7,000 Years on the Piedmont: Excavation of Fourteen Archaeological Sites along the Northwest Santa Fe Relief Route, Santa Fe County, New Mexico

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Administrative Summary

The Office of Archaeological Studies (OAS), Museum of New Mexico, conducted archaeological excavations of 14 sites along the proposed right-of-way of the Northwest Santa Fe Relief Route in Santa Fe County. This segment of the road project began with the interim terminus of NM 599 north of the Cottonwood Trailer Park and ended at the corporate limit of the city of Santa Fe. It had three planned interchanges and 4.6 miles of 375 ft wide right-of-way (MP 5 to 9.6).

Excavation of the 14 sites comprised Phase 2 of our investigations along the project route. Over the course of 14 years, 60 archaeological sites with at least 77 temporal components were investigated. The sites span 7,000 years of human occupation and land use of the Santa Fe Piedmont, from the Early Archaic to the historic Pueblo and Euroamerican periods. The particular importance of the Phase 2 excavations is that they bridge the geographic gap from the low-elevation juniper grasslands to the upper elevations of the piñon-juniper piedmont.

All sites except LA 111364 were on land that had been acquired by the New Mexico Department Transportation. LA 111364 was on land owned by Las Campanas de Santa Fe Limited Partnership, who granted permission for the excavation. LA 61286, LA 61287, LA 61289, LA 61290, LA 61293, LA 61299, LA 61302, LA 67959, and LA 67960 were excavated according to Wolfman et al. (1989). LA 108902, LA 111364, LA 113946, LA 113954, and LA 114071 were excavated according to Post (1997). Excavation began on March 3, 1997, and ended on October 16, 1997.

New Mexico Department of Transportation Project No. WIPP 599-1(3), CN 2147, C03541/98.

Museum of New Mexico Project No. 41.636 (Northwest Santa Fe Relief Route, Phase 2).

State of New Mexico Excavation Permit No. SE-121 (expiration February 7, 1998).

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Introduction

The Office of Archaeological Studies (OAS), Museum of New Mexico, conducted archaeological excavations of 14 sites along the proposed right-of-way of the Northwest Santa Fe Relief Route in Santa Fe County. This segment of the road project began with the interim terminus of NM 599 north of the Cottonwood Trailer Park and ended at the corporate limit of the city of Santa Fe. It had three planned interchanges and 4.6 miles of 375 ft wide right-of-way (MP 4.6 to 9.6). The excavations began on March 3, 1997, and ended on October 16, 1997. They were conducted under State of New Mexico Excavation Permit No. SE-121 (expiration February 7, 1998).

All of the sites except LA 111364 were on land that had been acquired by the New Mexico Department of Transportation (NMDOT). LA 111364 was on land owned by Las Campanas de Santa Fe Limited Partnership, who granted permission for the excavation. The project corridor was 4.6 miles long and 375 ft wide and followed a northeast direction from the west to east ends (Fig. 1). The west portion of the right-of-way is 225 ft wide, and the east portion is 150 ft wide. Site location information is provided in Appendix 1. On maps throughout this report, NMDOT station marker numbers are preceded by the abbreviation "NMSHTD" (New Mexico State Highway and Transportation Deparment), as they were named at the time of the project.

Nine sites—LA 61286, LA 61287, LA 61289, LA 61290, LA 61293, LA 61299, LA 61302, LA 67959, and LA 67960—had been identified during the initial survey and recommended for data recovery (Wolfman et al. 1989). Three of these sites—LA 61290, LA 67959, and LA 67960—were not included in the subsequent testing program, so before the excavation phase we had no additional information about the depth, nature, and extent of their cultural deposits. Five sites—LA 108902, LA 111364, LA 113946, LA 113954, and LA 114071—were added to the excavations as a result of inventory and testing projects (Post 1997).

The excavations revealed a 7,000-year occupation history, resulting in a greatly expanded view of the Archaic period. They also enabled us to conduct a more detailed examination of Ancestral Pueblo foraging strategies.

The descriptive and analytic sections of this report are followed by interpretive chapters that are based primarily on Phase 2 excavations but also incorporate data from the testing and first and third phases of the project. This approach provides a wider geographic overview and integrates data collected over the entire course of the twelve-year project. Chipped stone artifacts were recovered from all sites and are presented with site descriptions to allow for better integration with discussions of site structure and function. Artifact and sample descriptions and summaries are presented in the interpretive chapters and integrated into project-level synthesis. The interpretive chapter on the chipped stone assemblage deals with technological, functional, and structural studies of lithic artifact assemblages, attributes, and distributions.

Archaic occupations are examined from the perspective of the ethnoarchaeological work and theory building of Lewis Binford in the 1970s, which have been applied in archaeological hunter-gatherer studies throughout the Southwest and intensively in the San Juan Basin of New Mexico and the Colorado Plateau of the Four Corners Region. A methodological framework focusing on differences in subsistence strategies and contrasting residential mobile collectors with residentially stable foragers provided a new way to interpret the association of cultural features, artifacts, and deposits. Intrinsic to this approach is that artifact and feature distributions may represent a complex of strategies developed to address spatial-temporal incongruities in critical subsistence resources. These strategies were not uniform through time, and sites or landscapes were really composites of different strategic decisions made throughout the life of an annual or lifetime territorial range. Site types such as residential site, habitation site, logistical hunting site, foraging site, and resource-extraction site are defined within a continuum representing different strategies for successfully living in or exploiting a

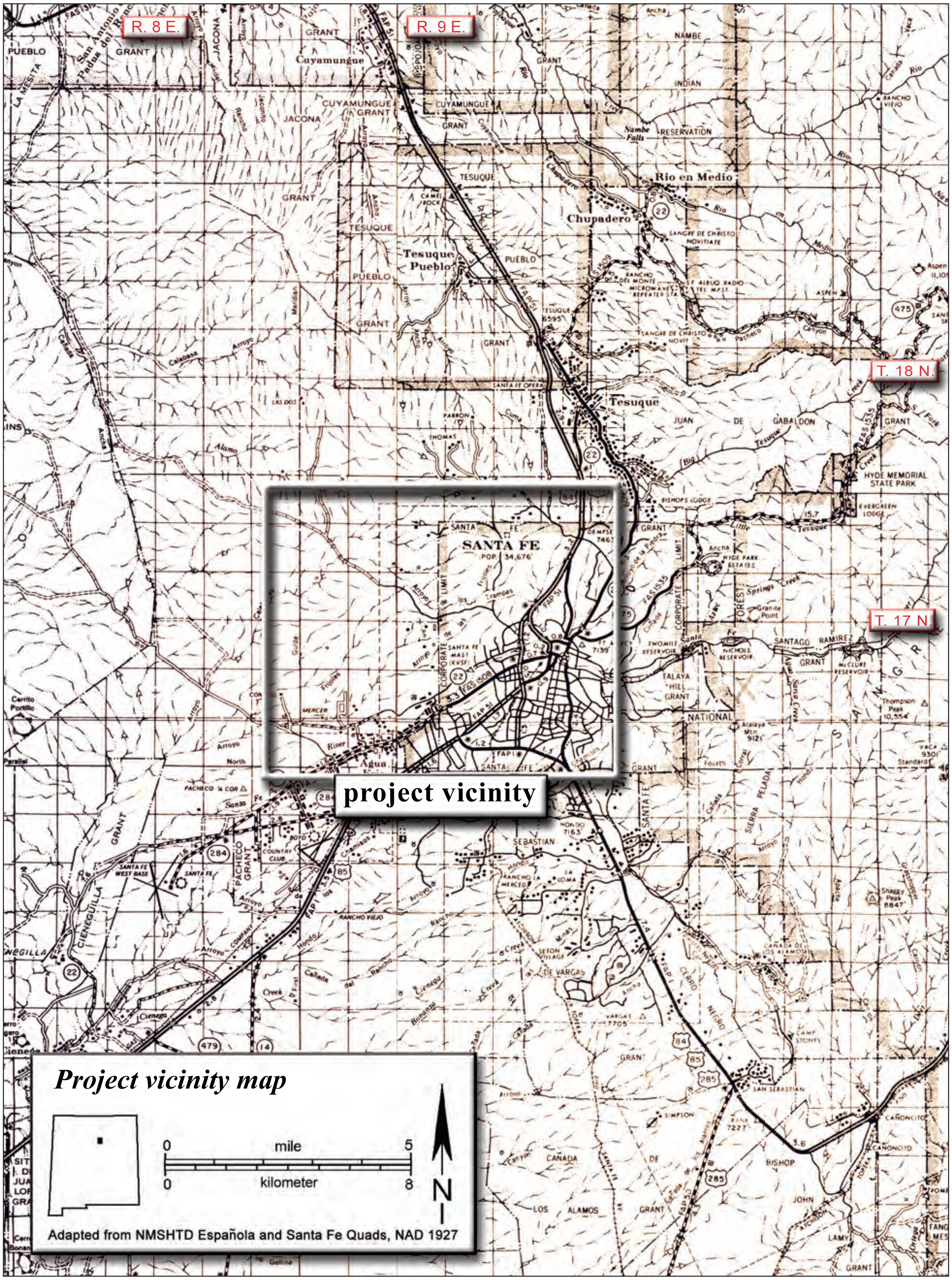


Figure 1. Project vicinity map.

particular place during a specific time of year for variable lengths of time.

As Binford (1994) observed, his theory of the organization of hunter-gatherers was meant as a starting point, rather than an end. In many instances, his methods of examining site and assemblage structure relative to foraging and collecting strategies have taken on the normative structure and implications that he was exhorting archaeologists to leave behind. The terms *forager*, *collector*, *serial forager*, and *forager-collector* all imply different kinds of economic and technological organization relative to mobility and seasonality. Useful tools for understanding organization within annual or lifetime territories, they are difficult to apply consistently and meaningfully to projects that have "sites" representing a momentary component of a much larger whole.

Over the course of 6,000 years of hunter-gatherer or Archaic occupation, it is highly likely that the broadest range of behaviors and strategies is represented in the archaeological record. In the current study, these changes are examined through time and spatially across the project area and in relation to other excavated sites in the area.

Environment of the Project Area

Modern Environment

The project area is within a basin of the Southern Rocky Mountain physiographic zone that is bounded on the west by the Jemez Mountains and on the east by the Sangre de Cristo Mountains (Folks 1975:110). An alluvial plain dissected by many arroyos stretches westward from the foothills at the base of the Sangre de Cristos. This alluvial plain forms the piñon-juniper or Plains surface piedmont. The piedmont includes the Santa Fe–Tesuque Divide, which is the headwaters of the main tributaries of the middle Santa Fe River basin. The piedmont ends at an extensive drainage trough that extends northwest to the Cerros del Rio, west to the edge of La Bajada, and southwest to the Cerrillos Hills and La Cienega (Fig. 2).

Local topography alternates among nearly level piedmont tableland, rolling gravel terraces, and steep, rocky slopes. The major drainage is the Santa Fe River, with four major tributaries: Cañada Rincón, Arroyo Gallinas, Arroyo de las Trampas, and Arroyo de los Frijoles, draining much of the south piedmont slope. The arroyo floodplains were farmed during historic times (Spivey 1996) and may have been farmed during the Ancestral Pueblo period, although no evidence of fields or field structures has been identified (Post 1996a). These major tributary arroyos are separated by low, broad ridges that are heavily incised by primary and secondary arroyos. These smaller tributary arroyos have grassy areas at their headwaters that provided protected settings for foraging and processing camps, a pattern that is repeatedly evident along the Northwest Santa Fe Relief Route (Post 2000a) and in the Las

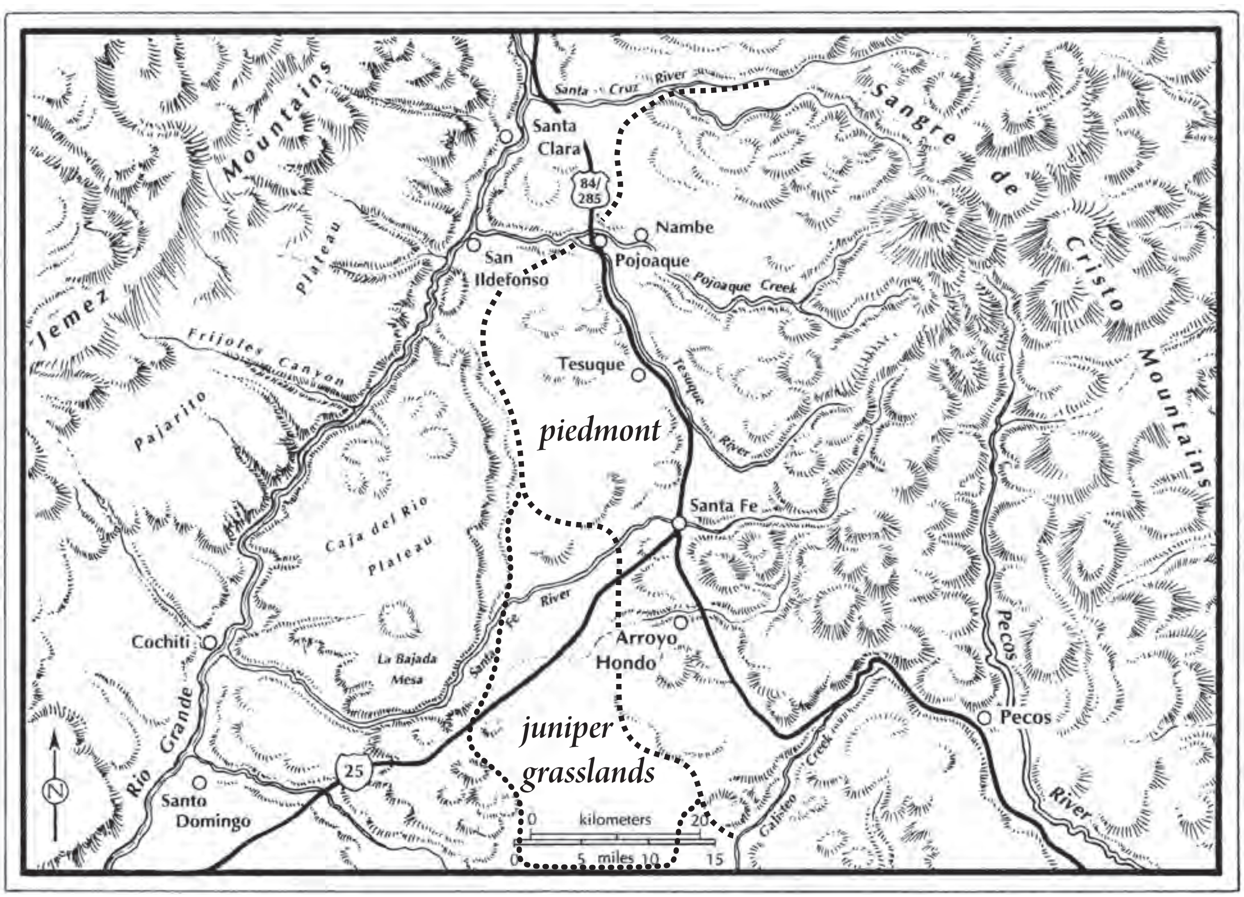


Figure 2. Main physiographic features of the Santa Fe River Basin and surrounding area.

Campanas area (Post 1996b; Lang 1997).

Project area soils are typical of the dissected piedmont plains (Folks 1975:3-4). Two of the major soil associations of the piedmont plains occur within the project area: Pojoaque-Panky Rolling and Pojoaque Rough Broken Land.

Pojoaque-Panky Rolling is the predominant soil association. It covers the ridge tops and slopes. It is interspersed with patches of Pojoaque Rough Broken Land. It consists of 60 percent Pojoaque sandy clay loam on slopes of 5 to 25 percent and 35 percent Panky Loam on slopes of 0 to 9 percent (Folks 1975:43). Bluewing, Cerrillos, and Agua Fria soils make up the remaining 5 percent. Pojoaque soil has moderate permeability, an effective rooting depth of 60 inches, and a water-holding capacity of 8 to 9.5 inches.

Pojoaque Rough Broken Land soils occur on the ridges that divide the major drainages. The Pojoaque soils make up 50 percent of the association and are well drained on upland terraces, with a 8-inch surface layer of reddish brown sandy clay loam. The substratum is 32 inches of a light reddish brown gravelly sandy clay loam with mild calcareous content (Folks 1975:43). The Rough Broken Land soils are on steep slopes, have shallow depth, and consist of sandy to sandy loam. Their greatest depth occurs as colluvium at the base of rock slopes.

Most of the archaeological deposits encountered during the Northwest Santa Fe Relief Route testing project (Wolfman et al. 1989) occurred within the modern or A horizons of the predominant soil associations. The common and abundant occurrence of prehistoric and historic deposits on similar soil horizon surfaces suggests that many of the land forms in the project area have not undergone radical geomorphological change in the last 2,000 to 3,000 years. However, recent excavation of Northwest Santa Fe Relief Route and Las Campanas project sites revealed deeply buried Early to Late Archaic period deposits in topographic settings that have experienced substantial colluvial aggradation (Post 2000b). Deeply buried cultural deposits may co-occur with later near-surface deposits, or they may be visible as a faint, gray soil lens. Close examination of these gray soil lenses usually reveals charcoal flecks and dark-stained soil. The cultural deposit may have fire-cracked rock or an occasional artifact, or there may be no indicator besides the soil stain. These soil lenses are often missed or were interpreted as tree burns or evidence of grass or forest fires. Ranging from 10 to 40 cm thick, these buried deposits exposed by modern erosion or ancient channel meandering have been found 20 to 200 cm below the modern ground surface. Radiocarbon dating has placed the earliest of these deposits in the sixth millennium BC (Anschuetz 1998). Topographic settings with a high percentage of south, southeast- or southwest-facing slopes, sheltered swales and drainage heads, and 1 to 2 km proximity to seasonal water are proving to have high densities of these deeply buried, presumably Archaic period deposits (Anschuetz and Viklund 1997; Anschuetz 1998; Post 2000a, 2000b, 2001).

The relative abundance of lithic raw material suitable for core reduction and tool manufacture seems to have to had a strong influence on the structure of the piedmont archaeological record. Exposed along Arroyo de los Frijoles, Arroyo de las Trampas, Arroyo Gallinas, and their major upland tributary arroyos are gravel deposits of Santa Fe and Ancha formation origin dating to the middle to late Tertiary. They contain a wide range of igneous and metamorphic rock. Mixed with these gravel deposits are the alluvial deposits from the Sangre de Cristo Mountains, which contain redeposited nodules of chert and chalcedony from the bedded Pennsylvanian age Madera limestone formation (Lang 1993). These combined deposits provided a wide range of chert, chalcedony, silicified wood, quartzite, and igneous and metamorphic materials. There is differential distribution of suitable lithic raw materials throughout the piedmont hills. Particularly thick deposits were noted along Arroyo de los Frijoles (Lang 1997). These local raw materials make up 95 percent of the chipped stone recovered by the excavations at Las Campanas (Post 1996b) and from the majority of the sites along the Santa Fe Relief Route (Wolfman et al. 1989).

Two main plant communities are common within the Northwest Santa Fe Relief Route project area: piñon-juniper woodlands and the rabbitbrush community Kelley (1980). Other important plant communities include the grassland community, which extends to the edge of La Bajada, and the riparian environment of the Santa Fe River. Together these plant communities provided a diverse array of floral resources for prehistoric populations.

Piñon-juniper woodland is the dominant plant community in the project area, covering an estimated 80 percent of the land. Piñon-juniper woodlands supported 135 of the 271 plant species observed within the Arroyo Hondo Pueblo catchment (Kelley 1980:60). Of these, 63 species are edible or have medicinal qualities. However, with the exception of piñon, most of the species are not abundant or are most productive in disturbed soils. Economic plant species besides piñon found in the piñon-juniper woodland and in archaeological contexts include yucca, prickly pear and pincushion cacti, *Chenopodium* sp., *Amaranthus* sp., and Indian ricegrass. Wetterstrom (1986) suggests that intensive gathering of these species might offset years of moderately poor agricultural production. However, consecutive years of poor moisture would affect the productivity of wild plants and cultigens alike, rendering their buffering potential unpredictable.

The rabbitbrush community of the arroyo channels and terrace slopes may have provided abundance and variability in plant species when piñon-juniper yield was decreased or less predictable. Affected by runoff, flooding, and erosion, arroyo channels and terraces are more disturbed and support the grasses, shrubs, and succulents that favor disturbed conditions. The arroyo channels or terraces also may have been dry-farmed, which would have created disturbed soils zones when left uncultivated. Plant species of the rabbitbrush community include prickly pear, yucca, *Chenopodium* sp., *Amaranthus* sp., and Indian ricegrass.

The fauna of the piedmont have been described in Wetterstrom (1986), Lang and Harris (1984), and Kelley (1980). The most abundant mammals on the piedmont were cottontail and black-tailed jackrabbit; a variety of squirrels, rats, mice, and gophers prairie dogs; coyotes; and mule deer. Pronghorn would have roamed the shortgrass plains. The distribution and abundance of these species would have depended on available forage and prey species. It is likely that in good years a full range of small, medium, and large mammals would have been available. However, Lang and Harris (1984) suggest that during the Ancestral Pueblo period, Arroyo Hondo residents became more reliant on small mammals and long-distance hunting trips for large game.

The Santa Fe area has a semiarid climate. Most of the local precipitation occurs as intense summer thunderstorms, which produce severe runoff and reduce usable moisture. The area receives 229–254 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.

Paleoenvironment

Few paleoenvironmental reconstructions of the Northern Rio Grande have been published. The most recent and perhaps most reliable study used dendrochronological data from Arroyo Hondo Pueblo (Rose et al. 1981). This temporally extensive study is applicable to Ancestral Pueblo period investigations, but the sequence starts at AD 985. Therefore, Early Developmental period and earlier occupation of the Santa Fe area lack detailed climatic reconstruction, which would allow closer examination of the relationships between the environment and settlement and subsistence patterns. More general paleoclimatic reconstructions of the Early Archaic to early Ancestral Pueblo occupations of the Santa Fe Piedmont and Northern Rio Grande are available in McFaul (1997) and Cully (1977).

The earliest evidence of occupation in the Santa Fe area dates from 7000 to 5000–4000 BP, during the middle Holocene, also known as the Altithermal (Antevs 1949, 1955). The Altithermal is the middle period of a three-phase sequence that was based on analysis of stratigraphic sequences of arroyo cutting and filling that led to a reconstruction of past rainfall patterns. The Altithermal was warmer and drier than the 4,000 years that followed. However, Mehringer's (1967) study of the southern Basin Range pollen record and Petersen's (1981) pollen study of the San Juan Mountains in southwest Colorado suggest that there were significant fluctuations and that this 2,000- to 3,000-year period was not uniformly dry across the northern Southwest. Periodic summer monsoons may have temporarily created warm-wet conditions that advanced woodlands (Petersen 1981). Spatial variation in rainfall and temperature may have promoted environmental conditions suited to expansion of hunter-gatherer territories, accounting for the widespread occurrence of Bajada-style points over a large area. It is generally accepted that during this period in the northern Southwest diminishing Pleistocene lakes were replaced by open grasslands, and mesic conifers were replaced by an expansion of the piñon-juniper woodlands (Van Devender et al. 1984). Unfortunately, as a consequence of this drier climate, the water table lowered and erosion increased, resulting in a reduction of the ground surface and erasure of the alluvial pollen record in some areas. This pattern made more detailed reconstructions impossible (Wills 1988:53).

More recent geomorphological study in the Jemez Mountains has shown that from 9000 BP to the present, landform instability has been far more common than landform stability (McFaul et al. 1997:44). Therefore, aspects of the biotic community may have been similar to those of more recent times, but the topography and physical landscape may have been considerably different from what has existed for the last 2,000 years. These prolonged periods of landscape instability may also have caused cultural deposits from 6200 to 3500 BP to be differentially preserved in the archaeological record. The Early to Late Archaic may be represented by a site distribution that does not necessarily reflect human settlement patterns as much as the cumulative effect of geomorphological processes on an unstable landscape. In other words, we may not know the actual extent of hunter-gatherer territories or the effect of changing climate on settlement because the record has been erased.

