Northwest Santa Fe Relief Route, Phase 2, Santa Fe County, New Mexico. Submitted to the New Mexico State and Highway and Transportation Department. Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

in prep. a

Excavation of LA 61282, the Airport Road Site, along the Northwest Santa Fe Relief Route, Santa Fe County, New Mexico. Museum of New Mexico, Office of Archaeological Studies, Santa Fe.

in prep. b

Excavation of LA 61315 along the Northwest Santa Fe Relief Route in Santa Fe, New Mexico. Museum of New Mexico, Office of Archaeological Studies, Santa Fe.

Sayles, E. B.

- 1983 *The Cochise Cultural Sequence in Southeastern Arizona*. Anthropological Papers of the University of Arizona, no. 42. Tucson.

Schmader, Matthew F.

- 1994 Archaic Occupations of the Santa Fe Area: Results of the Tierra Contenta Archaeology Project. Submitted to the Archaeological Review Committee, City of Santa Fe, by Rio Grande Consultants, Albuquerque, New Mexico.

Stiger, Mark

1986 Technological Organization and Spatial Structure in the Archaeological Record. Ph.D. dissertation, Department of Anthropology, University of New Mexico, Albuquerque.

Stuart, David E., and Rory P. Gauthier

1981 *Prehistoric New Mexico: A Background for Survey*. Historic Preservation Bureau, Santa Fe.

Thoms, Alston V.

1977 A Preliminary Projectile Point Typology for the Southern Portion of the Northern Rio Grande Region. Master's thesis, Department of Anthropology, Texas Tech University, Lubbock.

Toll, Mollie S.

1985 An Overview of Chaco Canyon Macrobotanical Materials and Analyses to Date. In *Environment and Subsistence of Chaco Canyon, New Mexico*, edited by Frances Joan Mathien. Publications in Archeology 18E, Chaco Canyon Studies. National Park Service, U.S. Department of the Interior, Albuquerque.

1987 Plant Utilization at Pueblo Alto: Flotation and Macrobotanical Analyses. In *Investigations at the Pueblo Alto Complex, Chaco Canyon*, vol. 3, pt. 2, edited by Frances Joan Mathien and Thomas C. Windes. Publications in Archeology 18F, Chaco Canyon Studies. National Park Service, Santa Fe.

Vierra, Bradley J.

1980 A Preliminary Ethnographic Model of the Southwestern Archaic Settlement System. In *Human Adaptations in a Marginal Environment: The UII Mitigation Project*, edited by James L. Moore and Joseph Winter, pp. 351-357. Office of Contract Archeology, University of New Mexico, Albuquerque.

1985 Hunter-Gatherer Settlement Systems: To Reoccupy or not to Reoccupy, That Is the Question. Master's thesis, Department of Anthropology, University of New Mexico, Albuquerque.

1990 Archaic Hunter-Gatherer Archaeology in Northwestern New Mexico. In *Perspectives on Southwestern Prehistory*, edited by P. E. Minnis and C. L. Redman, pp. 57-67. Westview Press, Boulder, San Francisco, and Oxford.

Wetterstrom, Wilma

1986 Food, Diet, and Population at Prehistoric Arroyo Hondo Pueblo, New Mexico. Arroyo Hondo Archaeological Series 6. School of American Research, Santa Fe.

Wills, W. H.

1988 *Early Prehistoric Agriculture in the American Southwest*. School of American Research Press, Santa Fe.