By 7000 BP piñon-juniper woodlands were in place in northern latitudes or southern highland settings, and it is reasonable to assume that the Northern Rio Grande and more specifically the Santa Fe River piedmont could have supported plant communities similar to what is present today. However, it is likely that the distribution and frequency of different plant species may be very different, though the range of species would have been similar (see Hudspeth [1997:40] for similar observations about the OLE project area.). Archaeological deposits in association with deeply buried outcrops of Tesuque sandstone exposed in more recent arroyo cuts or erosion channels have been found in the Santa Fe Piedmont (Anschuetz and Viklund 1997; Post 2000b). These outcrops are buried by deep sandy colluvium that may have been deposited at the end of the Altithermal or during early dry intervals of the succeeding Medithermal (Antevs 1955; Irwin-Williams 1979).

During the Medithermal, which began after 4000 BP, the climate was substantially similar to modern climate in the range of precipitation and temperature (Antevs 1955). Evidence of this climatic regime was a decrease in xerothermic plants, accumulation of water in desert basins, stabilization of dunes, arroyo filling, and the development of glaciers in high mountains (Antevs 1955). Sedimentary evidence from the San Augustin Basin in southwestern New Mexico show an increase in moisture from 5000 to 3500 BP (Powers 1939; Cully 1977:97). Palynological evidence from western New Mexico and eastern Arizona suggest that between 4000 and 3000 BP light summer rains were more prevalent with a winter-dominant precipitation pattern. From 3000 to 500 BP, a summer-dominant precipitation pattern returned, typified by heavy rains. Periodicity in precipitation and rainfall is indicated in the pollen record by a span of increased summer rainfall from 3400 to 2800 BP, decreased annual precipitation with cooler temperatures between 2800 and 2500 BP, warmer temperatures and more precipitation between 2500 and 2300 BP, warmer temperatures with less precipitation between 2300 and 2100 BP, and a return to cool temperatures with more precipitation between 2100 and 1600 BP (Petersen 1981).

Geomorphological analysis was conducted at LA 61315 during Phase 3 of the Santa Fe Relief Route project (Greene 2000). Analysis of the accumulated colluvial slope deposit indicated that from 5300 BC to AD 300 there was a long-term history of mass wasting and sheet deposition with very limited evidence of illuviation. These deposits were formed over a long period, indicating relative uniform geomorphological activity in the piedmont. Another study (Miller and Wendorf 1953) in the Tesuque Valley, downslope from the piedmont, documented 4 and 5 m of alluvial deposition between the third century BC and AD 1200. This startling record suggests that long-term deposition could accumulate to more than

5 m in some locales. In upslope settings such as LA 61315, regular colluvial soil movement undoubtedly contributed to these massive valley and terrace accumulations. The implication is that not only Early Archaic sites, but all Archaic sites in low-elevation settings could be deeply buried. Such deep deposition seriously affects the identification and interpretation of Archaic sites.

Periodicity in the 200- to 500-year spans is highly generalized in these studies. The actual length of these periods of different temperature and moisture regimes is similar to that of the more recent record provided by Rose et al. (1981) for Arroyo Hondo Pueblo. The importance of these long-term changes for Late Archaic populations is their effect on the distribution and abundance of food. Changes in the range of the major plant communities such as the piñon-juniper woodlands or shortgrass plains should be reflected in the temporal and spatial patterning of site types and subsistence strategies (Wills 1988). Examples of corresponding changes in climate and their effect on biotic community range include an extension of shortgrass plains with an increase in summer-available seeds and increased or greater distribution of pronghorn herds. Extension of piñon-juniper woodlands would result in a decrease in local pronghorn but an increase in the range of mule deer and the fall piñon nut harvests.

Late Archaic base camps dating to after 2500 BP occur at the edge of the short-grass plains and in upland piñon-juniper woodlands (Schmader 1994a; Post 1996a). Their occurrence in both zones suggests a settlement flexibility that may reflect a response to changes in temperature and precipitation and a concurrent change in biotic structure. Lang (1977) suggested a fluctuating environmental pattern that may have influenced hunter-gatherer settlement between 50 BC and AD 400. His climatic reconstruction identifies the periods from 50 BC to AD 200 and from AD 250 to 400 as the best for a hunting and gathering adaptation (Lang 1977:328–329). These periods had precipitation patterns similar to or above modern precipitation averages combined with warmer than modern temperatures during the early period and equal to or cooler than modern temperatures during the later period. Warmer temperatures combined with above-average precipitation may have supported a more abundant and perhaps diverse plant community and larger herds of large mammals. These favorable intervals promoted Late Archaic–Basketmaker II settlement in the area, and base camps may have been used for longer periods or more frequently.

A climate reconstruction of the last 2000 years was completed for the El Malpais area, in west-central New Mexico (Grissino-Mayer 1995). A recent dissertation by Robert Dello-Russo (1999:48–54) summarizes climatic reconstructions from AD 81 to 660. Three major periods were recognized in the study: AD 81–257, AD 258–520, and AD 521–660. From AD 81 to 257, increased variability and rapid shifts in precipitation occurred. This unpredictability was accentuated by periods of severe drought and extreme precipitation. The driest years were from AD 145 to 170. The most severe drought period over the 2,219-year record occurred between AD 258 and 520. Major drought periods occurred from AD 300 to 395 and AD 419 to 489. If the focus of food procurement changed in response to decreased biotic resources, these periods may be reflected in the Basketmaker II populations of the Middle Rio Grande and Colorado Plateau periphery. Stress could have resulted in changing subsistence strategies or seasonal movements into wetter and less affected areas, for example, north into the upper reaches of the Rio Grande Valley and its tributaries. From A. D. 521 to 660, drought conditions subsided and were replaced with generally favorable conditions, but high unpredictability and variability took place during much of the period. AD 570 to 660 may have been the period most suited to seasonal foraging and one of the more stable for Basketmaker II populations in the middle Rio Grande.

From this reconstruction of long-term precipitation patterns in west-central New Mexico, Dello-Russo defined three main periods: Pre-Drought, before AD 258; Drought, AD 258 to 520; and Post-Drought, AD 520 to 660. Although these reconstructed patterns cannot be directly applied to the Santa Fe River basin, they do offer a framework for analyzing settlement and subsistence patterns through time. Comparisons between the Rio Rancho sites and Santa Fe River sites may provide insight into ways in which populations dealt with long-term environmental stress that have been suggested by other investigators. These solutions include change in seasonal range, change in subsistence focus, or abandonment of areas until environmental conditions return to suitable levels.

During the Ancestral Pueblo period, occupation of the Santa Fe River is most evident in the archaeological record after AD 1050. Rose et al. (1981) provide an analysis of seasonal and annual variation in precipitation and temperature from Arroyo Hondo tree rings that is applicable to the Santa Fe River basin. Precipitation, temperature, and soil type are three environmental factors that influence plant and animal productivity and distribution, and the probability of success for irrigation and dry-farming. Prior to AD 1050 low population density permitted mobility when crop and wild-food productivity were low. After AD 1050 settlement of the Santa Fe River and other major drainage basins in the Northern Rio Grande increased, and mobility options may have decreased. The availability and distribution of critical resources as influenced by an unpredictable climate may have strongly affected settlement viability and the timing and rate of community growth.

Rainfall and temperature ranges similar to modern patterns may have been sufficient to maintain small populations along the Santa Fe River. Periods of better than mean spring and summer rainfall may have increased crop production and supported larger or sustained existing populations. Periods of greater than average spring precipitation occurred between AD 1050 and 1080, AD 1195 and 1210, AD 1290 and 1340, AD 1390 and 1415, and AD 1430 and 1435 (Rose et al 1981:98–99). During these periods agricultural productivity could have surpassed the average, and established villages could have increased population or increased stores of food in anticipation of inevitable bad years. By the same token, settlement in the best-watered areas may have occurred when rainfall was low and surface water availability was critical to survival. Between AD 1250 and 1290 there were more bad years than good, and a small settlement was established at Pindi Pueblo a that time (Rose et al. 1981; Ahlstrom 1989).

Throughout the Coalition period (AD 1175 to 1350) the piedmont hills would have been used as resources permitted. Consecutive good years may have boosted piñon nut crops, resulting in intensive gathering. Poor years might have limited the gathering of piñon but still supported cheno-am production, resulting in gathering in the grasslands between piñon-juniper woodlands and on the short-grass plains. The severity of drought and its effect on available biomass may have regulated distances traveled for foraging and strategies for procuring and transporting resources. Environmental conditions undoubtedly had an effect on hunting-gathering practices and the formation of the Santa Fe River piedmont landscape. The timing of environmental conditions and the formation of sites may be difficult to correlate, but clearly they were strongly intertwined.

Culture History of the Project Area

The two main Archaic traditions of the Anasazi and Mogollon culture areas, Oshara (Irwin-Williams 1973) and Cochise (Sayles 1983), define changes in Archaic settlement and subsistence that eventually evolved into the sedentary agriculturalism of the Anasazi and Mogollon culture areas. They imply continuity in settlement in which Archaic populations developed into Ancestral Pueblo peoples over the course of 6,000 to 7,000 years. But in the case of the middle and Northern Rio Grande, it is not so clear that there was a developmental sequence from Archaic to Ancestral Pueblo that can be characterized as following developments in either major culture area. Thus, I refer here to the pre-Pueblo history of the Santa Fe area in more general terms to imply change and a temporal sequence without suggesting that the early Pueblo settlers were preceded by Anasazi (Oshara) or Mogollon (Cochise) populations. The Rio Grande was a major corridor for mobile peoples, and tremendous mixing of technologies and ideas occurred there. In this study, the Archaic era from 5500 BC (or maybe a little earlier) to AD 850 or 900 is divided into the Early, Middle, Late, and Latest Archaic periods (following Matson 1991; Fig. 3).

The Early Archaic Period

The Early Archaic in the northern Southwest began in 7000 to 8000 BP. It marks the transition from early Holocene big-game hunting to a broad-based and generalized subsistence strategy in conjunction with a dryer, warmer climate (Huckell 1996; Irwin-Williams 1973, 1979; Matson 1991; Wills 1988). Whether there was a change in population or just a change in settlement and subsistence strategy for the same population remains unresolved. In the Northern Rio Grande, A. E. B. Renaud (1942, 1946) and Kenneth Honea (1971) offered the earliest evidence with which to assess the Paleoindian-Archaic transition. From Honea's perspective, stylistic similarity between late Paleoindian points and succeeding Jay and Bajada points argued for continuity. Cynthia Irwin-Williams (1979, 1994) argued from an ecological perspective that the drier and less abundant desert Southwest was insufficient for Paleoindian hunters' needs, causing them to leave for the Plains, and they were replaced by a more generally adapted hunter-gatherer population initially referred to as the Desert Culture.

Since support for each side was and continues to be derived from a few excavated sites and surface projectile point distributions, a very limited view of Early Archaic settlement and subsistence was represented. At the southern edge of the Northern Rio Grande region, the Bajada-type site (LA 9500) overlooks the broad Santo Domingo Basin, covers 300,000 sq m, and exhibits a wide array of tools and manufacture debris, suggesting a repeatedly occupied hunting camp, perhaps geared to summer exploitation of large game and June maturation of Indian ricegrass (Hicks 1982). Renaud's sites in the San Luis Valley of southern Colorado to the north evidenced a more balanced subsistence strategy and a wide range of dart points associated with large-mammal bones and one-hand manos.

A continued reliance on projectile point styles and surface finds biased our interpretation of Early Archaic settlement and subsistence patterns, a situation that could be remedied only by excavation data and absolute dates. The first indication that Early Archaic sites were not fitting traditional site type models was obtained from the OLE project, conducted by TRC, Inc., from 1991 to 1993 (Acklen 1997). This large-scale archaeological project examined 33 sites consisting of surface artifact scatters with features along a corridor 87 km long across the Northern Rio Grande from the Abiquiu area to the southern Jemez Mountains (Acklen 1997). A detailed geomorphological study and radiocarbon dating informed OLE archaeologists of the probable presence of Late to Early Archaic horizons. At two sites, ten absolute dates were obtained from thermal features or associated charcoal deposits. The dates ranged from 4300 to 6100 BC. These features and associated dates documented long-

TIME	*OSHARA*	*COCHISE*	*GENERAL ARCHAIC*
5500 B.C.	Jay	Sulphur Springs	
4800 B.C.			Early
4500 B.C.	Bajada		
4000 B.C.			
3500 B.C.			
3300 B.C.			
3000 B.C.	San Jose	Chiricahua	Middle
2500 B.C.			
2000 B.C.			
1800 B.C.			
1500 B.C.	Armijo		
1000 B.C.			Late
800 B.C.			
500 B.C.	En Medio	San Pedro	
A.D. 1			
A.D. 600	Trujillo	Georgetown	Latest
A.D. 900	Pueblo	Mogollon	Beginning of Ancestral Pueblo

Figure 3. The Archaic period, with Oshara and Cochise Tradition phases and date ranges.

term Early Archaic use of the northern Jemez Mountains that spanned the transition from Paleoindian to Archaic. Unfortunately, these dated features were the earliest components on sites that had been occupied intermittently over 6,000 years, and the sites yielded few artifacts that could be unequivocally associated with these features. Therefore, it was difficult to correlate technological organization with optimal foraging hunter-gatherer models designed for the project. LA 9500 has hundreds of pieces of manufacture debris and tools, indicating that large assemblages are possible if not common (though the site suffers from mixed deposits as well), but segregating them from later occupations is problematic. OLE archaeologists thought the Early Archaic hearths had been used by small groups who hunted at higher elevations while maintaining access to the lower-elevation resources of the piñon-juniper forest (Hudspeth 1997; Acklen 1997). In other words, by 6100 BC early hunter-gatherers were in the Jemez Mountains and returned there regularly. Depending on the setting, their hearths were just as likely to be near the surface as buried 1 m below it.

Roughly concurrent with the distribution of the OLE project report, Kurt Anschuetz (1998), then with Southwest Archaeological Consultants, excavated small buried sites in the piñon-juniper piedmont north of the Santa Fe River (Fig. 2). These sites were found during a cultural resource investigation, required for planned residential development and new road construction. Anschuetz's excavation of a small hearth buried only 20 cm deep yielded a radiocarbon date range between 5561 and 5282 BC calibrated, but no associated artifacts. This further reinforced the OLE idea that Early Archaic occupations could be near the surface and ephemeral. Also, it became evident that to document Early Archaic settlement, isolated hearths need to be investigated and not written off as insignificant.

During Phase 3 of the Northwest Santa Fe Relief Route project, excavation of LA 61315, which was in a southeast-facing drainage swale overlooking the upper Santa Fe River basin, exposed a charcoal-impregnated lens capped by 1.8 m of colluvium. A collapsed cobble-ring hearth yielded a calibrated two-sigma radiocarbon date of 5260 to 5040 BC (Post 2000b). Fine-screening recovered 57 pieces of chipped stone debris and a Rio Grande basalt Gypsum Cave–style dart point. Much of the core-reduction debris and the dart point were of nonlocal lithic raw materials, indicating seasonal movement between the Rio Grande or the Pajarito Plateau and the Santa Fe River piedmont area. Scorched small-medium mammal bone indicated a woodland hunting pattern. Fuelwood was mainly piñon, indicating that it was a prominent component of the plant community as early as 7000 BP.

Hearths without artifacts or a few near the surface, deeply buried deposits with features, and nonlocal materials and dart points predate most conventional chronologies. This is the Early Archaic of the Northern Rio Grande. Radiocarbon dates indicate that the Early to Middle Archaic occupation sequence was continuous. At least two site types are present: the sprawling tool-manufacturing and hunting camp at the Bajada site, and the small family camps represented by the Santa Fe Piedmont and OLE sites. Furthermore, the radiocarbon dates seem to support the interpretation that the Rio Grande culture as first described by Renaud (1942, 1946) developed out of a Paleoindian tradition. Evidence of reoccupation of this small sample of sites indicates that Early Archaic populations were well aware of the best places to live, a knowledge that could only accumulate from a long and unbroken history of occupation. Except for large, multicomponent hunting camps, initial indications of Early Archaic settlement in the Northern Rio Grande are subtle and can easily be confused with later or even noncultural deposits.

The Middle Archaic Period (3300–1800 BC)

Middle Archaic sites are still rare in the Santa Fe archaeological record. In the Middle Rio Puerco of the East, this period saw a gradual increase in population during a cooler, drier interval in the Altithermal period (Irwin-Williams 1973, 1979). Expanded woodlands and grasslands provided greater spatial distribution and abundance of critical plant and animal resources. Middle Archaic populations expanded into areas that had previously experienced limited or no occupation. The Middle Archaic, which is named the San Jose phase in the Oshara Tradition, produced dart point styles that were very similar to Pinto Basin points, which were widespread in the Great Basin and Rocky Mountains (Irwin-Williams 1979; Matson 1991; Metcalf and Black 1991).

In the Santa Fe area, LA 86139 in the Las Campanas project area was dated to the Middle Archaic period by associated projectile point fragments (Post 1996a). The cultural deposit was deflated and eroded but did yield an assemblage of obsidian and biface tools, tool-production debris, and basin metate fragments. Little can be extrapolated about the Middle Archaic occupation of the Santa Fe River from this small site. However, the artifact assemblage diversity and the presence of thermal features suggest a camp occupied longer than the Early Archaic sites. One of the main contributions of Phase 2 excavations of the Northwest Santa Fe Relief Route project is the addition of considerable data on Middle Archaic occupations in the Santa Fe Piedmont.

The Late Archaic Period (1800–1 BC)

The Late Archaic period is divided into two phases in the Oshara Tradition: the Armijo phase (1800–800 BC) and the En Medio phase (800–1 BC) (Irwin-Williams 1973). At Middle Rio Puerco sites, the Late Archaic is distinguished by seasonal aggregations as represented by the dense and extensive occupation floors at the Armijo shelter, the first indications of maize use, and the presence of a stone-tool kit that exhibited a wider selection of plant-processing implements (Irwin-Williams 1973:10). Within the Late Archaic period, temporal distinctions are made based on projectile point styles. The early style, associated with the 1800 to 800 BC date range, has an ovate blade with shallow corner notches and a concave or slightly indented base. The later occupations are associated with triangular-bladed, deep to shallow corner-notched dart points that appear to be developing toward an arrow point style.

The important distinction between the Santa Fe Piedmont Archaic and the trends observed in the Middle Rio Puerco (Irwin-Williams 1973, 1979) and the Colorado Plateau (Matson 1991) is the almost complete absence of evidence of agriculture prior to AD 850 or 900 on the piedmont. Instead, there appears to be an uninterrupted Archaic-style occupation that focused on seasonally available wild plants and game mammals.

Locally, there is abundant evidence of occupation during this period from a wide range of environmental settings. Along the margins of the Santa Fe River, near the Santa Fe Airport at Tierra Contenta (Schmader 1994a; Dilley et al. 1998) and along Airport Road (Post 2004), excavated sites have had multiple pit-structure foundations, diverse thermal features, and a tool assemblages reflecting varying levels of reliance on hunting and gathering. The data from the Tierra Contenta and Airport Road sites reflect repeated seasonal occupations by small groups that coincided with the availability of abundant subsistence resources. Different occupation patterns are evidenced by the presence of 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 1994a). These sites could be termed residential basecamps (Binford 1980; Hudspeth 1997; Vierra 1985, 1994). Wood charcoal from pit structures and associated features yielded calibrated two-sigma date ranges between 1930 and 830 BC. The tightest cluster of dates indicates occupations during the ninth and tenth centuries BC (Schmader 1994a:92). The Airport Road site, LA 61282, had a cluster of 23 thermal and processing features and a high-density biface manufacture discard area (Post 2004). Faunal remains indicated hunting and processing of deer and antelope at different times between the twentieth and fifteenth centuries BC. The clustered spatial distribution of these sites indicates that a periodic, semipermanent water source was available. The occurrence of these sites suggests that during the second millennium BC, populations regularly moved in and out of the Santa Fe area. Sites cluster near water and the juniper and grass plains, and at the edge of the higher piedmont.

Well into the upper elevations of the piedmont overlooking Cañada Rincón was LA 127578 (Lakatos et al. 2001). This site was remarkable in that it yielded a large, shallow, burned remnant of a pit-structure foundation with five intramural thermal features and one possible storage pit as well as perimeter postholes. The abundant chipped stone focused on local chert used in core reduction, with some biface manufacture. One-hand manos and a metate were in the fill above and on the floor of the structure. The structure was partly filled with chipped stone debris and fire-cracked rock, and it was burned. There was an associated activity area 3 m south of the structure and a fire-cracked rock midden south of the activity area. This formalized site structure pattern is consistent with a planned, long-lasting occupation and the expectation of returning (Kent 1999). This site and the Tierra Contenta structures are evidence that populations planned to stay in or near the piñon-juniper woodlands for an extended time. Prolonged late-fall occupation of the piñon-juniper woodlands has been interpreted as a possible precursor of or preexisting condition for the introduction of maize (Wills and Huckell 1994).

The later phase of the Late Archaic (800–1 BC) is not as well represented by excavated structures, thermal features, and diverse artifact assemblages. One component of the Tierra Contenta project at LA 54752, Feature 8 (cal. 190 BC to AD 80 two-sigma range), was a shallow, deflated pit-structure foundation or activity area (Schmader 1994a:92). Feature 8 yielded few associated artifacts and very limited charred ethnobotanical remains. This structure remnant was ephemeral, and the low artifact frequency indicated a brief occupation. These data suggest that the Late Archaic occupation was shorter and less substantial than the earlier occupations in the Tierra Contenta project area. Excavation of LA 86148 in the Las Campanas project area focused on a chert chipped stone concentration. This site was in the piedmont overlooking the confluence of two tributaries of Arroyo Calabasas (Post 1996a). Two Late Archaic–style dart points were associated with two one-hand mano fragments and an assemblage of core reduction and early- and middle-stage biface reduction debris. Twenty-one pieces of utilized debitage were found, a high number for such a small assemblage. No thermal feature or structure was found. This site appears to have been used for a brief, focused occupation, typical of a logistically organized subsistence strategy (Binford 1980; Hudspeth 1997). It could be termed a habitation site, but with a shorter, less intensive occupation. Residential mobility may have increased during the late stages of the Late Archaic, perhaps in response to less predictable climate and resource availability and abundance.

The Latest Archaic Period (AD 1 to 850 or 900)

In the Santa Fe area and most of the Northern Rio Grande, the transition from hunting and gathering to agriculture is poorly represented in the archaeological record. Except for a few isolated examples, there is strong evidence that this change did not occur until AD 850 or 900.

Between 800 BC and AD 400–600, during the late stage of the Late Archaic and into Basketmaker II 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 distribution. These changes are commonly attributed to the gradual adoption of cultigens (Wills 1988; Vierra 1985). As a result of a less mobile lifestyle and an increased dependence on cultigens, occupation duration increased, and technological organization focused more on expedient tool manufacture and the construction of formal facilities such as pit structures and storage pits (Vierra 1994; Stiger 1986; Fuller 1989; Irwin-Williams 1973; Schmader 1994a). Chipped stone technology, which was dominated by biface manufacture before the En Medio phase, included increasingly more evidence of local raw-material use and the manufacture of expedient or less formal tools (Kelly 1988; Andrefsky 1994).

To date, how and when these changes occurred in the Northern 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). This situation is further complicated by past research orientations, which focused on identifying cultural remains that were comparable to the more "typical" Basketmaker II sites described for the San Juan Basin and Colorado Plateau (Matson 1991). Implicit in such research was the expectation that the transition to agriculture occurred in the Northern Rio Grande as it did in other areas.

The importance of agriculture has been a focus of interest in defining and distinguishing between the Latest Archaic and Basketmaker II cultural adaptations on the Colorado Plateau and within and adjacent to the Middle Rio Puerco and Rio Grande Valleys. To most researchers, the combination of maize or cultigens, evidence in the material culture of longer occupations, and triangular-bladed, corner-notched dart points represents a transition from Archaic hunter-gatherers to a recognizable antecedent to the ancestral Anasazi and Mogollon cultures.

When was maize first incorporated into the Archaic hunter-gatherer diet? How did maize come into the future homeland of the Ancestral Pueblo populations long known as "the Anasazi" by Southwestern archaeologists? Why was maize incorporated in some areas and not in others? What were the conditions under which agriculture was or could be first accepted as a complementary and eventually a seasonal alternative to hunting and gathering? In what archaeological or environmental context was early evidence of maize found, and what does it mean in terms of seasonal mobility and economy?

Often, early maize comes from archaeological contexts that are disturbed or of questionable integrity, leading to questions about the validity of the finds (Wills 1988; Chapman 1980; Matson 1991). Not surprisingly, cave sites often yield perishable organic and plant remains that provide a more complete perspective on hunter-gatherer economy and subsistence, and they are often the best source of early corn. Early excavations of cave sites produced assemblages that were used to develop material culture trait lists that may characterize the extent in time and space of a particular aspect of hunter-gatherer economy and organization that led to the adoption of maize (Dick 1965; Haury 1950; Irwin-Williams 1973). While occasionally yielding spectacular results, cave sites represent only one seasonal component of a regional Archaic or Basketmaker II annual settlement and subsistence cycle. As cultural resource management archaeological investigations repeatedly have demonstrated, open-air sites, which comprise an important component of the Late Archaic–Basketmaker II archaeological record, are more abundant. This situation is acutely evident in the Northern Rio Grande, where, with a few notable exceptions (Alexander and Reiter 1935; Ford 1975; Hubbell and Traylor 1982), excavated and documented cave sites are virtually absent.

Two primary models are offered for the transition from hunting and gathering to an agriculture-dependent economy and by inference the changing of Archaic people into Anasazi/Mogollon people (Matson 1991; Berry 1982; Irwin-Williams 1979). One model proposes that maize and maize production came from Mexico with or through the Basin and Range populations of the Cochise Archaic populations sometime between 1200 and 500 BC. In this model, migrating Cochise populations moved north into the western and central Colorado Plateau after 1800 BC, filling a void left by earlier San Jose or Armijo populations as defined by Irwin-Williams (1979). Matson (1991:184–202) cites the paucity of Armijo- and En Medio–style projectile points during what he terms the "Latest or Terminal Archaic" as evidence of low population or a population void that was filled by people bearing San Pedro or Gypsum Cave projectile points from the south. These Cochise-like Archaic people brought maize and were responsible for its rapid spread and the eventual formation of early Basketmaker II villages or settlements of the Long House Valley, Prayer Rock District, and Durango District of the west-central Colorado Plateau. Maize and agriculture were imported or brought to the area by migrating populations by 500 BC.

Irwin-Williams's model of the transition to and adoption of agriculture is based on seminal work in the Middle Rio Puerco Valley (Irwin-Williams 1973, 1979; Matson 1991). There, excavations revealed the presence of maize during the late Armijo or early En Medio phases (1200 to 800 BC). This early occurrence of maize was followed by an unbroken occupation sequence that exhibited a settlement and subsistence pattern that was the equivalent of the Basketmaker III period defined for the Colorado Plateau. This unbroken sequence was hypothesized as evidence of in-situ development of the Anasazi culture in the Middle Rio Puerco Valley, considered to be a separate cultural manifestation from the Cochise Archaic tradition, from which the Mogollon culture descended.

The source of maize within the Oshara model undoubtedly was Mexico, but the mechanism by which it was transported into the Oshara area is not known. If maize moved gradually up the Rio Grande from the southern Basin and Range region, one would expect to find earlier maize to the south with gradually later dates to the north.

Currently, there is no such assemblage of early maize sites in the Rio Grande corridor to support this hypothesis. Trade or marriage between fringe Colorado Plateau groups and southern Basin and Range populations could have resulted in exchange of seeds and planting technology and explain the absence of a south-to-north temporal gradient.

Matson (1991:203–207) evaluates the likelihood of both models based on the archaeological evidence. He surmises that for the Oshara in-situ model, agricultural development should result in archaeological sites and assemblages that are distinct from Cochise culture Basin and Range sites. Different Southwestern Pueblo groups would have evolved from different Archaic origins, resulting in differences in the ways that agriculture was adopted and concomitant differences in material culture. Instead, Matson (1991:204) sees close similarities between Oshara and Basin and Range sites and assemblages, suggesting similar Archaic origins for the later Ancestral Pueblo groups of the Anasazi and Mogollon culture areas. He believes, "The migration model presents the various shades of Anasazi, and Mogollon, and Hohokam as evolving from the same basic source, and fits well with some recent thinking on the origin of the Hohokam" (Matson 1991:205). Basically, Archaic groups inhabiting the Colorado Plateau and its fringes (such as the Middle Rio Puerco and the Northern Rio Grande corridor) were replaced by or coexisted with northward-migrating Cochise Basin and Range populations. The knowledge and technology needed to grow maize may have been available to Northern Rio Grande populations, and the Northern Rio Grande may have been seasonally occupied by early part-time horticultural Archaic populations. However, other nonhuman or environmental conditions may have forestalled or obviated the transition to agriculturally supplemented subsistence.

While Matson (1991) believes that the Basin and Range or "migration model" agrees most closely with the archaeological record, supporters of Irwin-Willams's (1973) Anasazi or in-situ model of the Middle Rio Puerco do not. If the perspective is moved to the east into the Rio Grande Valley, the transition from hunting and gathering to agriculture is less clear (if that is possible). Currently, there is little evidence of the early introduction of maize or for the transition from the Late or Latest Archaic to the Basketmaker II and Basketmaker III settlement and subsistence patterns so clearly evident on the Colorado Plateau. This problem is recognized by Matson (1991:70–71) regarding the Rio Rancho phase, which was defined by Reinhart (1968). Matson (1991:70) considers the Rio Rancho phase archaeological evidence to be "the furthest afield, off the Colorado Plateau on the outskirts of Albuquerque, New Mexico, . . . and in many ways it is the weakest candidate for Basketmaker II ." Matson (1991:71) cites the informal nature of the shallow pit structure, the absence of storage features and an antechamber, and no direct evidence of maize use in concluding that these sites possess "few similarities to, and a number of significant differences from, other Basketmaker II material." If the Rio Rancho phase sites are Basketmaker II, as Matson defines it, then they need better dating and more conclusive evidence of maize use.

Reinhart (1967:466–468) was comfortable equating his Rio Rancho phase materials with the Basketmaker II sites of the Durango and Los Pinos area. He recognized similarity in the projectile point styles with the Cochise San Pedro materials and cites the dwellings and associated intramural and extramural features as evidence of a more sedentary occupation. Direct evidence of maize was not found, but the metates were characterized as the "long-stroke" variety commonly associated with maize grinding. Similarities between the Rio Rancho phase materials and the Cochise San Pedro materials shows how difficult it is to define the Latest Archaic and Basketmaker II materials of the middle and Northern Rio Grande in terms of the Basketmaker II-III transition.

In Reinhart's (1967:469) developmental scheme, the Rio Rancho phase sites were antecedent to the Alameda phase sites. The Rio Rancho–Alameda phase site continuum was interpreted as an unbroken developmental sequence that culminated in Anasazi-like architectural and material culture traits. Again, Matson (1991) contends that because Reinhart's Rio Rancho phase sites do not exhibit sufficient similarity to Basketmaker II sites of the Durango and Los Pinos area, they may represent a different ethnic or linguistic group. The fact remains that the Rio Rancho phase sites did yield projectile point styles that could be comfortably classified as indicative of the Cochise or Oshara tradition. Regardless of the early evidence, there is no doubt that by AD 700, the Rio Rancho area was well inhabited by agriculturally dependent and perhaps seasonally mobile populations (Reinhart 1967; Frisbie 1967; Schmader 1994b). With material culture traits similar to the Anasazi and Mogollon sites to the south and west, settlement could have been by descendants of people who migrated from the south or a mixing of resident and migrant populations that eventually moved north and peopled the Northern Rio Grande.

Moving farther north to the foot of La Bajada and into the Galisteo Basin, two projects yielded site data that could be applied to the hunter-gatherer settlement and subsistence, the transition to maize use, and the establishment of permanent settlements in the Northern Rio Grande. If Matson (1991) were troubled by including the Rio Rancho phase sites in his Basketmaker II study, then the evidence provided by the Northern Rio Grande archaeological record is even more difficult to accept or incorporate into Colorado Plateau and Basin and Range models. While much of the work on Archaic–Basketmaker II-III transition sites relies on Irwin-Williams's Oshara tradition, researchers have identified Cochise tradition style projectile points, as well, suggesting close affinity to the mixed Rio Rancho phase materials.

Ten Late Archaic period and Basketmaker II period sites were identified in the San Cristobal area of the eastern Galisteo Basin by Lang (1977). The sites had projectile point styles of Oshara and Cochise traditions. Lang (1977) suggested that populations from the south used the San Cristobal area between 800 and 400 BC as evidenced by one site with a Chiricahua dart point and one site with a San Pedro dart point. The Cochise tradition intrusion into the San Cristobal area was marked by small, specialized activity sites of short duration and seasonal occupation (Lang 1977:317–326). This was the first reference to a "Cochise intrusion" or more aptly the budding recognition by archaeologists working in the Northern Rio Grande that traditional developmental sequences did not work there.

Based on the San Cristobal sites, Lang (1977:327–328) assigns 380 BC to AD 400 to the Basketmaker II period, 380 years earlier than is accepted for most areas to the west. He suggests that hunting-dominated occupations during the early part of the Basketmaker II period shifted to more generalized hunting and gathering (1977:342). Some sites were reused, a practice that was not evident at earlier or later sites until AD 900. Evidence of reuse during the latter portion of the Basketmaker II period includes a site with eight hearths, grinding implements, and a greater focus on flake-tool production and use (Lang 1977:345–346). According to Lang's (1977:328–329) climatic reconstruction, the periods from 50 BC to AD 200 and from AD 250 to 400 may have been the best for a hunting and gathering adaptation. These periods had precipitation levels similar to or greater than modern precipitation averages combined with warmer than modern temperatures during the early period, and temperatures equal to or cooler than modern temperatures during the later period. Warmer temperatures combined with above-average precipitation would have supported a more abundant and diverse plant community and the potential for larger herds of game mammals. Year-round habitation could have been supported in the eastern Galisteo Basin and the Santa Fe drainage basin during these periods, or recurrent occupation of shorter intervals may have been more common.

To the west along the Rio Grande, near Cochiti Pueblo, construction of Cochiti Reservoir included a large-scale, multiyear salvage excavation project. Survey and excavation identified 90 nonstructural artifact scatters with hearths, for which Late Archaic or Basketmaker II period dates were suggested (Biella and Chapman 1977:201). If these sites were of Late Archaic or Basketmaker II age, they represented the first recognizable and most intensive use of the Cochiti Reservoir area, since there were no conclusively identified Early to Middle Archaic sites or components. Intensive, repeated occupation of the terraces along the Rio Grande strongly contrasts with the limited evidence of Late Archaic period occupation found by Lang (1977) in the eastern Galisteo Basin, which was sporadic and dispersed. The Cochiti Reservoir sites analysis examined variability in site placement relative to diverse biotic resources. It was expected that site locations would reflect variability in residential group sizes, variability in activity performance, and variability in tool manufacture relative to raw-material distribution (Chapman and Biella 1979:386–393).

Estimates of residential group size were based on the number of and spatial relationship between hearths, and the spatial distribution of hearths relative to artifacts. There was a consistent co-occurrence of hearths, fire-cracked rock, milling stones, and chipped stone that suggested minicamps used by one commensal group. The artifact distributions formed arcs enclosing 3 to 4 m of open space. The hearths, associated with fire-cracked rock concentrations, were at the apex of the arc. Intact ground stone artifacts were commonly associated with the hearths. Contrary to the expectation for settlement concentration, sites with multiple hearths suggesting larger-group occupation or multiple occupations were poorly correlated with areas with potentially higher vegetative diversity. In fact there was little correspondence between potential for vegetative diversity and site clusters.

Investigation of variability in activity performance focused on a functional dichotomy of base camp and location (Chapman and Biella 1979:388). Base camps had a hearth with ground stone and chipped stone debris. Base camp assemblages consisted of a full range of core-reduction debris distributed in the discard arc outside the hearth area. Smaller core-reduction and biface manufacture debris clustered near the hearth, and larger debris formed the discard arc. The unpatterned distribution of tools and manufacture debris indicated that manufacture and processing activities were not spatially segregated. Locations were dominated by early-stage core-reduction debris that was distributed in a circular pattern reflecting one occupation or activity. Chipped stone assemblages lacking discarded or broken tools suggested generalized activities and brief occupations, during which expedient tools only were used sparingly.

Technological variability was strongly conditioned by locally abundant and suitable lithic raw material (Chapman and Biella 1979:391). Most tools were made from local material with a core-flake reduction technique. Obsidian occurred mainly as formal tools that were worn out or broken. Core-reduction debris often exhibited waterworn cortex, indicating that it was obtained from river gravel sources. There was little evidence of formal tool production or gearing up using local material (Andrefsky 1994; Kelly 1988). This suggests that the small mobile commensal groups commonly moved between areas where raw material for tools was available. Abundant raw material also permitted a less efficient and more expedient technology that generated considerably more waste than finished or used products.

The archaeological evidence of the Late Archaic period at Cochiti Reservoir was summarized as

> short-term residential occupations by very small complements of commensal groups, which characterize the Late Archaic adaptation within the Cochiti Reservoir locale. Considerable redundancy for site location is evident in all aspects of subsistence-related behavior, including strategies of food resource processing and consumption; strategies of raw-material selection for tool manufacture; reduction trajectories involved in tool manufacture; and the character of site space utilization. (Chapman 1979:72)

Archaeological evidence of seasonal movement within and between different environmental zones was scarce because floral and faunal remains were poorly preserved or absent (Chapman 1979:73). The Late Archaic period Cochiti Reservoir inhabitants appear to have been residentially mobile, since the sites, except for hearths, lacked permanent structures or facilities. The distance between moves could not be determined, though it was probably determined by the distance between seasonally abundant resource patches. The lack of evidence of gearing up or an intense biface manufacturing industry suggests that the group(s) moved to areas where raw material was available. The limited evidence of biface production also suggests that anticipated activities and tool needs between base camps could be supported by flake tools, existing formal tools, or minimally reduced cores or nodules of material available from the river gravel.

An explanation of the difference in Archaic period site frequencies in the eastern Galisteo Basin and the Cochiti Reservoir locales is lacking. The differences in spatial and temporal distribution could result from changes in the paleoenvironment that required periodic shifts in subsistence strategies. The difference may arise from settlement behavior: sites along the

Rio Grande were reoccupied often, resulting in greater artifact and feature accumulations. Less frequent reoccupation and a more dispersed settlement pattern would result in sites with lower archaeological visibility, like those in the eastern Galisteo Basin. Another important factor is survey coverage and ground visibility. Deflated and sparsely vegetated surfaces in the Cochiti area may promote site identification. Less eroded or deflated and more heavily vegetated settings in the San Cristobal drainage may mask early sites. The San Cristobal drainage is well watered and sheltered, and supported productive though relatively small-scale resource patches. Thus, more Late Archaic to Basketmaker II sites would be expected.

As of 1994, Post (1996a) provided the latest site survey data for the Santa Fe area on Archaic site settings and site structure. All of the sites are open-air lithic artifact scatters with or without hearth complexes or fire-cracked rock concentrations. Site clusters in the Airport Road area (Hannaford 1986; Schmader 1994a), southwest of Santa Fe along Cañada de los Alamos (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. 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 1994; Fuller 1989).

Most of the sites in the Santa Fe area were identified as limited or temporary base camps and limited-activity sites. Typical of these two site types are low numbers of or no processing facilities and equipment, a low-density artifact scatter or a small artifact cluster, and very few unbroken tools. Brief occupations are inferred from low artifact counts and limited artifact variability. A number of characteristics that would suggest longer, more permanent settlement are lacking from site surface characteristics. Facilities and equipment are usually associated with longer occupations or planned reoccupations (Binford 1980; Vierra 1985; 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 before 2000 furnished evidence of longer-duration occupation and frequent reuse or reoccupation of desirable locations. Sites with pit-structure foundation remnants have been excavated in the Tierra Contenta area (Schmader 1994a), in the vicinity of the National Cemetery in Santa Fe (Kennedy 1998), north of the Santa Fe River in the Las Campanas area (Post 1996a), and in the Santa Fe piñon-juniper piedmont below the Tano Divide (Post 2000a). These shallow, roughly circular, basin-shaped structures often have intramural hearths, sometimes with multiple remodeling episodes, and a suite of extramural roasting pits and hearths. 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 BC and AD 900, suggesting that seasonal occupation of pit structures may have continued and coincided with the earliest Pueblo settlements recorded in the Santa Fe area and the Northern Rio Grande region (Kennedy 1998; Post 1996a; Schmader 1994b).

The Pueblo Period (AD 600 to 1600)

Developmental Period (AD 600–1200)

The Developmental period (Wendorf and Reed 1955) is divided into Early (AD 600 to 900), Middle (AD 900–1000), and Late (AD 1000 to 1200). This temporal framework roughly corresponds to the Pecos Classification system developed by Kidder (1924).

Early Developmental period sites are uncommon in the Northern Rio Grande (Wendorf and Reed 1955:138; Stuart and Gauthier 1981). Archaeological survey at Cochiti Reservoir found only 12 sites that could be assigned to this period (Biella and Chapman 1977:203). McNutt (1969:70) found no Early Developmental period components north of La Bajada and White Rock Canyon. In the eastern Galisteo Basin, only five components may date to this period (Lang 1977; Scheick and Viklund 1989). One suggested explanation for the late development of a sedentary, agricultural adaptation is that hunting and gathering sufficiently supported Northern Rio Grande populations into the AD 800s. Peckham (1984) suggests that climate was not conducive to agricultural production until after AD 800. This continued focus on hunting and gathering may be partly attributed to the rich resource diversity of the Northern Rio Grande Valley, forestalling an early reliance on small-scale farming (Cordell 1979:2; Cordell 1989:314).

As during the Latest Archaic period, excavation data from sites along Cañada de los Alamos suggest use of the Santa Fe area to support a residential lifestyle elsewhere (Lang 1992; Post 1998). Low-frequency artifact scatters with a relatively high proportion of hunting-related implements are indicative of a logistically organized subsistence strategy. If populations living outside the Santa Fe River drainage (presumably at lower elevations, where agricultural production was more predictable) came into the area to hunt, then logistical organization would have been the most efficient strategy. An assumed logistical organization is partly supported by the dominance of obsidian at the Cañada de los Alamos sites. Transport and use of nonlocal material indicates knowledge of local material availability, anticipated needs and uses of raw material, and a decision to carry obsidian on forays. As more dates from the AD 400 to 800 period sites lacking pottery are reported, we will have a better understanding of Early Developmental period subsistence organization.

Successful farming of the Pojoaque River Valley may have occurred by the early AD 800s. Farming was successfully practiced in the Albuquerque area, to the south, by the early AD 400s (Cordell 1979; Reinhart 1967). In the Santa Fe area, temperature and precipitation may have been too unpredictable to sustain an agriculturally focused economy prior to AD 800. North of the Santa Fe River, small villages were established along the Tesuque and Nambe Rivers after AD 800 (Wiseman 1995; Lent et al. 1994). These areas are at lower elevations, have predictable water supplies, and presumably could sustain agriculture. It is possible that small, family-sized, agriculturally sustained groups did occupy the Santa Fe River drainage at this time, but sites have not been found.

During the Middle Developmental period (AD 900 to 1000), site frequency increased in the Northern Rio Grande area. Excavations in the Santa Fe and Tesuque river valleys revealed pithouses associated with contiguous surface rooms and perhaps a kiva (Honea 1971; McNutt 1969:58). The pottery was mineral painted in the Red Mesa style, and neckbanded utility wares occurred. These sites do not necessarily mean that population increased, but they may reflect a change in the settlement and subsistence pattern to a more sedentary lifestyle. Sedentary occupations tend to leave more visible structural remains and artifact accumulations. The general settlement pattern was still one of low population density. Few sites dating to this period have been identified in the Santa Fe area.

The Late Developmental period is assigned to AD 1000–1200. This period is roughly contemporaneous with the late Pueblo II and early Pueblo III periods of the Pecos Classification. In the Northern Rio Grande, increases in the number and size of sites indicate population growth (Wendorf and Reed 1955:140–141). Site size in the Northern Rio Grande area ranges from 1 to 100 rooms. Some researchers suggest that the increased population represents overflow from the Anasazi heartland (Cordell 1979). This hypothesis is partly based on the predominant pottery type, Kwahe'e Black-on-white, which was originally identified by Mera (1935) as a local Rio Grande variant of Chaco-style pottery. Kwahe'e Black-on-white is a mineral-paint pottery that favors hatchured and solid design elements. It has been suggested that the spread of this decorative style coincided with the growth of the Chaco system in the San Juan Basin in northwestern New Mexico (Toll et al. 1992).

Known sites near the south end of the project area include LA 114 (Arroyo Negro), LA 15969 (Wiseman 1978), and a minor component at Pindi Pueblo (LA 1) (Stubbs and Stallings 1953). The Pindi Pueblo component shows that some large Coalition period sites had their origins in this period (Stubbs and Stallings 1953:14–15).

Arroyo Negro (LA 114) was originally recorded by Mera in the 1920s. It has seven small (less than 10 rooms) to medium (11–25) roomblocks constructed of adobe with cobble foundations (Peckham 1974, ARMS file). In 1934 W. S. Stallings collected 95 tree-ring samples from pothunted rooms and four kivas (Smiley et al. 1953:27–29). The tree-ring dates indicate an occupation span of AD 1050–1150, with less reliable dates of AD 950–1000 for Kiva C. Two construction episodes occurred between the AD 1050s and AD 1130–1145 (Smiley et al. 1953:29). Identified pottery types at LA 114 included Kwahe'e Black-on-white, Santa Fe Black-on-white, Socorro Black-on-white, and Wingate Black-on-red.

LA 15969 was identified by Wiseman (1978:8) on top of the gravel terrace overlooking the north prehistoric floodplain of the Santa Fe River. The site included a U-shaped 14-room structure with a kiva. It is estimated to have been occupied between AD 1100 and 1150, making it contemporaneous with the later occupation of LA 114.

The Late Developmental component at Pindi Pueblo (LA 1) had two jacal structural remnants, a pithouse, and sparse refuse (Stubbs and Stallings 1953:9). The refuse was in the central portion of the site on a knoll. Identified pottery types included Red Mesa Black-on-white, Kwahe'e Black-on-white, and Puerco and Wingate Black-on-red (Stubbs and Stallings 1953:14). Stubbs and Stallings observed that the pre-Pindi material was very sparse and the deposit ranged from 2 to 50 cm deep. These deposits were underneath the later Coalition period occupation.

In the Las Campanas study area, Late Developmental period sites and isolated occurrences were rare. Only seven Late Developmental period sites were identified, and six of these were mixed with evidence of more intensive use during later periods (Post 1996a:442–443). This low number of sites suggests that Late Developmental period foraging activities that might have resulted in the discard of pottery were limited to areas that were closer to more permanent habitations than the foraging radius in the Coalition period. In other words, if foraging were restricted to a 2–3 km radius rather than a 3–7 kilometer radius, then Late Developmental period sites would also be rare in the Santa Fe Ranch lease.

Coalition Period

The Coalition period is marked by three major changes in the archaeological record in the Northern Rio Grande: a significant increase took place in the size and numbers of sites, suggesting an increase in population and an extension of the early village-level organization of the Late Developmental period; pithouses as domiciles were replaced by contiguous arrangements of adobe and masonry surface rooms; and mineral paint was replaced by organic paint in pottery making. These changes from the Late Developmental period were sufficient to warrant a new period in the Northern Rio Grande cultural sequence that was divided into two phases: Pindi (AD 1220–1300) and Galisteo (AD 1300–1325) (Wendorf and Reed 1955). The decorated pottery was divided into Santa Fe Black-on-white and all its local variants (Stubbs and Stallings 1953) for the Pindi phase and Galisteo Black-on-white (Mera 1935) for the later phase. Most of the large sites were established during the Pindi phase. The largest sites continued to grow into the Galisteo phase, anticipating the large villages of the Classic period. Site sizes ranged from 2 to 200 rooms; 15 to 30 rooms was the most frequent size (Stuart and Gauthier 1981:51). Site frequencies in all areas of the Northern Rio Grande increased enormously at this time (Biella and Chapman 1977:203; Orcutt 1991; McNutt 1969; Lang 1977).

In the Santa Fe River Valley, large villages on the prehistoric floodplain near the river channel were established during the Early Coalition period. The only reported excavations were at Pindi Pueblo (LA 1; Stubbs and Stallings 1953) and the Agua Fria Schoolhouse site (LA 2; Lang and Scheick 1989). LA 1, LA 2, LA 109, LA 117, LA 118, and LA 119 have Santa Fe and Galisteo Black-on-white and at least a small amount of glaze-paint pottery, suggesting that all six sites are roughly contemporaneous. These villages formed a large continuous community that was 3.2 km (2 mi) long. Sites in the Santa Fe River Valley recorded by Carter and Reiter (1933), but not by Mera, include CR (Carter-Reiter) 178, 180, 182, 183, and 185. These sites may have Coalition and Early Classic period components, since Pindi Pueblo and Agua Fria Schoolhouse were recorded by Carter and Reiter as historic sites.

Pindi Pueblo was excavated by Stubbs and Stallings in 1933, and the monograph on the excavation results was published in 1953. Based on Stubbs and Stallings's (1953) site map, 210 rooms, 2 plazas, 4 subterranean kivas, and 2 surface kivas were excavated. Stubbs and Stallings (1953:155) recognized two ceramic periods and three building periods.

The first ceramic period and first building period were contemporaneous. The first ceramic period was dominated by Santa Fe Black-on-white and sand-tempered utility pottery (Stubbs and Stallings 1953:155). The first building period occurred between AD 1270 and 1305 (Ahlstrom 1989:369). The building was made of adobe, consisted of 40 rooms, and had an irregular shape. It was built on top of the central ridge that crosses the site. All or part of four kivas date to the first building period. The wall abutments shown on the site map indicate that the first building period resulted from erratic small-scale accretional construction. Most walls are two rooms long, and there are few double corner abutments from simultaneous construction.

The second ceramic period dated between AD 1305 and abandonment in 1350 (Ahlstrom 1989:376). It includes Stubbs and Stallings's (1953) Building Periods 2 and 3. Building Period 2 occurred between AD 1305 and 1340 and included two periods of growth (Ahlstrom 1989:375). The early portion of Building Period 2 dated from AD 1305 to 1320. It was a period of slow growth with a possible occupation hiatus between AD 1316 and 1321 (Ahlstrom 1989:375). During the latter portion of Building Period 2, Pindi Pueblo experienced rapid growth, and an estimated 200 rooms were constructed between AD 1320 and 1340 (Ahlstrom 1989:376). The pottery types were dominated by Galisteo and Pindi Black-on-white, western glaze polychromes, and a few Rio Grande Glaze A wares (Stubbs and Stallings 1953:155). Building Period 3 may have occurred late in the AD 1340s, based on the tree-ring dates.

Pindi grew rapidly from AD 1320 to 1339. Building Period 1 rooms were remodeled or razed, and many roomblocks were added to the village plan. The buildings were estimated at one to four stories tall (Stubbs and Stallings 1953:31). The enlarged village enclosed two plazas, two surface kivas, and six specialized rooms, which may have been kivas. While size and population may be correlated, Stubbs and Stallings (1953:10) are careful to mention that as room conditions deteriorated, rooms were abandoned and filled with trash or dirt. Then new rooms were constructed. This process is described in detail by Stubbs and Stallings (1953:10), but the implications for pueblo growth and population estimates are not explored.

The material culture of Pindi Pueblo indicated that maize agriculture was a major subsistence pursuit. Turkey pens were excavated, showing that the residents practiced animal domestication. Referring to formal tools and not tool-manufacture debris, Stubbs and Stallings (1953) observed that there was little evidence of a stone-tool industry. Obsidian and local chert, chalcedony, silicified wood, and quartzite were the most common raw materials. Most of tools they illustrated were for heavy-duty use, such as mauls, hammerstones, adzes, hoes, and axes. A large number of manos and metates were also recovered.

A review of the material culture items lists and illustrations shows that the inhabitants of Pindi Pueblo used an array of natural resources typical of the local ecozones. Faunal remains included nine species of bird and 15 mammal species. The most abundant species was turkey, which was used for food and feathers, and as raw material for bone tools and ornaments. Large mammals could have been hunted in the Galisteo Basin and on the piñon-juniper piedmont. Curiously, no elk or bison bones were identified, which suggests that Pindi hunters had fairly restricted hunting ranges. Yucca was used for sandals, baskets, and mats. Macrobotanical specimens included cultigens (corn, beans, and squash) and wild plants (yucca, cactus, and amaranth).

Stubbs and Stallings (1953) do not say why Pindi Pueblo was abandoned. Lang and Scheick (1989:197), using dendrochronological data from Rose and others (1981), suggest that boom periods at LA 1 and LA 2 corresponded with variable moisture periods, while slow growth was associated with too much water. Too much water may have caused a contamination of the water table, which affected agricultural productivity. A brief period of drought in the middle AD 1340s corresponds to the decline and eventual abandonment of Pindi Pueblo. Poor soil quality, variable precipitation, and perhaps degraded living conditions may have combined to force the abandonment.

Limited excavations at the Agua Fria Schoolhouse site (LA 2) yielded more information on a prehistoric Santa Fe River community that appears to have flourished during the Middle to Late Coalition and Early Classic periods. Like LA 1, LA 2 was established sometime between AD 1275 and 1310 (Lang and Scheick 1989:189), which contradicts Stubbs and Stallings's (1953:155) notion that as LA 1 was abandoned, LA 2 was established. Clearly, both villages were inhabited concurrently during the Coalition period.

During the Coalition period, LA 2 was a coursed-adobe pueblo with at least three plazas and an unknown number of rooms (Lang and Scheick 1989:191–192). The size of the site was estimated at 4.3 ha (11 acres) and may have housed between 1,000 and 2,000 people by the late AD 1300s (Lang and Scheick 1989:196). It is not known how many rooms were built or how many people occupied the village during the Coalition period.

The artifact assemblage from LA 2 was similar to that of LA 1. The numbers of Santa Fe Black-on-white, Wiyo Black-on-white, and Galisteo Black-on-white sherds were similar (Lang and Scheick 1989:192). Trade wares from the Zuni-Acoma areas were most common at LA 2. The chipped stone industry showed a reliance on obsidian for formal tools and a heavy reliance on locally available materials for ground stone, large chipped stone hand tools, and expedient utilized flakes (Lang and Scheick 1989:192). Subsistence data showed a reliance on cultivated squash and corn, cattails and probably other riparian plants, wild plants, small fauna, and the consumption of domesticated turkey (Stiner 1989:187). People from both communities probably relied heavily on the initially abundant resources of the Santa Fe–Tesuque Divide and the rolling piñon-juniper woodlands of the Caja del Rio. A definite increase in use of these areas is suggested by the large number of isolated occurrences and nondiagnostic lithic artifact scatters recorded by recent surveys (Wiseman 1978; Maxwell 1988; Hannaford 1986; Viklund 1990).

During excavations at Las Campanas, 37 Coalition period components were identified by the presence of Santa Fe Black-on-white pottery (Lang 1997; Post 1996a). Pottery occurred as isolated or clustered artifacts, usually associated with chipped stone scatters and clusters. Thermal features associated with pottery included fire-cracked rock filled pits, unlined burned pits, and two pottery kilns (LA 84793 and LA 86159). Many sites had evidence of repeated occupations with many clusters of pottery and thermal features. No formal structures were identified, though a foundation for a temporary shelter was identified at LA 98680. Use of chipped stone focused primarily on raw-material procurement, core production, and the use of core flakes as tools. Formal tools were rare, but when present, they were often made from obsidian. Typically, the sites were on gentle slopes or flat ridges above the Arroyo Calabasas and Arroyo de los Frijoles and their major tributary arroyos.

The Coalition period land use within the Las Campanas area has been interpreted with a "common lands" perspective (Kohler 1992; Post 1996b). Common lands can be conceived of as "land used by all." This includes the Santa Fe River piedmont area, which is 5 to 10 km from the nearest village. "Land used by all" implies no restrictions and no social or political pressure to continually reoccupy locations. Other locations might be more productive. Plant-gathering and plant-processing sites should have been in the most productive and abundant areas, and there is no evidence to the contrary. Lithic raw materials available on the landscape were intensively used, but other activities were bundled with raw-material procurement and early-stage reduction. Special-activity sites that could be differentiated from the strong pattern of multiple occupation and mixed technological organization were rare. Kiln sites are rare in any site assemblage within the Northern Rio Grande. Such sites have been found 6 to 7 km from the villages, suggesting that such activities took place during foraging (Post 1996b).

The Northwest Santa Fe Relief Route inventory and testing (Maxwell 1988; Wolfman et al. 1989) yielded 16 components from the Coalition or Early Classic period that remained from short or daily use of the piedmont hills. Thermal features were mainly shallow, oval-shaped pits. Cobble linings or fire-cracked rock were absent to moderately abundant. Most sites exhibited chipped stone reduction patterns, reflecting material procurement and testing, and debris from all stages of core reduction. Sites were interpreted as containing debris from activities that supported daily foraging. Local raw material made up 95 percent of the chipped stone debris. The artifact and feature distributions reflect occupations of single high-intensity episodes or many brief visits that left a dispersed artifact scatter.

Classic Period (AD 1325 to 1600)

Wendorf and Reed (1955) mark the beginning of the Classic period (AD 1325–1600) by the appearance of Glaze A and locally manufactured red-slipped pottery (see also Mera 1935; Warren 1979). Characterized by Wendorf and Reed as a "time of general cultural florescence," regional populations reached their maximum size, and large communities with many plaza and roomblock complexes were established. Although the reasons for the appearance and proliferation of the glaze wares are debatable, many researchers, including Eggan (1950), Hewett (1953), Mera (1935, 1940), Reed (1949), Stubbs and Stallings (1953), and Wendorf and Reed (1955), believe that the similarity of the new pottery to White Mountain Redware is evidence of large-scale immigration into the area from the San Juan Basin and Zuni region. Steen (1977) argues, however, that the changes seen during this period resulted from rapid indigenous population growth. Steen believes that the population growth was enabled by favorable climatic conditions, which allowed Rio Grande populations to practice dry farming in previously unusable areas. Steen also suggests that there was "free and open" trade between the Northern Rio Grande region and other areas, accounting for the observed changes in Classic period material culture.

It is therefore unclear how much of the population increase during this period resulted from immigration and how much was the result intrinsic growth. Besides populations migrating from the west, it has also been suggested that some population growth came with the arrival of people from the Jornada branch of the Mogollon to the south, and perhaps from northern Mexico (Schaafsma and Schaafsma 1974).

Large villages of this period found in the Santa Fe vicinity include the Aqua Fria Schoolhouse (LA 2), Arroyo Hondo (LA 12), Cieneguilla (LA 16), LA 118, and LA 119. The latter portion of Building Period 2 and Building Period 3 at Pindi Pueblo are Early Classic period occupations. When Glaze C pottery appeared (ca. AD 1425), however, only Cieneguilla was still occupied, and the size of its population is unknown. Dickson (1979) believes that abandonment of the large villages was the result of drought conditions revealed by tree-ring studies (Fritts 1965; Rose et al. 1981) and subsequent agricultural failure.

To the south of the project area in the Santa Fe River Valley, LA 1 and LA 2 are the best-known Classic period sites. LA 1 was occupied between AD 1325 and 1350, which is the early part of the period (Stubbs and Stallings 1953:155). This may have been a time of population movement and village reorganization. Pindi Pueblo experienced a short interlude of decreased occupation before AD 1325, but by AD 1330 new building and renewed use of older parts of the pueblo had taken place (Stubbs and Stallings 1953:14). A similar pattern was suggested for LA 12 (Arroyo Hondo Pueblo) (Lang and Scheick 1989:196). A change in kiva function may be indicated by a change in their number (four to two) within villages and a change from subterranean to surface placement. Plazas were more conspicuous at this time, suggesting a more centralized organization that may have required larger community areas for social or ceremonial functions. It is known that the large villages of the Galisteo Basin, the Rio Grande, and Rio Chama, like Early Classic period Pindi Pueblo, had fewer kivas and used larger, more centrally located community space. The full florescence of the Classic period was not realized at Pindi Pueblo because it was abandoned in AD 1350, when the larger villages were being established.

The limited excavation data from LA 2 suggests an occupation that lasted until AD 1420, which corresponds to Arroyo Hondo Pueblo and La Cieneguilla. Little is known about the Early Classic period at LA 2. The abundance of Glaze A pottery suggests that the residents were engaged in regular social or economic interaction with Classic period villages to the south (Lang and Scheick 1989). Lang and Scheick (1989:195) surmise that LA 2 was the largest village in the Santa Fe River Valley until AD 1420. If the village did house between 1,000 and 2,000 people, as suggested by Lang and Scheick (1989:196), then the smaller surrounding villages (LA 117, LA 118, and LA 119) may have been abandoned by AD 1350, and the local population may have coalesced at LA 2. An untested hypothesis suggests that this coalescence may have been brought on by a change in social organization, not environmental conditions. The resources of the Santa Fe River could have been successfully exploited by many little villages. Success notwithstanding, sometime after AD 1350, everybody may have moved into one large village. If economic resources were equally available to all, then there must have been other social or religious factors that contributed heavily to population aggregation (Cordell 1978:58).

After AD 1420, the Santa Fe River Valley east of Agua Fria, was mostly abandoned. The large settlement at La Cieneguilla increased in size and was still occupied by Native Americans until the Pueblo Revolt in AD 1680. The settlement pattern that prevailed throughout the Rio Grande, Rio Chama, and Galisteo Basin was a decrease in the number of small villages or large farmsteads. The remaining large villages in the Galisteo Basin, the Cochiti area, and the Tewa Basin dramatically increased in size (Stuart and Gauthier 1981). Presumably these large villages had extensive subsistence catchment basins and extensive networks of social and economic interaction. That few or no Native American sites dating between AD 1420 and 1680 are found in the Santa Fe area is reflected in the survey results from large parcels near the Santa Fe River Valley (Hannaford 1986; Maxwell 1988; Wiseman 1978; Gossett and Gossett 1989).

On the Pajarito Plateau, population declined in the Early Classic period (AD 1325 to 1400), while aggregation continued to increase, and there was a shift to lower-elevation settlements. The increase in aggregation was accompanied by a proliferation of agricultural fieldhouses (Orcutt 1991; Preucel 1988). Population remained aggregated throughout the Middle Classic period (AD 1400 to 1550) and in the late Classic period (AD 1550 to 1600) as population continued to decline. These late aggregates are at lower elevations near reliable water and good arable land, such as Frijoles Canyon.

The Research Design

The research design and data recovery plan for the Northwest Santa Fe Relief Route project was based on testing results that apparently demonstrated that the majority of the cultural materials and deposits were exposed on or close to the surface. These shallow cultural deposits occurred in very rocky colluvial and eolian soil that was originally interpreted as geomorphologically stable. This observation was based on a lack of understanding of the natural processes that had affected the piedmont over the last 7,000 years. Two sites, LA 61315 and LA 61286, were chosen for further study because of the likelihood that they contained intact buried deposits. Santa Fe Relief Route Phase 3 excavations (Post 2000b) confirmed that deeply buried deposits were present, though the example was limited to one site, LA 61315. The buried deposits were multicomponent and stratified. At lower elevations on the Santa Fe Plains (Spiegel and Baldwin 1963), excavations at the Airport Road site, LA 61282 (Santa Fe Northwest Relief Route, Phase 1), also showed that even in areas where the slope was gentle and the potential for colluvial accumulation was apparently minimal, substantial buried deposits could exist on the basis of a light scatter of chipped stone artifacts (Lent 1988; Post 2004). The research design recognized that supervisory archaeologists might need to use mechanical equipment to search for or expose deeply buried deposits. However, the significance of these deposits in chronology, subsistence, and local and regional settlement organization was not addressed.

Problem Domains

Theoretical developments since the mid 1960s, including a heavy emphasis on changing settlement and subsistence patterns through time, have demanded a shift in research orientation away from individual sites and towards the archaeology of local areas or even broad regions. This newer perspective is important to remember because it conditions our understanding of the data of the Northwest Santa Fe Relief Route sites. Individually, each of the sites provides us with only a very limited glimpse of the prehistoric cultures of the Northern Rio Grande area. However, the data recoverable from the sites as a whole, if interpreted as part of a regional pattern, allows us to understand portions of the overall subsistence and land-use patterns that we conceivably could not study at large habitation sites.

The Northwest Santa Fe Relief Route sites appear to have played at least three roles in the general adaptive strategies of local prehistoric peoples. There were areas where chippable stone could be obtained, tested, and initially worked before being transported to habitation sites or foraging or resource-extraction locations. There were areas where people paused briefly during the seasonal gathering of wild-food resources and nonfood biotic and geologic resources (besides lithic raw material). Finally, there were areas in which farming could be practiced, if soil and moisture could be concentrated through the use of checkdams or similar features. The focus of the data recovery, therefore, was to better define these three functions as parts of larger subsistence and settlement patterns.

As a further consideration, the Northwest Santa Fe Relief Route sites could not be fully interpreted in terms of the traditional concern with placing remains within phases or other slices of time. This is because the emphasis of many Southwestern archaeological studies is on a specific type of site structure. The most desirable sites, of course, are those with stratigraphy. Almost as useful are a series of archaeological sites, each of which represents one short-term occupation, because the sites can then be seriated to establish a local occupational sequence. In contrast, sites without datable remains, or where the remains of several periods are mixed together, are seen as a difficult or an impossible methodological challenge.

Yet this is exactly what the Northwest Santa Fe Relief Route sites appear to be. In a sense they are a fossil remnant of a landscape that people used for many centuries, periodically or seasonally procuring and reducing lithic raw material; foraging for plants, seeds, and nuts; planting and tending a small maize crop; or spending a few days in a temporary camp. Until recently it seemed that there was no local geographic focus, such as a spring or a rock shelter, where these activities were concentrated. Recent research in the Las Campanas area, which adjoins the Northwest Santa Fe Relief Route on the north, has shown that sites do tend to cluster along primary tributaries of the Santa Fe River and their tributary arroyos. Extensive but shallow cultural deposits exist on the ridge and terrace slopes (Post 1996b; Lang 1997). As a transect sample of the cultural deposits in the piedmont hills, the remains within the Northwest Santa Relief Route are an unstratified, diffuse record of limited actions. Because of the nature of the prehistoric or early historic land-use patterns, spatial proximity or artifacts and features may or may not indicate contemporaneity. We may find a hearth near a checkdam, and both within a light scatter of chipped stone, but that does not mean that those remains were all left by the same people. An Archaic hunter may have built the campfire; centuries later, a Pueblo farmer may have built his garden plots; and for several thousand years, local people may have been testing and reducing nodules of chert.

Thus, it is inappropriate to emphasize chronology. We may be able to tell which periods saw the heaviest use of the project corridor from the number of diagnostic artifacts from those periods and the temporal distribution of radiocarbon and other dates, but it may often be impossible to associate dates with specific remains. The alternative is to see the Northwest Santa Fe Relief Route sites as evidence of general subsistence approaches shared by various groups through time, and to assess the nature and importance of these various approaches. For example, were piñon nuts the primary wild food resource along the Northwest Santa Fe Relief Route, as we currently suppose, or were other wild foods more important? What made checkdams a practical farming tactic in this area? And why were local gravels such an attractive source of chippable stone?

In summary, traditional "site" approaches did not work for this project. Instead, it is necessary to define the Northwest Santa Fe Relief Route corridor as part of an "archaeological landscape" that also includes habitation sites outside the right-of-way. Within this landscape, each feature capable of yielding useful excavation data represented the proper unit of field study, while the proper unit for final analysis was the set of all excavated features. Once analysis of the excavation data were complete, it was possible to define specific cultural or temporal trends and understand the use of the landscape in a general sense over time.

Problem Domain 1: Use of Chippable Stone

Prehistoric inhabitants of the Santa Fe area used chert, quartzite, and other types of stone in the local surface gravel and cobble deposits as raw material for the production of stone tools. Given the scattered nature of the chipped stone found along the Northwest Santa Fe Relief Route and tributaries of the Santa Fe River, it appears that the occupants could obtain raw material during daily foraging or travel or specifically for transport back to the village. Prospecting consisted of cracking open or removing single flakes from surface cobbles. If the material were suitable, then the promising cores or flakes they had produced would be taken off-site, and the debris would be left. The degree of dispersion following discard depended on erosion, the degree of slope, how often the area was visited, and how intensely the remaining debris was graded.

Archaeologists typically draw circles around artifact clusters and call them sites, but such circles may not be appropriate units of analysis. Artifact clusters may represent the accumulation of chipping debris over many decades or centuries. Indeed, the same nodule may have been reduced several times over the years. Palimpsest artifact distributions will always offer a challenge to accurate or meaningful dating, but they should not deter the use of sites or components as tools for examining subsistence and land-use patterns on broader temporal scales. The Las Campanas study showed that there is a continuum of assemblage and attribute variability that reflects the range of activity and intensity at which certain areas were used by prehistoric populations (Post 1996a:468–470). Furthermore, comparing sites of unknown age with Pueblo or Archaic period sites and components shows that the unknown sites are more like the Pueblo sites (Post 1996a:470–472). Individual sites with palimpsest (multicomponent) distributions may not be informative, but the Las Campanas project showed that assemblages of sites and components can be productive objects of research. Because of the relatively large number of sites and the intensity at which they have been and will be studied, the Northwest Santa Fe Relief Route chipped stone assemblages are important.

Wolfman et al. (1989:153) defined one major concern in the study of chipped stone recovered from the Northwest Santa Fe Relief Route sites: "What was the relationship, if any, between the procurement of chippable stone in the Northwest Santa Fe Relief Route area and the other adaptive behavior (farming, food gathering) evident in the Northwest Santa Fe Relief Route sites? Did lithic procurement take place as part of subsistence activities, or independently from them?"

This broad question incorporates technological, functional, and structural studies of lithic artifact assemblages, attributes, and distributions. We attempted to recover chipped stone artifacts from more extensive excavation of core-reduction concentrations or clusters and feature/activity areas. The excavation strategy focused on systematic recovery of artifacts for spatial analysis of artifact and attribute distributions. Our analysis strategy was to compare artifact types and attributes with those of other Northwest Santa Fe Relief Route excavations and the Las Campanas excavations.

Problem Domain 2: Foraging

The second major activity posited for the Northwest Santa Fe Relief Route is foraging for wild foods and the collection of nonfood biotic and geologic resources (other than lithic raw materials). Wild-food procurement could include hunting and plant-food gathering. Wolfman et al. (1989:156) assumed that the emphasis was on plant-food gathering with a seasonal focus on the harvesting of piñon nuts. Though not confirmed by macrobotanical or pollen analysis, it is more likely that prehistoric Santa Fe River villagers obtained a broad spectrum of resources from the piñon-juniper piedmont hills. As described in "Modern Environment" (this report), "Piñon-juniper woodlands supported 135 of the 271 plant species observed within the Arroyo Hondo Pueblo catchment (Kelley 1980:60). Of these, 63 species are edible or have medicinal qualities. However, with the exception of piñon, most of the species are not abundant or are most productive in disturbed soils."

In considering the Northwest Santa Fe Relief Route sites, it is instructive to consider a brief article by Sebastian (1983), which considers the nature of one-day-use sites in the Chaco Canyon area. She wrote that such sites have either structures or hearths, but not both, and contain high percentages of utility wares (about 80 percent of the total) and jar sherds (about 70 percent). Chipped stone artifacts were not especially diagnostic relative to site function. One problem with interpreting such sites is the lack of ethnographic information on historic Pueblo day-use site practices. Sebastian (1983) noted, "Beaglehole (1937) provides the most comprehensive discussion of Pueblo gathering practices (Hopi in this case) that I could find, and this section of his monograph covers a scant two pages."

Ellis (1978) wrote that piñon nuts were gathered on outings of one to several days. Many of the gathering camps described by Ellis contained no structures, but those used overnight often had perishable structures that might include one dry-laid stone wall. Although it is not clear, Ellis seems to indicate that piñon nuts were roasted at the camps (also see Sebastian 1983). In his brief description of eastern Pueblo piñon collecting, Lanner (1981) describes the practice of roasting the nuts in the pueblos instead of in the field. Thus, based on the limited ethnographic information, piñon nut gathering sites may or may not contain thermal features used for roasting the nuts.

Tray-roasting piñon nuts with live coals from hearths was a common aboriginal practice. Thus, even if a thermal feature was used as part of the nut-roasting process, there may be no burned hulls in the thermal feature itself. However, charred piñon hulls were recovered during testing from at least one thermal feature during this project (LA 61286, Feature 3), suggesting that further attempts at recovering such remains is worth the effort.

Excavation of over 30 thermal features from Las Campanas sites failed to yield any evidence of nonwood charcoal economic species and very limited evidence of meat roasting, processing, or consumption (Mick-O'Hara 1996; Post 1996a; Toll and McBride 1996). Recovery strategies varied from water-screening and fine-screening 2 to 4 liters of soil from features to recovering the whole feature. There was no immediate reason to believe that current efforts would be more successful, but intensive sampling of features was meant to explain the paucity of charred plant and faunal remains.

Part of this effort was recovering charcoal from fuelwood to provide evidence of continuity or change in the local environment. As a supplement to ceramic manufacture dates, thermal features were expected to provide charcoal for radiocarbon dating in direct association with other remains. This meant that the analysis of foraging patterns could yield information on changes in those patterns over time.

These concerns were framed into the following research questions:

1. What evidence of plant and animal foods is in the various thermal features along the Northwest Santa Fe Relief Route? Does that evidence suggest a dependence on local wild foods, and if so, which ones? Is the archaeological distribution of these food types consistent with their modern spatial distribution? Or do the data suggest a dependence on crops, and if so, which ones?

2. Are functional differences in thermal features evident in morphology, internal fill and structure characteristics, or artifact assemblages?

3. How old are the various hearths? Do they occur over an extended time span, or are they most common in one period?

4. Given the known content and age of hearths, can we suggest any changes in subsistence emphasis along the Northwest Santa Fe Relief Route through time?

5. What is the relationship between foraging activities and other activities in the Northwest Santa Fe Relief Route area?

Answering these questions required the recovery of flotation and datable samples from thermal features and their systematic excavation. We were looking for use-surfaces in association with the hearths, but since the sites were largely superficial, this was not likely.

Problem Domain 3: The Settlement-Subsistence System

Once the basic questions from studies of farming and foraging behavior were addressed (and the chipped stone data evaluated in terms of that behavior), we planned to step back and interpret the project results in terms of the known prehistory of the Santa Fe area as a whole. We hoped to explain how the limited or seasonal activities encountered along the Northwest Santa Fe Relief Route formed part of a greater subsistence and settlement system:

1. When the Northwest Santa Fe Relief Route is viewed as a whole, what was its basic role as a sustaining area or resource area? If temporal distinctions are possible, can we also define any continuity or change in this role through time?

2. How do patterns along the Northwest Santa Fe Relief Route, as a sustaining area, compare to the known settlement and subsistence patterns of the Santa Fe area as a whole? For example, does the most intensive use of the Northwest Santa Fe Relief Route coincide with the heaviest local occupations? Or can we see a fairly consistent use of the area, independent of other changes in the area?

3. Does the relationship between the Northwest Santa Fe Relief Route sites and nearby habitation areas provide us with insights about the future study of sustaining vs. habitation areas in the Northern Rio Grande region as a whole?

Answering these questions required us to compare the Northwest Santa Fe Relief Route to nearby areas of occupation with site survey records and previous reports on Santa Fe archaeology.

LA 61286

LA 61286 was between centerline stations 649+00 and 655+25.00 on a gentle southeastern slope overlooking Arroyo Gallinas (Fig. 2). Erosional channels dissected the site, including two major channels that delineate the eastern and southwestern edge of the site. It was primarily within the west portion of the right-of-way and extended outside the right-of-way to the northwest onto private property, so the true limits of the site could not be determined.

Preexcavation Description

LA 61286 was thought to measure 200 m north-south by 200 m east-west during the testing phase. Five features that appeared to be hearths or roasting pits were examined. Features 1, 2, and 5 exhibited cultural deposits that could yield chronological or subsistence information. Feature 4 was a surface hearth with no intact subsurface deposits, and Feature 3 was outside the right-of-way. Investigators collected 240 lithic artifacts and 38 sherds of Coalition or Early Classic period pottery. The lithic artifacts were mostly core-reduction debris of local chert and quartzite. Part of a sandstone basin metate was found. Obsidian occurred in small amounts as reduction debris and a formal tool fragment. The pottery included 35 Tesuque smeared indented corrugated jar sherds, 1 Santa Fe Black-on-white bowl sherd, and 2 unidentified carbon-painted bowl sherds. It was suggested that the site had been occupied by a large band while collecting plants and hunting, or that small foraging bands or groups had occupied it repeatedly. Occupation was dated to AD 1200–1350. The excavation of the features was expected to yield C-14 samples to refine the site occupation sequence and history, and paleobotanical and faunal samples that would help determine site function (Wolfman et al. 1989:26–29).

Excavation Methods and Results

Excavation and an inspection of the site surface and erosion channel and arroyo cuts determined that LA 61286 was more extensive than originally thought (Fig. 4). Excavation began in the 100N area (Area 1), which was also the focus of the testing phase. As the excavation progressed and our search radius expanded, we identified two more areas with buried cultural deposits exposed in arroyo walls. One area appeared to be a single hearth about 1.60 m below the modern ground surface at 234N/100E (Area 3). Another area at 220N/40E displayed a 25 m long charcoal-infused soil stain from modern ground surface to 60 cm below the modern ground surface (Area 2). Intensely stained pockets appeared to be cross-sectioned hearths or roasting pits, while the overall evidence suggested that LA 61286 was a heavily reused base camp. These two additional areas were investigated. The 234N/40E area extended to the west beyond the right-of-way limits.

Area 1

The excavation of Area 1 (100N) focused on relocating, exposing, and documenting the thermal features and near-surface charcoal stains (Wolfman et al. 1989). A 1 by 1 m grid system was established with 94N/100E as the southwest corner, and 100N/100E was set at centerline station 651+38.00. The site datum was set at 108N/75E, the westernmost extent of the cultural deposit. Vertical control was maintained from four subdatums. Because the majority of the surface artifacts were collected during testing, surface stripping focused on features. One hundred and fifteen units were surface-stripped within a 13 by 12 m area, or 74 percent of the area encompassing Features 1, 2, and 5 (Figs. 5 and 6).

Surface stripping of 5 to 15 cm of loose colluvial sandy loam revealed the test pit outlines and adjacent features. Feature 1 was

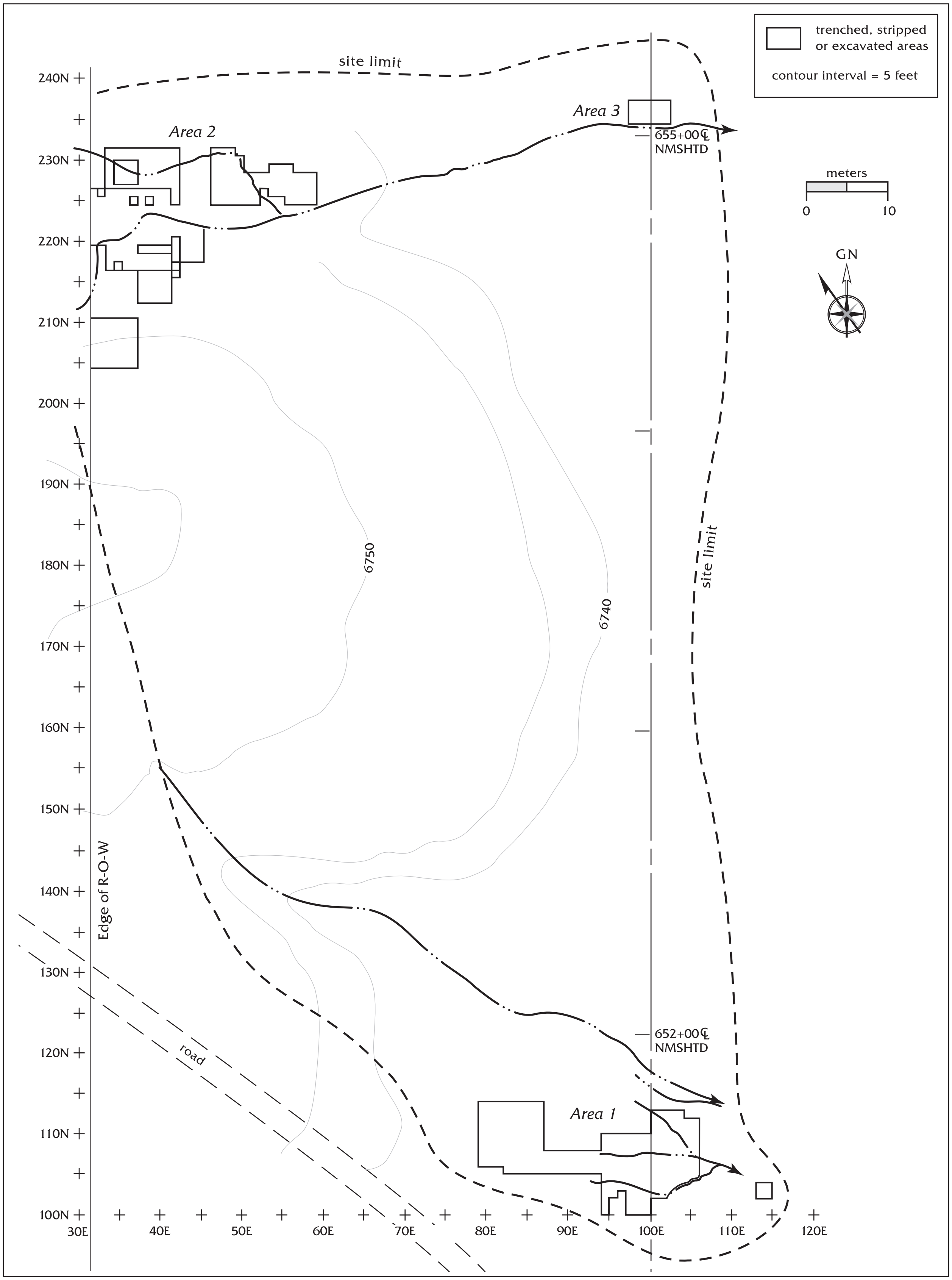


Figure 4. Plan of excavation area, LA 61286.

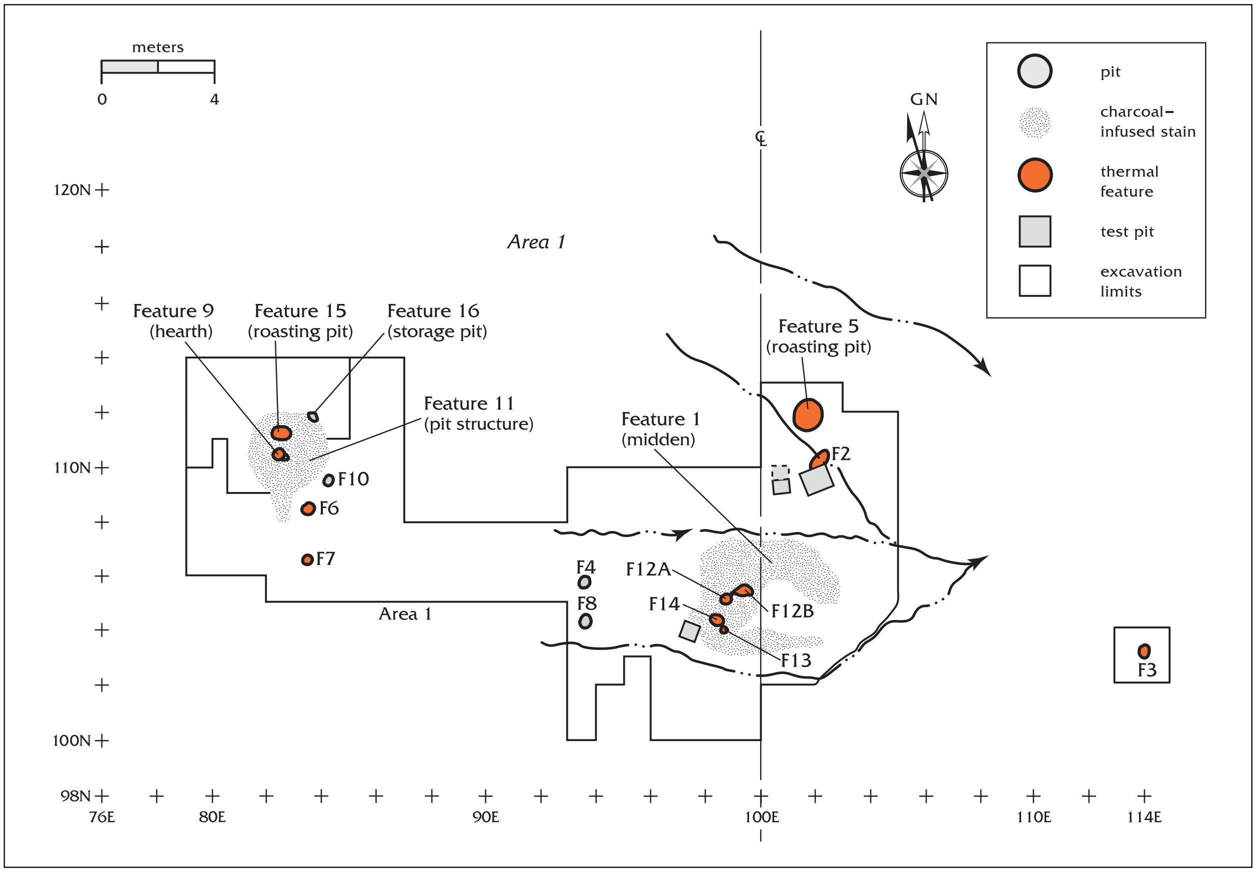


Figure 5. Plan of Area 1, LA 61286.

Figure 6. Area 1, LA 61286, looking east.

defined as a bifurcated undifferentiated burned pit (renumbered as Feature 2), which confirmed the testing determination. Features 2 and 5 were revealed as a dense cultural deposit or probable domestic midden (renumbered as Feature 1) overlying at least three thermal features (Features 12, 13, and 14). Obviously, the former Features 2 and 5 were much more extensive than determined during testing. Surface stripping within this area also revealed Features 3, 4, 5, and 8, which had not been identified during testing.

As features were defined, they were cross-sectioned to expose stratigraphy that might relate to function and to target additional soil sample collection. All fill removed from features within Area 1 was collected for flotation and paleobotanical analyses or screened through 1/8-inch steel mesh. This recovery method was stricter than required by the data recovery plan. However, when it was apparent that this area was more than a Coalition or Early Classic period foraging camp, greater emphasis was placed on site structure and the collection of feature contents to increase the chance that carbonized cultigens would be recovered. Complete excavation of a feature was followed by written description, profile and plan maps, and photographs. Radiocarbon samples were collected from feature fill, focusing on discrete clusters that might represent wood elements.

We encountered gray-stained soil on the surface 11 m west of the former Feature 1, 2, and 5 area, but no surface artifacts. We established an 8 by 8 m excavation area with 106N/79E as the southwest corner (Fig. 4). Surface stripping 5 to 15 cm deep exposed four concentrations of charcoal-infused colluvial sandy loam associated with 42 chipped stone artifacts. Excavation of the surface or near-surface stains yielded two undifferentiated burned pits (Features 6 and 7), an undifferentiated pit (Feature 10), a roasting pit (Feature 15), and a pit-structure foundation with a ramp entry (Feature 11). Features 6, 7, and 10 and the outline of Feature 11 occurred on the same old ground surface as the features in the former Feature 1, 2, and 5 area. Feature 15 was excavated into the upper fill of the pit structure (Feature 11), which indicated that some contexts had been reused almost immediately after they were abandoned and filled. Excavation of Feature 11 revealed an interior hearth (Feature 9) and a small storage pit along the northeast perimeter (Feature 16). Excavation of a 2 m perimeter outside of the pit-structure foundation extended into a noncultural layer (Stratum 3) with few artifacts and no external postholes or features exposed except Features 6, 7, and 10, as previously described.

The area between the two excavation areas was examined by surface-stripping a 3 m north-south by 6 m east-west area. No features and only three chipped stone artifacts were recovered. Surface stripping extended to the depth of the majority of the features, artifacts, and sheet trash deposits. The results of surface stripping suggest two discrete activity areas focused on the pit-structure foundation and Features 1 and 5.

Excavation was halted in Area 1 with completion of the Stratum 3 excavations around the northwest periphery of Feature 11. Excavation to 25 cm below the modern ground surface reached Stratum 3, which lacked any evidence of a cultural deposit. Nine auger holes on the 114N grid line from 94E to 109E at 2 m intervals reached 80 cm below the modern ground surface into the thick Stratum 3. No evidence of a cultural deposit was encountered in these explorations.

The upper reaches of the erosion channels that pass through the excavation area and the erosion channel 2 to 5 m north of the excavation area were examined for evidence of cultural deposits. None were observed. We also examined the erosion channel walls to the east and downslope from the excavation area. No cultural deposits were observed. These observations confirmed the excavation results, which showed the cultural deposit to be contained within a shallow (less than 20 cm deep) colluvial deposit. The cultural deposits had only recently been exposed by modern erosion.

Stratigraphy. Test excavation in 1987 focused on the features and artifacts that were exposed on the surface and covered by Stratum 1. Originally, the cultural deposits were expected to be restricted to Stratum 1 and limited to Pueblo III and later occupations.

Four primary strata were defined by surface-stripping, below-surface strip excavation, and auger exploration. Only Strata 1 and 2 were consistently encountered across Area 1.

Stratum 1 was an 8 to 14 cm thick, loose, eolian and colluvial brown sandy loam mixed with abundant gravel and cobbles that had eroded from upslope deposits. Stratum 1 was removed by surface stripping throughout Area 1. Stratum 1 was thickest in upslope areas above the erosion channels that cut through Area 1. Within and on the margins of the erosion channels, Stratum 1 was very thin. Stratum 2 was deflated, but more intact. Features were exposed during excavation of Stratum 1, but they were usually excavated into Stratum 2 or Stratum 3 (in the cases of the deepest features).

Stratum 2 was a 1 to 8 cm thick, gray brown sandy loam that displayed heavy root penetration, some charcoal flecks and charcoal infusion, and cultural materials such as chipped and ground stone and fire-cracked rock. The heaviest cultural deposit was adjacent to Feature 1, a midden in the south-central part of Area 1 and Feature 11, which was the pit-structure foundation to the west and upslope from the midden. Feature 11 appeared to have burned, contributing to the occurrence of charcoal-infused soil around its north and east perimeter. Generally, Stratum 2 yielded low artifact frequencies. The highest counts were in the midden and Feature 11.

Stratum 3 was a 15 to 60 cm thick light brown to brown sandy loam with a little pea gravel and sparse pebble- to cobble-sized clasts covered with calcium carbonate. This layer yielded no cultural material. The deeper pit features and the pit structure were excavated into Stratum 3. Stratum 3 was encountered during the test excavations.

Stratum 4 was a brown sand with intermittent lenses of water-deposited, coarse, unconsolidated sand. This layer became progressively coarse grained and eventually graded into the friable sandstone bedrock of the Tesuque formation.

Features. Sixteen features were exposed by surface stripping in Area 1 (Table 1). Some were within or excavated into the floor of Feature 11, the pit structure, and others were found under Feature 1. Superpositioning of features indicates that the site structure in Area 1 formed by accretion. No ceramics were found in association with thermal or pit features during the test excavation or data recovery effort. Because there was limited stratigraphic association between features and occupation surfaces, differentiation of individual occupation components is difficult. However, obvious morphological differences and spatial distribution reflect activity-specific site structure.

The main activity loci are represented by Feature 11, the pit-structure foundation; Feature 1, a domestic midden or discard area; and Feature 5, a large, intensively burned roasting pit. Features 2, 3, 4, 6, 7, 8, 10, 12, 13, and 14 are extramural undifferentiated burned or unburned pits that cannot be associated temporally or functionally with any of the three main activity areas. Some inferences can be made about site occupation history from these features.

Feature 11 was first observed as a charcoal-infused stain within Stratum 1 in 112N/82–84E. This stain became the north half of the pit structure. What we had initially thought was an oval thermal feature expanded upon excavation into the south-oriented entrance to the pit structure. Grid excavation in 5 to 20 cm levels exposed three strata within the pit structure, Feature 15 (a roasting pit built in the fill of Feature 11), and the pit-structure limits and interior.

The stratigraphy of Feature 11 consisted of three strata (Figs. 7 and 8). Stratum 1 was a sandy loam with brown (10 YR 4/3) pea-sized gravel and limited cultural material. It was 20 cm thick and capped the west half of the pit structure. It is the remnant colluvial deposit that accumulated after the structure had filled. Stratum 2 was a very dark grayish brown (10 YR 3/2) sandy gravelly loam with occasional cobbles. This stratum is heavily infused with charcoal and contains fire-cracked rock and dispersed artifacts. We attributed part of the staining in this stratum to the intrusion of Feature 15. However, not all staining was from the feature, since the structure was burned at abandonment. Stratum 2 was 40 cm thick. Stratum 3 was primarily visible in the west half of the structure. It was a dark grayish brown sandy loam that was charcoal infused and contained small amounts of cultural debris. Although this stratum was partly mixed with Stratum 2 and Feature 15 fill, its dark gray color indicates that the superstructure may have been burned on abandonment.

Excavation revealed that the pit-structure foundation was 3.00 m north-south by 2.9 m east-west (Figs. 9–11). Wall heights ranged from 15 to 30 cm. Lower wall heights were recorded along the north wall where the feature had been deflated. Upslope, the higher, more intact west wall was probably closest to the original wall height. The

Table 1. Features, LA 61286

Feature No.	Type	Grid	Dimensions (cm)	Artifacts	Radiocarbon Age (BP)
1	Midden with intensely charcoal-stained soil and fire-cracked rock	104-108N/98-103E	5 m diameter	lithics, animal bone	
2	Undifferentiated burned pit lithics (3)	109-110N/102-103E	A = 40 by 32 by 10 deep B = 46 by 40 by 10 deep		
3	Undifferentiated burned pit	103N/114E	45 by 40 wide	lithic (1)	
4	Undifferentiated burned pit	105N/94E	53 by 46 by 20 deep	lithics (3), animal bone (1)	
5	Roasting pit	112-113N/102-103E	106 by 60 by 56 deep	lithics (3)	
6	Undifferentiated burned pit	108N/83E	54 by 52 by 10 deep		
7	Undifferentiated burned pit	106N/83E	40 by 34 by 22 deep	lithic (1)	
8	Undifferentiated burned pit	104N/94E	64 by 46 by 14 deep	lithic (1)	
9	Hearth	110N/82E	39 by 36 by 16 deep	lithics (4)	
10	Undifferentiated pit	109N/84E	44 diameter by 7 deep		
11	Pit structure	109-112N/81-84E	4 m by 2.90 m by 50 cm deep	lithics (?), ground stone (2)	1720 ± 40
12a	Undifferentiated burned pit	105N/98E	40 by 20 by 12 deep	lithics (?)	
12b	Undifferentiated burned pit	105N/99E	50 by 35 by 12 deep		
13	Hearth	104N/98E	20 diameter by 20 deep	lithics (?)	
14	Hearth	104N/98E	40 diameter by 12 deep	lithics (?)	
15	Roasting pit with associated fire-cracked rock concentration	110-111N/82E	65 by 58 by ~18 deep	lithics (4), metate (1)	1680 ± 60
16	Storage cist	111N/84E	43 by 42 by 41 deep		
17	Undifferentiated burned pit	207N/34E	37 by 34 by 8 deep		
18	Roasting pit with associated fire-cracked rock concentration	207N/36E	97 by 93 by 13 deep	ground stone (1)	2150 ± 70
19	Fire-cracked rock-filled roasting pit	227-228N/36E	110 diameter by 20 deep	lithic (1)	1980 ± 60
20	Hearth	225N/51-52E	~65 by ~55 by 13 deep	ground stone (5)	
21	Undifferentiated burned pit	227N/49-50E	60 by 40 by 12 deep		
22	Undifferentiated burned pit	206N/36E	48 by 45 by 16 deep		2240 ± 80
23	Undifferentiated burned pit	205-206N/35-36E	68 by 64 by 20 deep		
24	Diffuse occupation, 10 stain, upper level, later occupation	223-225N/40-45E	5 m long by 2.4 m wide and 10 cm thick	lithics (2)	
25	Undifferentiated burned pit	220N/43E	60 diameter by 35 deep	lithic (1)	4090 ± 80
26	Undifferentiated burned pit, upper level, later occupation	219N/40E	50 diameter by 15 deep		
27	Undifferentiated burned pit	222N/36E	55 diameter by 10 deep		
28	Fire-cracked rock filled roasting pit	218-219N/42E	70 by 40 by 10 deep		
29	Fire-cracked rock filled roasting pit	218-219N/41-42E	113 by 77 wide		
30	Roasting pit	218N/36-37E	68 by 60 by 40 deep	lithic (1)	3820 ± 120
31	Possible posthole	216N/38E	27 by 24 by 17 deep		
32	Possible posthole	218N/38E	17 by 15 by 12 deep		
33	Possible posthole	217N/37E	20 by 17 by 16 deep		
34	Roasting pit	220N/39-40E	37 by 36 by 25 deep	lithic (1)	
35	Fire-cracked rock filled pit	224N/42E	40 diameter by 11 deep		
36	Fire-cracked rock and cobble concentration	218-221N/34-35E	248 by 200 by 8 deep	mano and metate, lithics	
37	Fire-cracked rock filled roasting pit	218N/43-44E	117 by 85 by 10 deep		
38	Undifferentiated burned pit with fire-cracked rock	224-225N/32-33E	76 by 49 by 17 deep		
39	Undifferentiated burned pit with fire-cracked rock	222-223/42E	50 diameter by 10 deep		4090 ± 40
40	Undifferentiated burned pit	216N/34E	65 by 40 by 9 deep		
41	Roasting pit	220N/35E	~40 diameter by ~12 deep	lithic (1)	
42	Occupation stain	222-223N/40-42E	200 by 100 by 12 deep		
43	Undifferentiated burned pit	219N/33E	~59 diameter by 20 deep	lithic (1)	
44	Roasting pit	219-220N/33-34E	67 by 49 by 30 deep		4350 ± 80
45	Undifferentiated burned pit	224N/33E	61 by 56 by 29 deep	mano	
46	Charcoal-stained layer	235-236N/97-98E	100 by 60 by 3 thick		
48	Undifferentiated burned pit	219-220N/32E	53 by 32 by 14 deep		
49	Undifferentiated burned pit	222-223N/41E	43 by 41 by 23 deep	lithic (1)	
50	Undifferentiated burned pit	219-220N/41E	74 by 68 by 9 deep	lithics (2)	
51	Undifferentiated burned pit	220N/32-33E	44 by 26 by 8 deep		
52	Undifferentiated burned pit	220N/32E	25 diameter by 15 deep		3910 ± 40

Table 1 (continued). Features, LA 61286

Feature No.	Type	Grid	Dimensions	Artifacts	Radiocarbon Age (BP)
55	Roasting pit	234N/100E	80 by 66 by 18 deep	lithics (2), metate fragments (2)	5640 ± 50
56	Undifferentiated burned pit	234N/100E and 235N/99-100E	100 diameter by 20 deep		5630 ± 40
57	Undifferentiated burned pit	220-221N/33-34E	52 by 38 by 26 deep		4290 ± 70
58	Undifferentiated burned pit	220N/34-35E	22 by 21 by 13 deep		
59	Undifferentiated burned pit	222-223N/34E	28 diameter by 10 deep		
60	Pit-structure foundation	221-223N/35-37E	398 by ~239 by 12 deep	lithics (3)	4020 ± 70
61	Undifferentiated burned pit	220-221N/35E	44 by 39 by 13 deep		
62	Undifferentiated burned pit	224-225N/34E	35 diameter by 12 deep		
63	Undifferentiated burned pit	223-224N/34-35E	62 diameter by 20 deep		
64	Undifferentiated burned pit	225N/35E	46 diameter by 16 deep		
65	Roasting pit within F. 60 and 66	221N/36E	50 by 40 by 26 deep		
66	Storage pit within F. 60	221N/36E	70 by 60 by 35 deep		
67	Storage pit within F. 60	223N/36E	55 by 52 by 13 deep		

walls were made of unprepared native soil, which is typical of Latest Archaic structures in the Santa Fe area. A C-14 sample from the floor yielded a two-sigma calibrated range of AD 240–415 (1720 ± 40 BP; Beta-132626).

The structure floor varied from nonexistent to well defined. The northeast part of the structure had the best-preserved floor, made of well-compacted and smoothed sandy loam. The floor rose to the wall in all directions, giving the structure its characteristic basin-shaped cross section. The remainder of the floor was in relatively poor condition. There was a break in the charcoal-infused Stratum 3. Few artifacts were found on the floor. A one-hand mano was mixed in with a pile of burned cobbles south of the central hearth (Feature 9). A chert core flake was recovered west of the central hearth. The structure floor measured 7.1 sq m. The available open floor area was diminished only by the central hearth and the possible storage pit along the northeast wall (Feature 16).

Feature 11 had no evidence of a superstructure. Large pieces of juniper charcoal found near the floor may indicate a roof made of branches or boughs. There were no obvious interior postholes, and only one possible exterior posthole was found in 111N/80E, outside the west wall. Usually the lack of postholes is interpreted to mean a structure had insubstantial superstructures, perhaps enough to keep out the weather without major maintenance.

An oblong extension of the southwest pit-structure wall measured 1.00 m long by 0.75 m wide. The floor of this extension was raised 5 cm above the pit-structure floor. It was filled with Stratum 3 and may have been an entryway to the structure. Formal entryways are rare in Latest Archaic pit structures in the Santa Fe area. When present, they are usually an informal break in the structure wall. A formal entryway suggests occupation during windy and cold weather typical of occupation during the fall and winter.

Only two floor features were present; the central hearth (Feature 9) and a perimeter storage pit (Feature 16). Feature 9, just east of the floor center, was a shallow, basin-shaped pit filled with dark gray (10 YR 4/1) charcoal-infused sandy loam (Figs. 12 and 13). Most of the charcoal was diffused, and only a few flecks were observed in the screened material. Six chipped stone artifacts were recovered, including three Madera chert biface flakes, indicating that some tool production or maintenance occurred inside the structure. A flotation test yielded charred *Chenopodium* (34.5 seeds/liter) and substantially smaller amounts of cheno-am and Compositae. A 50 cm east-west by 30 cm north-south pile of burned cobbles was on the east-southeast periphery of the hearth in line with the entry. These cobbles may have been used as an expedient or informal deflector when they were not in use with the hearth. An area measuring 30 by 25 cm to the east of the hearth was well worn and slightly depressed, indicating it was a cleanout for the hearth. Ashes or heated contents may have been moved from the hearth to this holding area for further use or processing.

Feature 16 was a steep-walled pit, 40 cm deep and 43 cm in diameter, filled with the equivalent of Stratum 1 (Fig. 14). This pit was not filled with

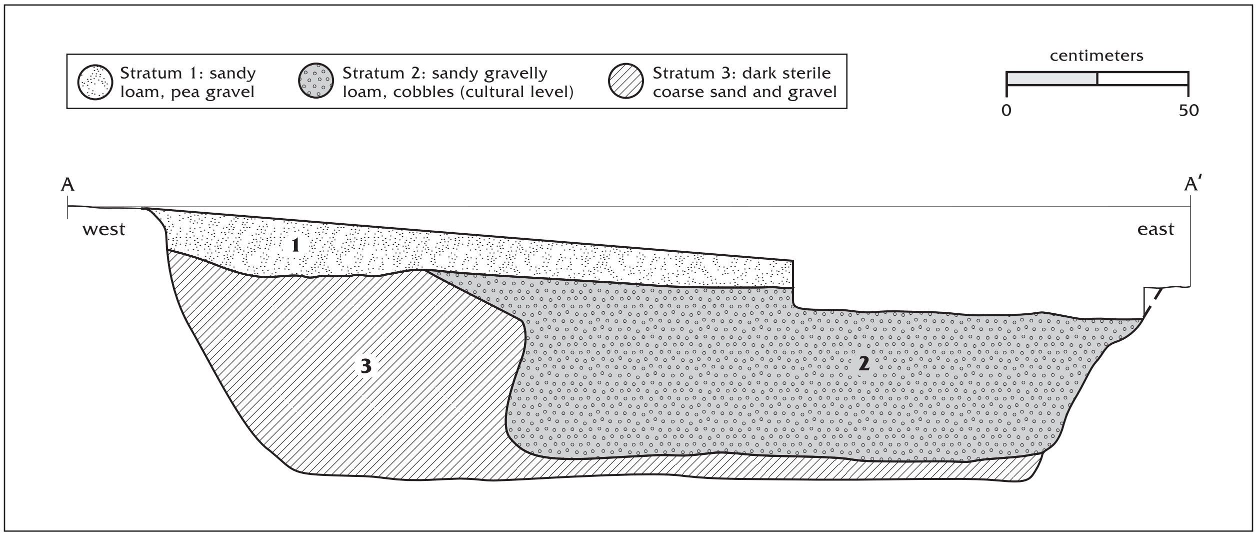


Figure 7. Profile of Feature 11, LA 61286.

Figure 8. The excavation of Feature 11, LA 61286, in progress.

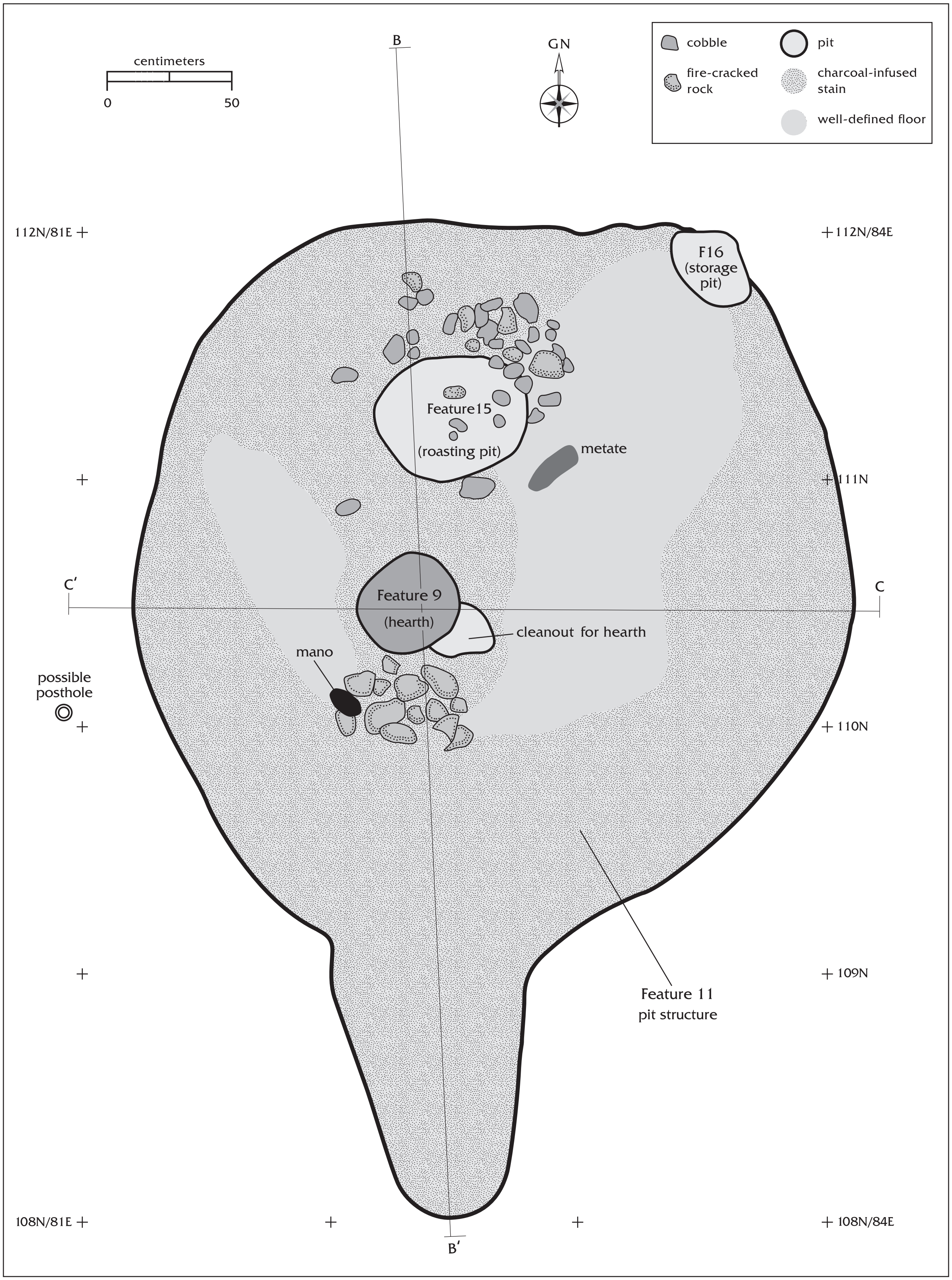


Figure 9. Plan of Feature 11, LA 61286.

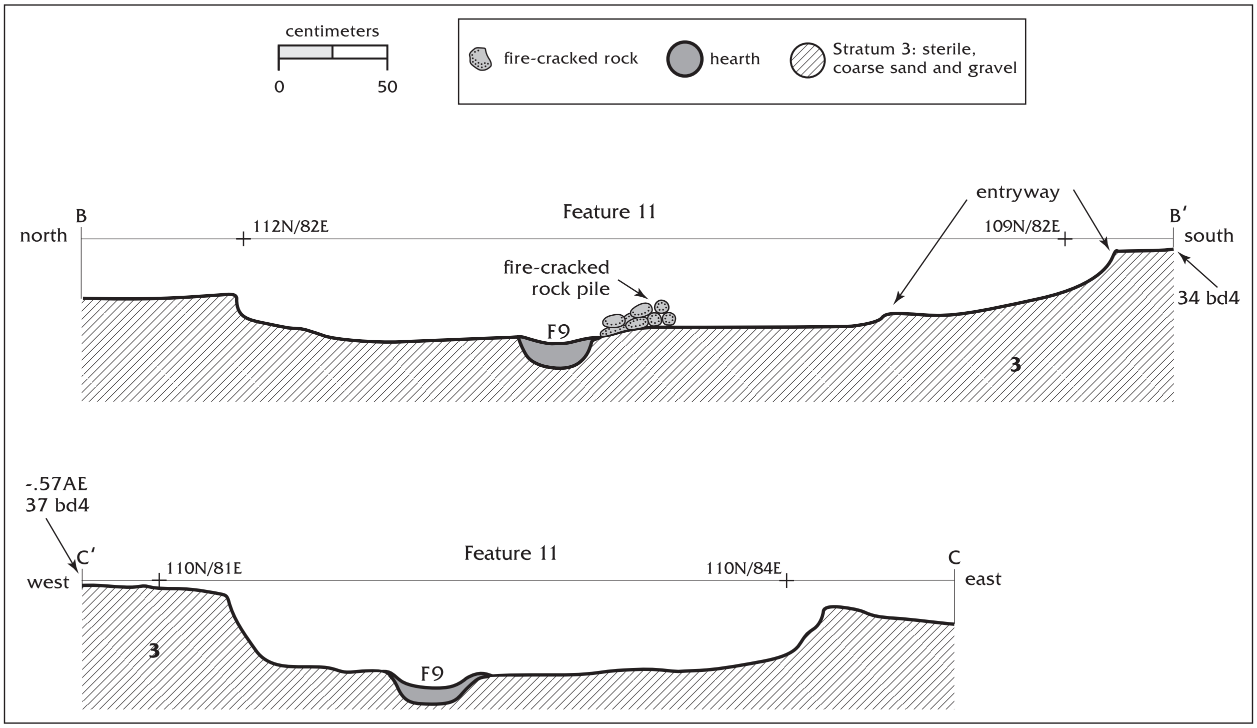


Figure 10. Profiles of Feature 11, LA 61286.

Figure 11. Feature 11, LA 61286, after excavation.

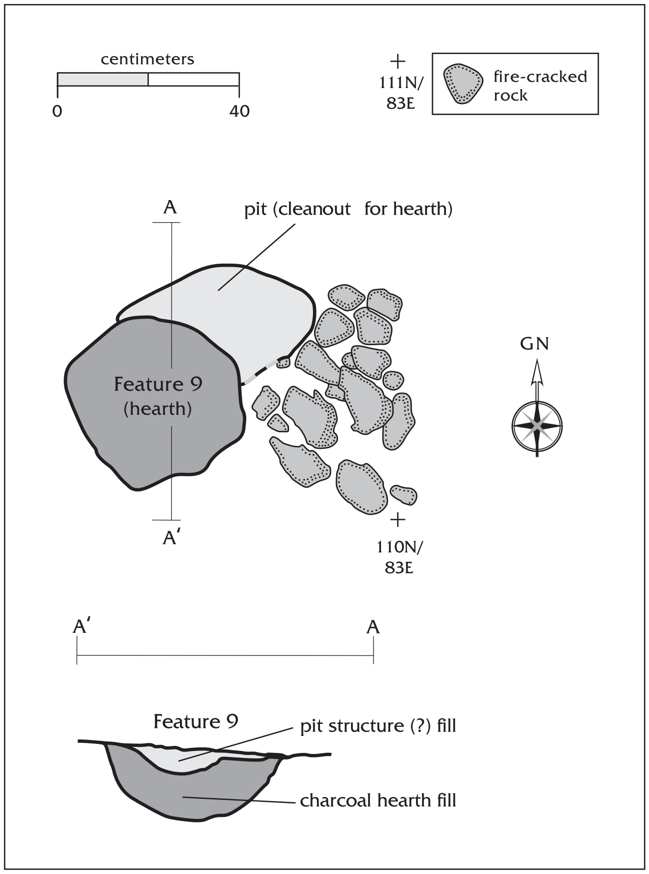


Figure 12. Plan and profile of Feature 9, LA 61286.

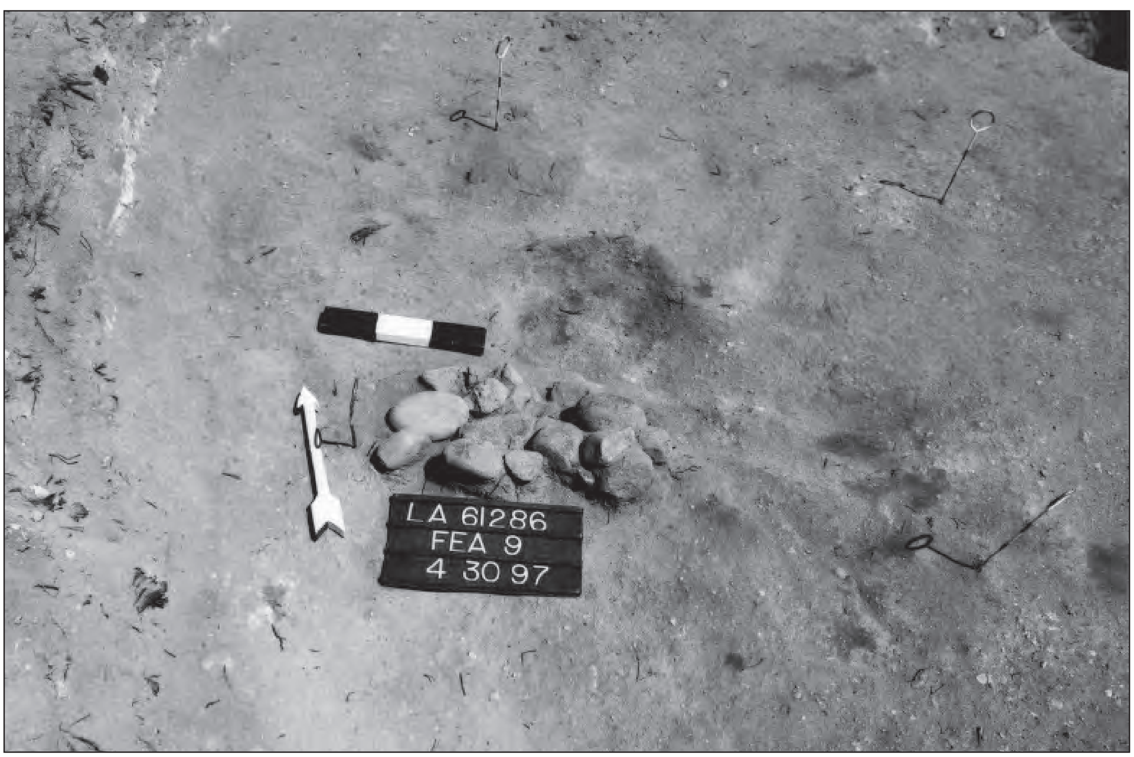


Figure 13. Feature 9, LA 61286, after excavation.

charcoal-infused soil or charcoal, suggesting it was sealed or covered when the structure burned. No artifacts were recovered from within the feature. Macrobotanical remains included small amount of *Amaranthus*, cheno-am, and *Echinocereus*. Feature 16 had a volume of 0.14 cu m volume and could have held enough small seeds for 25 percent of the caloric needs of ten people for six weeks (after Wetterstrom 1986). Although Feature 16 was small, it could have provided an important overwintering advantage to site occupants. Small seeds like those of *Descurainia* and *Chenopodium* sp. are dense and provide considerable caloric value but require little storage space.

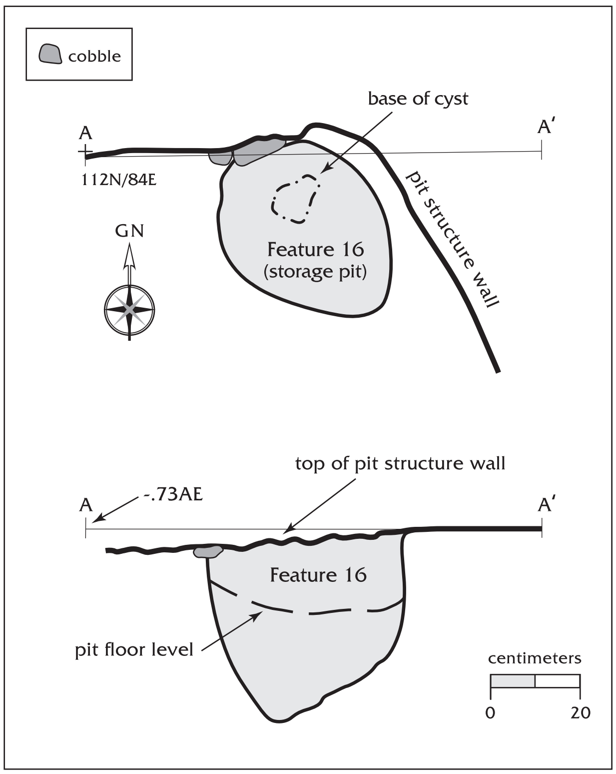


Figure 14. Plan and profile of Feature 16, LA 61286.

Features 6, 7, and 10 were south-southwest of Feature 11 (Figs. 15–20). Features 6 and 7 were burned pits lacking fire-cracked rock or enough charcoal for C-14 dating. Feature 7 yielded a small quantity of *Atriplex canescens* that could have been used for food or fuel. The proximity of these features to Feature 11 and the presence of Feature 15 in the fill of the structure indicates that they are not associated with the structure but do date to the Latest Archaic period. They are evidence that Area 1 experienced repeated occupations that combined to create a complex site.

Feature 15 was encountered in the lower fill of Feature 11. It was a large (65 cm long by 58 cm wide by 18 cm deep) roasting pit associated with a fire-cracked rock concentration and an overturned basin metate (Figs. 21 and 22). Feature 15 was built into the burned fill of the structure soon after the structure was abandoned. This sequence is suggested by the two-sigma calibrated range of AD 239–474 (1680 ± 60 BP; Beta-132622), which is statistically similar to that of the Feature 11 C-14 sample date range. Feature 15 contained four Madera chert core flakes, *Chenopodium*, cheno-am, and *Suaeda* (seepweed).

Feature 1 was a large amorphous charcoal-infused soil stain mixed with artifacts and other burned refuse and fire-cracked rock. Initially it was identified as a hearth in 106N/99–100E (Figs. 23–25). The perimeter of the cultural deposit was defined by excavating 16 1 by 1 m units. Vertical excavation followed a stratigraphic sequence that was neither continuous nor uniform, reflecting the intense use of this area, episodic deposition, and the effects of deflation and erosion on the feature. The thickness of the deposit ranged from 5 to 16 cm across a 5 m diameter area. Excavation ultimately failed to expose a regular outline or consistent depth to the deposit. Within the irregular limit of Feature 1 were four other smaller burned pits: Features 12a, 12b, 13, and 14. These pits were covered by the last layer of charcoal, suggesting a pattern of repeated site use that coincides with the superpositioning of Features 11 and 15.

The fill of Feature 1 consisted of a dark gray to black silty loam that was moderately consolidated and heavily disturbed by tree roots. Inclusions included abundant fire-cracked rock, lithic artifacts, and wood charcoal. The 5 to 16 cm thick deposit was thickest near the center of the feature within a 2 by 2 m area and thinned out toward the perimeter. The edge of the deposit was deflated and mixed with a brown sandy alluvium. The alluvium had been deposited long after the site was abandoned and had resulted from modern erosion and deflation.

Other lines of evidence that define Feature 1 are artifact abundance and variety. If Feature 1 were a formal midden, then artifacts would be expected in greater abundance than elsewhere

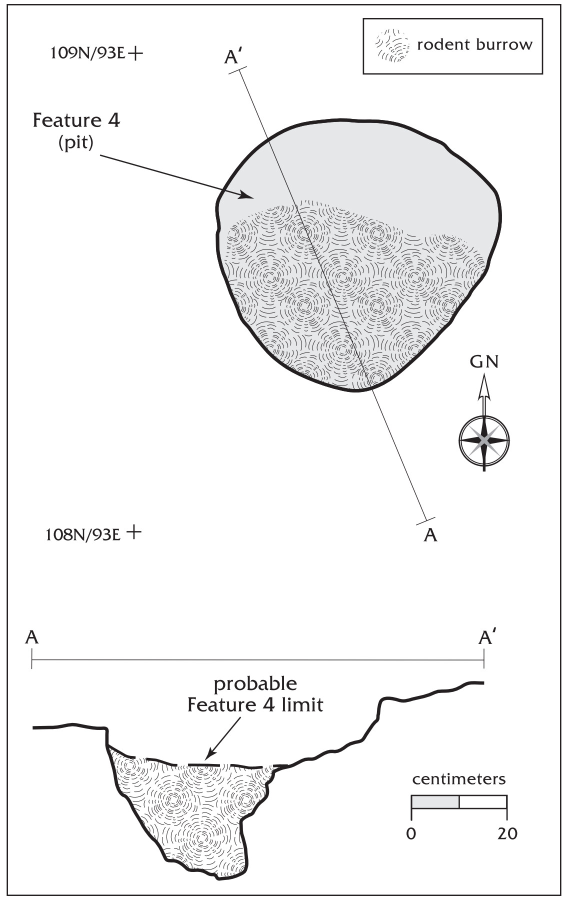


Figure 15. Plan and profile of Feature 6, LA 61286.

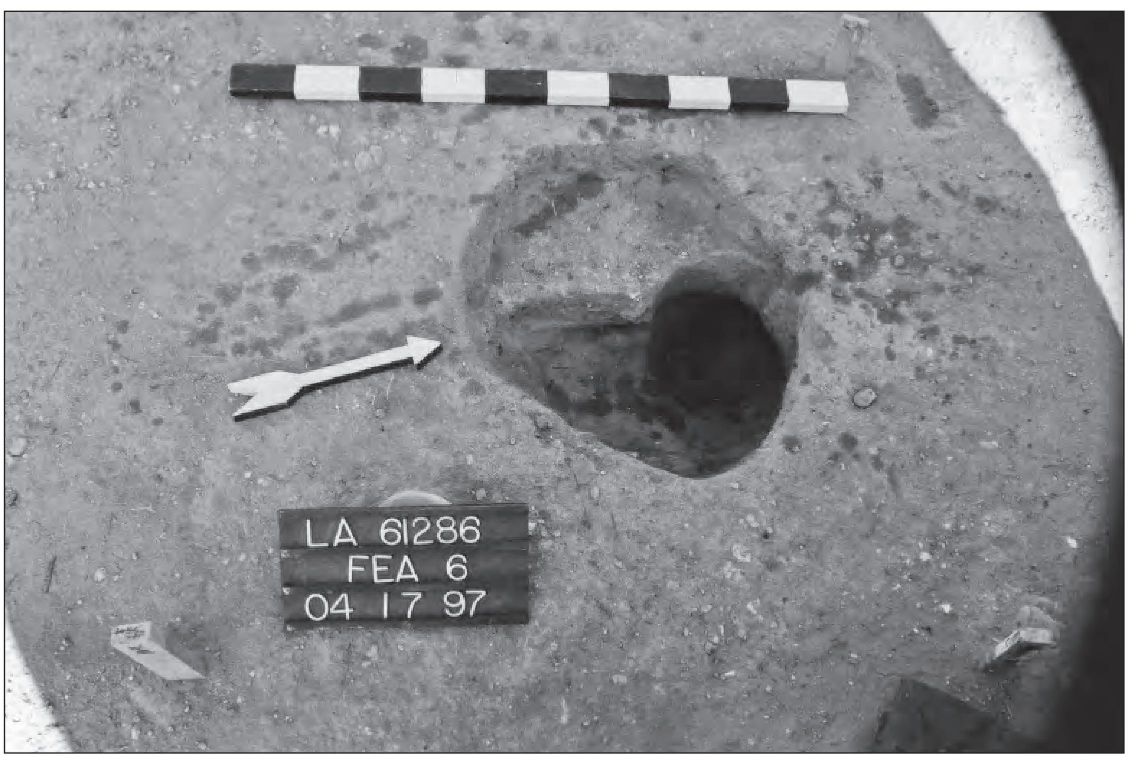


Figure 16. Feature 6, LA 61286.

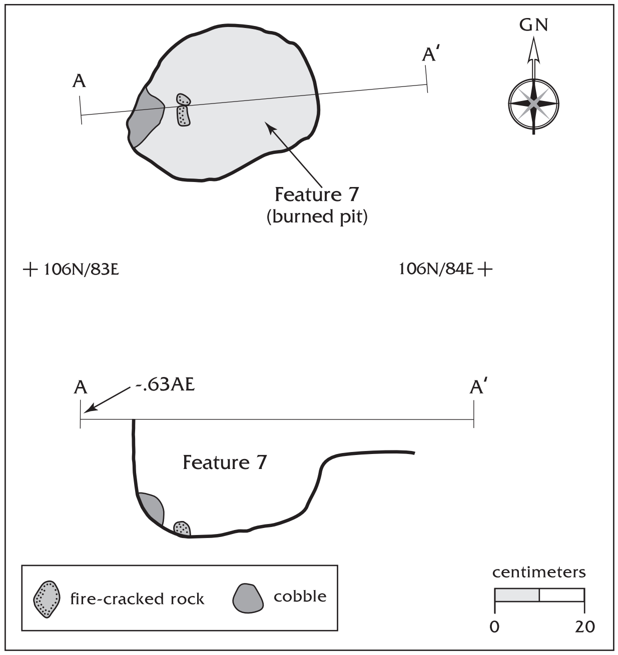


Figure 17. Plan and profile of Feature 7, LA 61286.

Figure 18. Feature 7, LA 61286.

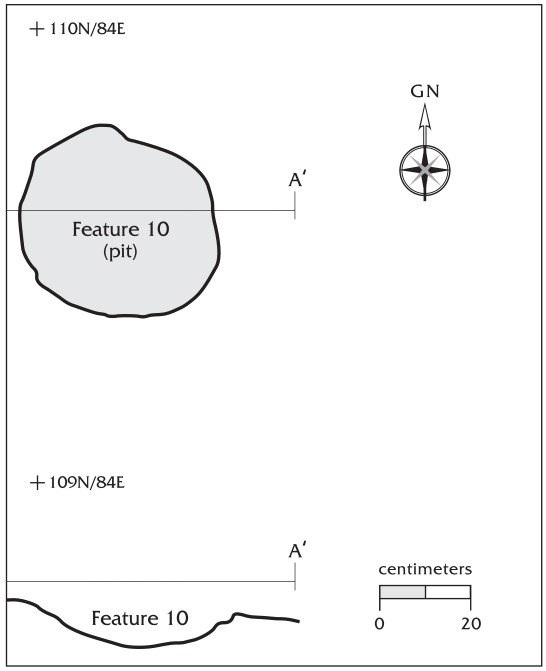


Figure 19. Plan and profile of Feature 10, LA 61286.

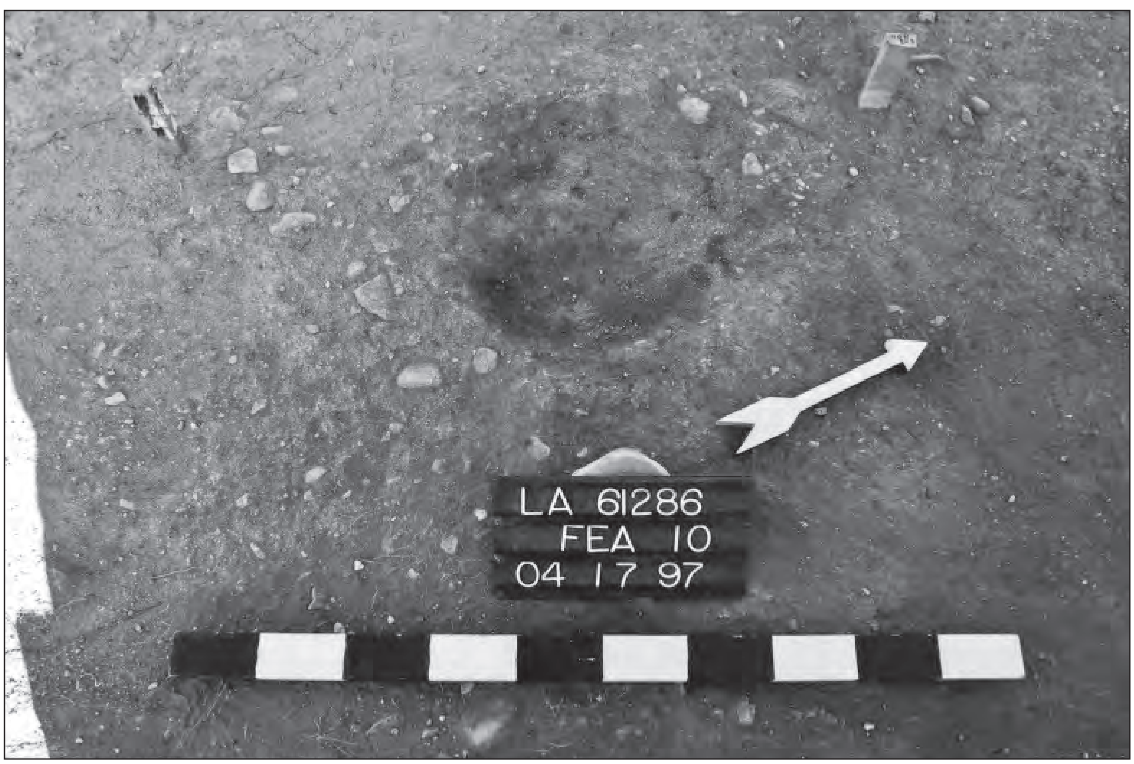


Figure 20. Feature 10, LA 61286.

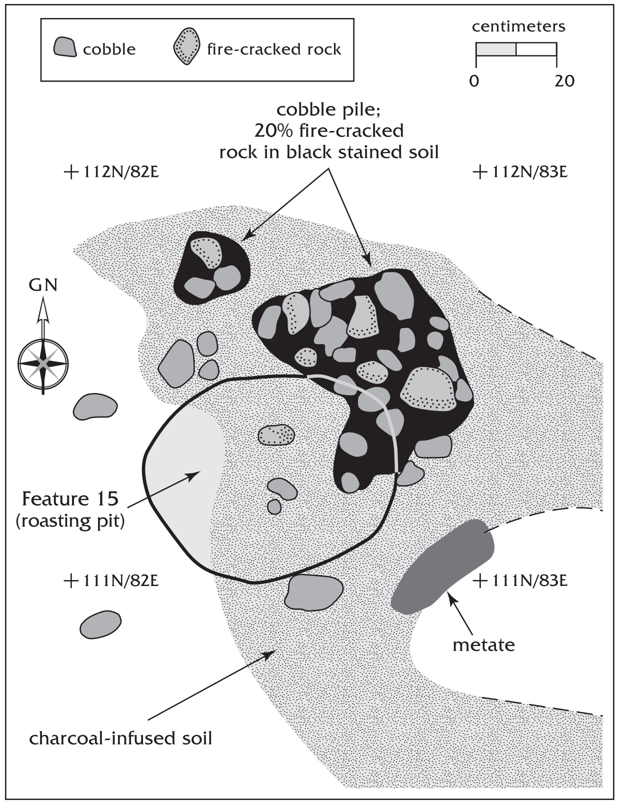


Figure 21. Plan of Feature 15, LA 61286.

Figure 22. Feature 15, LA 61286.

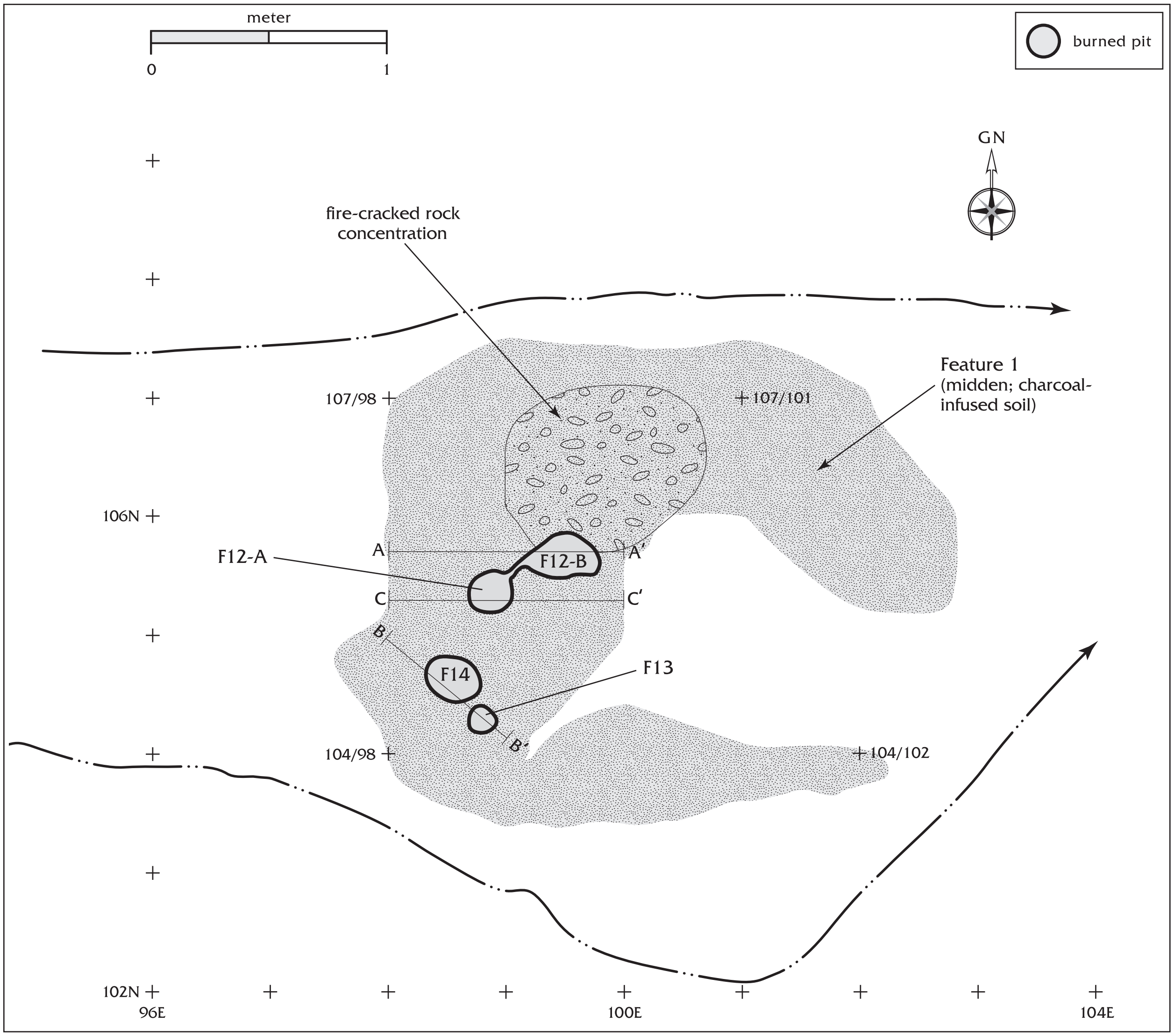


Figure 23. Plan of Feature 1, LA 61286, showing locations of Features 12a, 12b, 13, and 14.

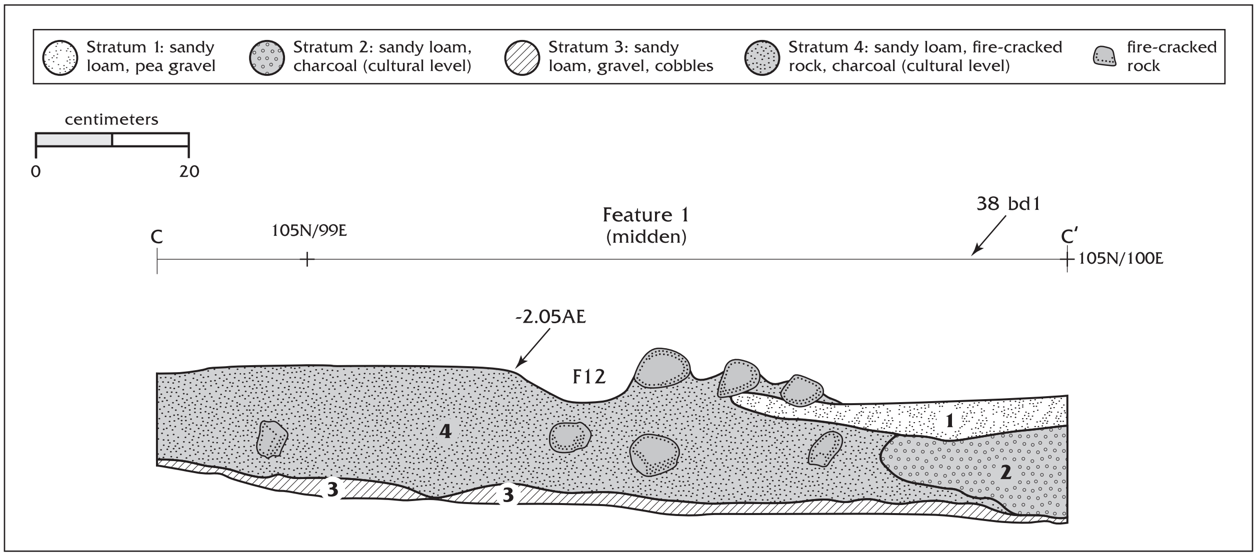


Figure 24. Partial profile of Feature 1, LA 61286.

Figure 25. Feature 1, LA 61286, during excavation.

in Area 1, and the variety of artifact types would be greater. The 175 chipped stone artifacts in Feature 1 included core-reduction and biface-reduction debris and tools made from local chert, chalcedony, quartzite, and obsidian. Obsidian artifacts accounted for 12 percent of the total. When these artifacts are compared with those recovered from the fill of Feature 11, which could have been a refuse magnet or represent collected artifacts that had been displaced and deposited by slope erosion, the same range of material types are present, but the debris from Feature 1 reflects more core reduction and less tool manufacture. In Feature 11, obsidian artifacts accounted for 2 percent of the total, substantially lower than Feature 1. Basically, the chipped stone evidence suggests that Feature 1 is more abundant and diverse. Feature 1 accounts for 35 percent of all chipped stone in Area 1 and 75 percent of all obsidian, further supporting the conclusion idea that it was a midden.

Very few animal bones were recovered from Feature 1 and from LA 61286 in general. Of the 13 animal bones recovered, 5 were from medium to large mammals, and 3 of those 5 were from Feature 1.

Ethnobotanical samples from Feature 1 yielded a slightly more diverse assemblage than in other features. *Chenopodium* was the most common, with smaller amounts of cheno-am, *Plantago*, and Solanaceae. The latter two were found only in Feature 1.

The evidence strongly favors interpreting Feature 1 as a midden rather than a sheet-trash deposit. Middens are associated with longer occupations and more highly formalized site layout (Kent 1999).

Feature 5, a large, heavily burned roasting pit, lacked internal fire-cracked rock and yielded only one core flake (Figs. 26 and 27). The lower fill was jet black and densely charcoal infused, as if a large amount of charcoal had remained in the pit after its final use. Large charcoal pieces are consistent with a fire that was built for coals and then smothered for slow roasting. The estimated volume of the pit indicates that it could have accommodated 0.25 metric tons of gathered nuts or seeds or large portions of game animals.

Feature 5 was by far the largest processing facility found in Area 1. The processing of larger amounts of food is consistent with long occupation, especially in the fall, when many wild plants bear fruit or seeds. Unfortunately, no evidence of wild-plant processing was found in the almost 48 liters of flotation samples collected. This strongly suggests that Feature 5 was used for meat roasting. Opler (1941:367) reports that the heads of large mammals and fetal deer or pronghorn were pit roasted. However, no animal bone was recovered from Feature 5.

Except for Feature 3, which was not dated, the undifferentiated burned or unburned pits (Features 2, 3, 4, 8, 12, 13, and 14; Figs. 28–32) probably date to the Latest Archaic period. However, the functional relationship between these pits could not be determined. They represent a component that is difficult to define within the Area 1 occupation sequence. Burned and unburned pits comprise the bulk of feature assemblages from Archaic period sites. In the Santa Fe area, these pits usually yield no or few remains of charred economic plant species or faunal remains, making it difficult to define their function. Features 2, 3, 4, 6, 7, 8, 10, 12, 13, and 14 had mean dimensions of 50 cm long by 39 cm wide by 15 cm deep and a mean area of 0.16 sq m—small enough to suggest daily processing or cooking. The outlines of these features were circular (3) and oval (6) with gentle or moderate (5) and steep or vertical (4) wall profiles. The condition of these features reflected their last use; five were burned, three were unburned, and one was deflated. Unburned pits tend to have slightly larger areas, and burned features tend to be slightly deeper. The morphological differences may indicate different functions.

The content of these features reflects the processing of food acquired through a hunting and gathering subsistence strategy. Dense midden deposits are rarely found on Late Archaic period sites in the Santa Fe area, although LA 61282, along NM 599 near its intersection with Airport Road, had a similar deposit (Wolfman et al. 1989; Post 2001). The pit-structure foundation and the midden spacing of 13 m reflects planned spatial organization, allowing for unobstructed traffic patterns and enough space for the activities associated with a long occupation. For example, Features 12, 13, and 14 were beneath Feature 1, indicating that the dense accumulation of cultural material succeeded their use. Features 12, 13,

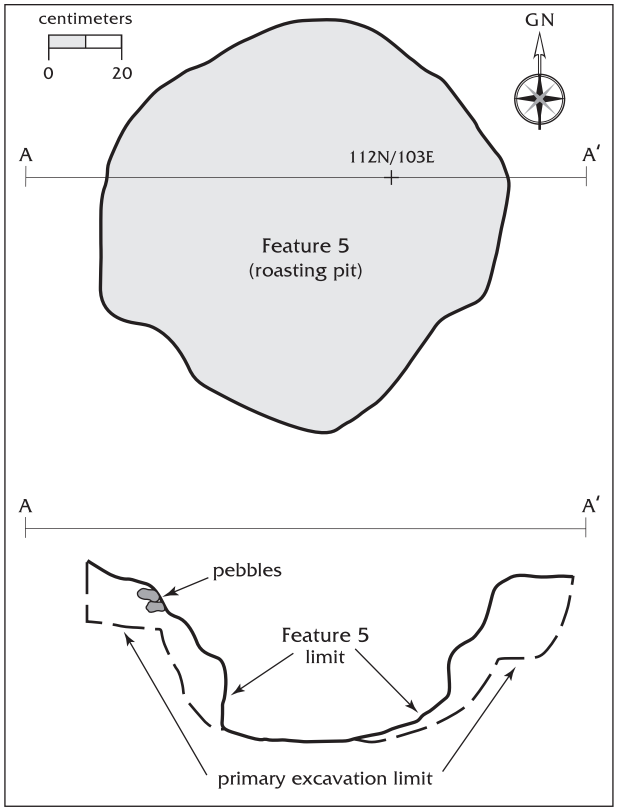


Figure 26. Plan and profile of Feature 5, LA 61286.

Figure 27. Feature 5, LA 61286, after excavation.

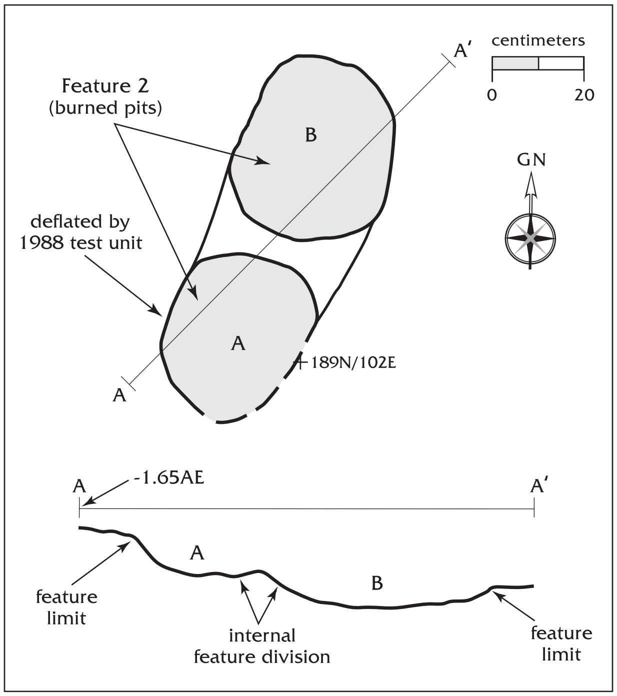


Figure 28. Plan and profile of Feature 2, LA 61286.

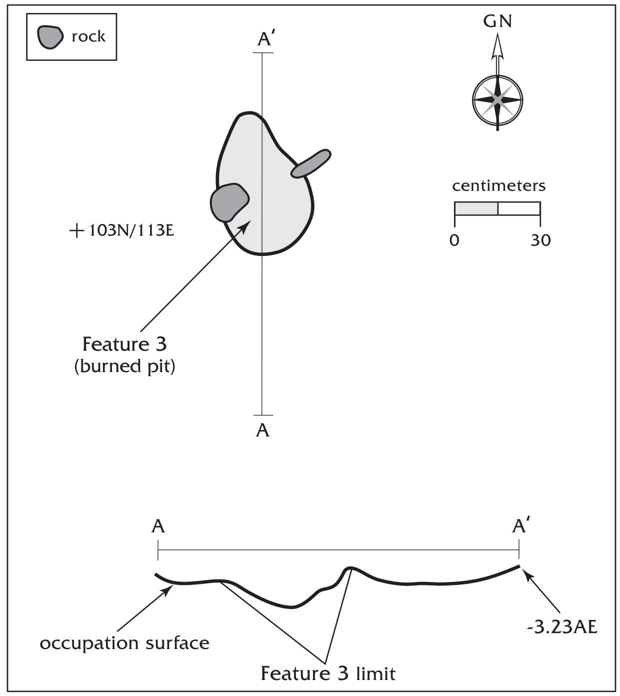


Figure 29. Plan and profile of Feature 3, LA 61286.

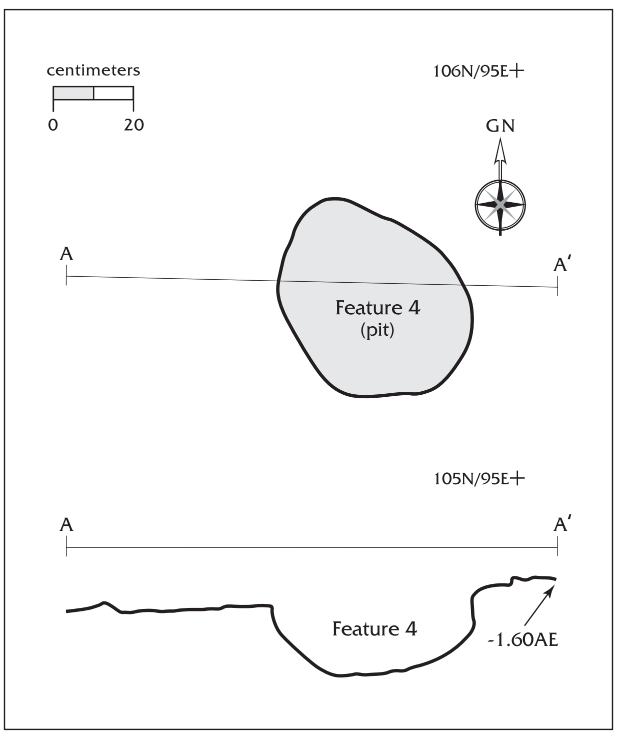


Figure 30. Plan and profile of Feature 4, LA 61286.

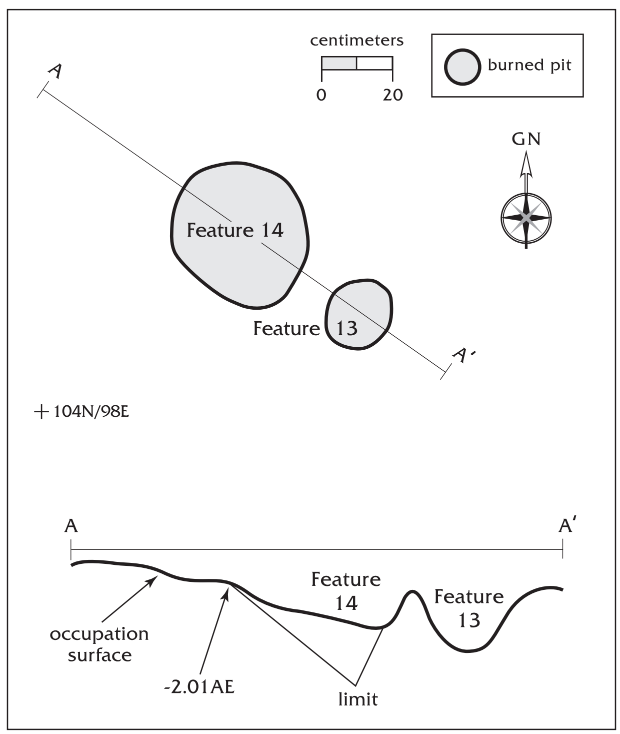


Figure 31. Plan and profile of Features 13 and 14, LA 61286.

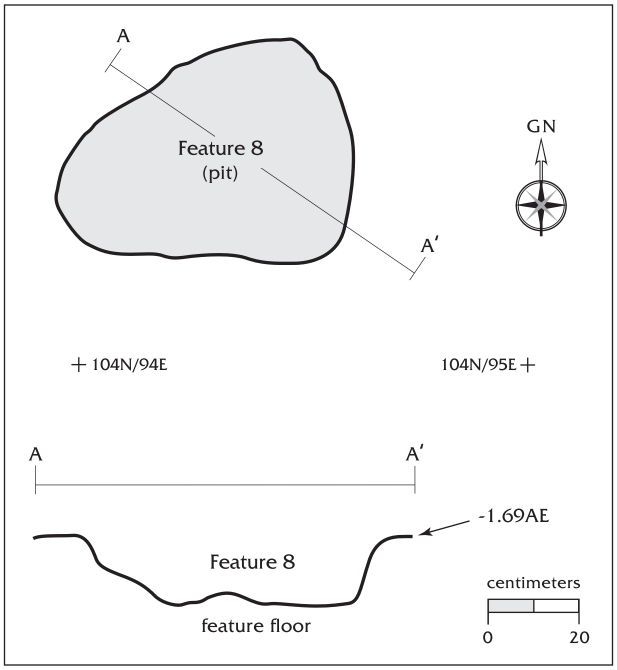


Figure 32. Plan and profile of Feature 8, LA 61286.

and 14 are tightly clustered or superimposed, reflecting intense use within a relatively short period. It is possible that Features 12, 13, and 14 were used during the early part of the main domestic occupation and decommissioned; then the activity area was used as a midden. Features 12, 13, and 14 are similar in size to Features 2, 3, 4, 6, 7, 8, and 10, suggesting they had a similar function. Their relatively small size and shallow depth indicate small-scale meat roasting or heating in the absence of a structure. The undifferentiated burned and unburned pits, therefore, may represent repeated short occupations of this site, a pattern that was interrupted by the construction and occupation of the pit-structure foundation, Feature 11.

Features 3 and 15 are not associated with the residential occupation. Feature 3 is a undifferentiated burned pit in the bottom of the erosion channel east of the main excavation area. It appears that Feature 3 was excavated into the erosion channel to provide shelter from the wind. Since the erosion channels are recent, it is probably a historic feature, though this cannot be verified with associated artifacts. Excavation into the adjacent channel bank failed to reveal an associated occupation surface.

Feature 15 was superimposed on and along the west perimeter of the pit structure. It was a large, basin-shaped roasting pit with associated fire-cracked rock piled neatly along its edge. A complete metate had been placed grinding surface down at the edge of the feature. It appears that the area was maintained for reuse, but it was not reused. The metate is a deep basin, a type commonly associated with Late Archaic plant processing. This suggests that the pit-structure depression and perhaps part of the superstructure were used as an expedient or temporary shelter. Surprisingly, Feature 15 yielded a calibrated two-sigma range of AD 235–530 (Beta-132622), statistically similar to the radiocarbon date of Feature 11. This indicates that Feature 15 was constructed and used soon after Feature 11 was abandoned.

Artifacts. Detailed descriptions of artifacts are presented after the descriptions of Areas 1–3 and in a separate chapter of this report. Summary data is presented here as a point of reference. All artifacts were recovered by surface stripping and feature excavation. Surface artifacts outside the excavation areas were not collected because the 240 chipped stone artifacts collected during the test excavation sufficiently represent the site scatter (Wolfman et al. 1989:122–151).

Excavation of Area 1 yielded 476 pieces of chipped stone debris including core and biface flakes and angular debris. Sixteen pieces of chipped stone debris exhibited edge modification or wear. Seven whole or fragmentary projectile points and bifaces were recovered. The projectile points most closely resemble En Medio or Late Archaic styles. Six chopper or core/choppers were recovered, adding to a general impression of a balanced stone tool technology.

Only five ground stone artifacts were recovered, including four complete one-hand manos and the shallow basin metate recovered from Feature 15. The manos were scattered throughout Area 1. Only FS 154 was recovered from the lower fill of Feature 11. Manos may have been recycled, resulting in a scattered distribution and poor association with activity areas or features. The metate found with Feature 15 in the fill of Feature 11 may have been used during both occupations, since they are so close in age. The low number of ground stone artifacts is in keeping with the small capacity of most of the burned and unburned pits and the relatively sparse chipped stone assemblage.

Only thirteen animal bones were recovered from Area 1. Small and medium-to-large mammal bones were identified, which is consistent with exploitation of a woodland environment. The low number of bones could be attributed to poor preservation, but the excavation of the Feature 1 midden should have produced more burned bone if roasting and consumption were a major activity. The low number of animal bones is also in keeping with the relatively low number of meat-processing and procurement tools. Their occurrence suggests that hunting did occur, but it was on a small scale and not the main source of nutrition.

Summary. The excavation of Area 1 yielded a complex of features and associated artifacts remaining from repeated Latest Archaic occupations. Earliest in the sequence is the residential occupation, represented by a house pit foundation with a formal entry, an intramural hearth, and a small storage feature. This combination of architectural, processing, and discard features in patterned arrangement reflects a planned occupation, perhaps during late fall and winter. The well-spaced distribution of the major features and activity areas indicate that the occupants expected to return to the site over a period of one or more years.

Such structured intrasite patterning has rarely been documented for the Latest Archaic period in the Santa Fe area. The accumulation of artifacts and processing debris are evidence of repeated and intensive periodic use. Splintered animal bone from the hearths and pits indicate subsistence hunting, but the preponderance of core-reduction debris and discarded ground stone artifacts suggests a greater emphasis on the acquisition, processing, and consumption of plant and other biotic resources. Latest Archaic period reoccupation is evidenced by the Feature 15 processing pit and metate. The pit was excavated into the charcoal-infused fill of the house pit foundation. The metate and fire-cracked rock lie outside the feature in a patterned manner, suggesting planned future use. The close range of radiocarbon dates may indicate reoccupation by members of the same household, but for a shorter time. Some of the other extramural pits may be contemporary with this second Latest Archaic period occupation, or they may represent an accumulation from many short, low-intensity occupations.

Finally, earlier test excavations indicated that a Coalition–Early Classic period component would be encountered. Instead, little evidence of this AD 1200–1350 component was encountered. It appears that the testing recovered the bulk of artifacts and feature data associated with this later use. A Coalition–Early Classic period overlay is common at most Northwest Santa Fe Relief Route sites. This late overlay masked much of the Archaic occupation that was encountered during excavation.

Area 2

Area 2 (220N/40E) was not identified during the survey or archaeological testing. It defines the northwest limit of the site as confined by the right-of-way. Cursory upslope inspection outside the right-of-way revealed other elongated soil stains that were probably cultural deposits. Many factors may influence the identification of obscure subsurface cultural deposits. Environmental factors include sun angle, shadow cover, soil moisture and color, and vegetative cover. These factors are often beyond the archaeologist's control. Methodological factors that we can control include transect interval, walking speed, reconnaissance orientation (across or parallel to slope), and recognition that buried deposits will occur in depositional environments that have been active in the last 100 years. Spending time and becoming familiar with an area will often result in expanded site limits, especially within a 114 m (375 ft) wide corridor. In the case of the 220N/40E area, time and familiarity resulted in recognition of this larger site component.

Area 2 was visible as a 10 to 20 cm thick charcoal-infused soil layer that was buried as much as 60 cm below the modern ground surface (Fig. 33). The stained soil layer was associated with a few fire-cracked rocks, a metate in the arroyo bottom, and two or three chipped stone artifacts. Pockets of darkly stained sandy loam appeared to be truncated features. The 25 m long stain was bisected by a modern erosion channel that had cut 10 to 20 cm below the bottom of the cultural deposit. The erosion channel followed the natural drainage pattern, which emptied a large swale containing the occupation surface and cultural deposit.

Figure 33. Cultural deposit exposed in the erosion-channel bank, Area 2, LA 61286.

To excavate the 220N/40E area, we needed to ensure that there were no surface cultural deposits and determine the depth and north-south extent of the buried cultural deposit. To accomplish the first goal, 195 units were surface-stripped within a 26 m east-west by 17 m north-south area (442 sq m), or 44 percent of the site surface. As shown in the excavation map of Area 2 (Fig. 34), all of the excavated area north of the arroyo was surface-stripped, yielding 39 lithic artifacts and a near-surface fire-cracked rock filled roasting pit (Feature 19). Because the surface stripping north of the arroyo showed limited and dispersed near-surface cultural deposits, features, or materials, only three 1 by 4 m areas and one 3 by 4 m area were stripped on the south side of the arroyo. These strip zones also yielded no lithic artifacts or features, confirming that the main cultural deposit was mostly capped by a mantle of colluvium. A light scatter of lithic artifacts was also examined in a 6 by 6 m surface-stripped area (204N/32E, southwest corner; Fig. 34). Stripping exposed an extensive charcoal stain 8 cm below the modern ground surface. This upslope area yielded four tightly clustered thermal features (Features 17, 18, 22, and 23), but only 10 lithic artifacts.

To define the north-south limit of the stain, a 1 by 11 m trench along the 42E grid line was excavated in arbitrary 10 cm levels. The trench profile exhibited seven stratigraphic layers. The primary cultural deposit (Stratum 4) was 15 to 50 cm below the surface, 10 to 25 cm thick, and an estimated 7 m wide in this area. Two 1 by 1 m units (216N/35E and 221N/34E) were excavated in 10 cm levels through the cultural deposit to determine its depth and thickness near the western edge of the right-of-way. Stratum 4 occurred at 50 cm below the modern ground surface and was 20 to 25 cm thick. A heavily charcoal-infused section of Stratum 4 was visible in the north bank of the arroyo at 220N/35E, so a 2 by 2 m area was excavated in 10 cm levels to the top of the cultural deposit to obtain more information on its nature, content, and condition. A concentration of fire-cracked rock was found in an area that eventually yielded five thermal features. An odd characteristic of the cultural deposit was the low number of artifacts. From these 17 excavation units, only 30 chipped stone artifacts were recovered, which indicated that the limits of the charcoal-infused Stratum 4 was the best indication of the extent of the occupation.

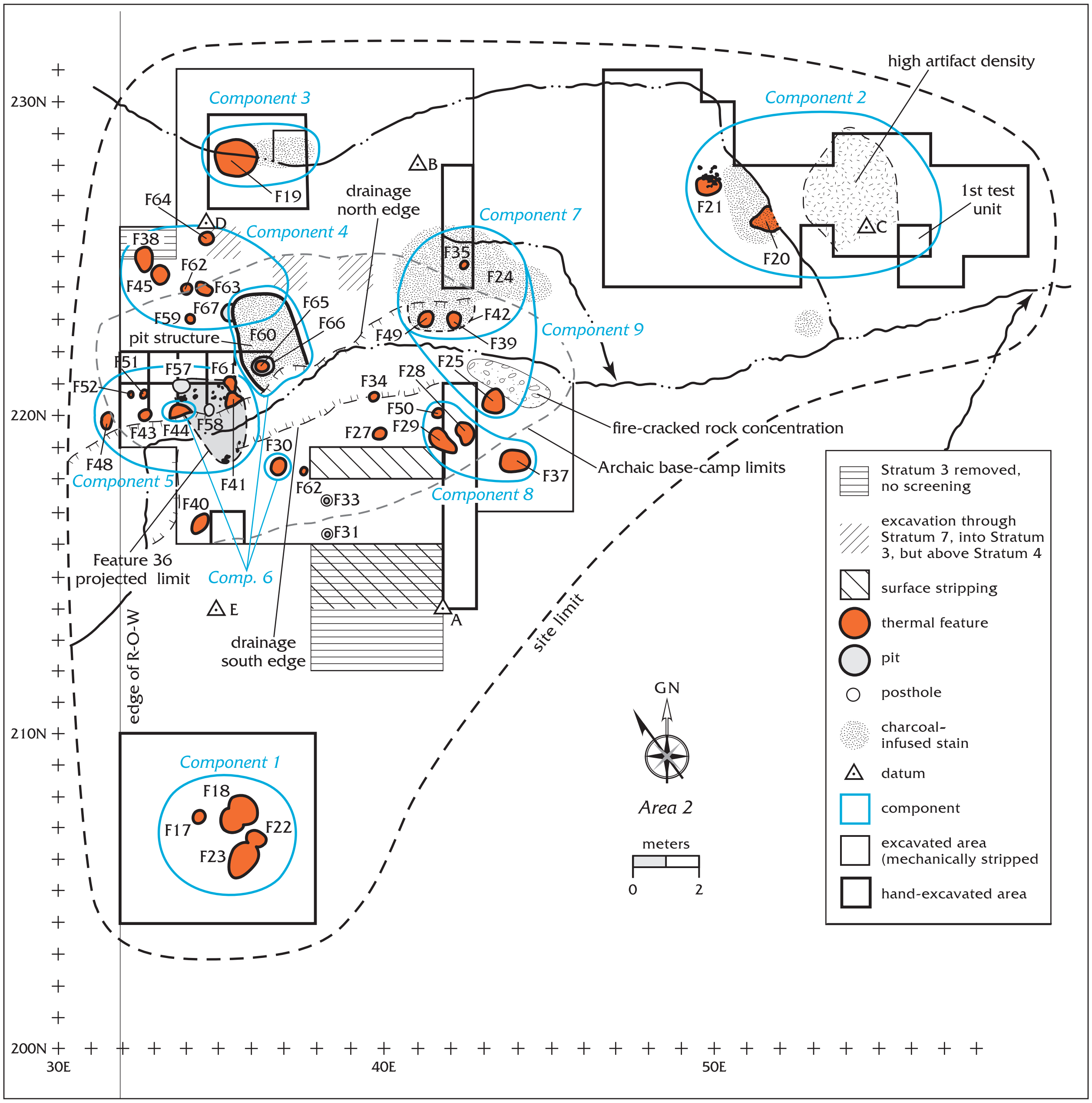


Figure 34. Excavation area, Area 2, LA 61286.

East of the main excavation area were charcoal-infused soil stains in a minor erosion channel on the north bank of the arroyo. A 1 by 2 m unit (234N/55E) was placed north of the easternmost stain. Excavation yielded no artifacts or evidence of a cultural deposit within the colluvium that capped the coarse, water-deposited sand. Three obsidian flakes were found on the surface northeast of the excavation unit, so a 3 by 3 m area was surface-stripped, yielding higher than expected artifact counts to the east. The surface-strip zone was expanded to the west with 10 additional units, yielding a dense cluster of obsidian biface reduction flakes and a San Jose style projectile point base. The artifacts were within a 10 cm thick layer of old colluvium capped by 10 to 20 cm of recent colluvium that was trapped by tree roots. Excavation in this area demonstrated that discrete, high-density clusters were present, but they might be masked by variable soil accumulations caused by vegetation. The area west of this cluster (224N/47E) was surface-stripped (Fig. 7) and did not yield other discrete tool-production areas. Two stains exposed in the erosion channel that cut through this area were deflated thermal features (Features 20 and 21).

A lightly charcoal-infused sandy loam layer, Stratum 7, was visible below surface stripping at the edge of the north bank of the arroyo and exposed in the west wall of the 42E trench. The west portion of Stratum 7 was excavated in 10 cm levels within a 6 sq m area. One lithic artifact and only charcoal and charcoal-infused soil were encountered in the 20 to 25 cm layer. The age and nature of the deposit could not be determined, indicating it had limited data potential. Excavation was confined to the 6 sq m area (Feature 24).

Three other 1 by 1 m units were excavated in 10 cm levels into soil that did not yield artifacts or evidence of a cultural deposit. Stratum 6, a coarse-grained sandy loam with abundant gravel and cobbles, was reached at 30 cm below the modern ground surface. This layer appeared to be the old hill slope and marked the limit of the cultural deposit.

After initial excavation of the site surface and investigation of Stratum 4, mechanical earth-moving equipment (a Bobcat) was used to remove the overburden from Stratum 4 (Fig. 35). The overburden was removed from a 10 by 10 m area in 10 to 20 cm levels to 5 to 10 cm above Stratum 4. Features 26 and 27, exposed in Stratum 3, were excavated and recorded. Mechanical excavation stopped at the level of Feature 27 on the north side of the arroyo. The remaining overburden (Stratum 3) was removed by hand. Feature 26 was very shallow and was mostly removed by the Bobcat shovel, so mechanical excavation proceeded to the level above Stratum 4.

All of the Stratum 4 occupation and feature fill was screened through 1/8-inch mesh. Fire-cracked rock and artifacts in situ within Stratum 4 or on the old ground surface were piece-plotted. Stratum 4 was excavated in 10 cm levels, usually two levels per unit. A distinct old ground surface or occupation level could not be defined because of the relatively homogenous, vertical diffusion of the charcoal-infused deposits. Obviously, the levels with heavy fire-cracked rock clusters closely approximated old ground surfaces. Thirty features including fire-cracked rock discard areas, a pit-structure foundation and intramural pits, and thermal features were exposed in Stratum 4.

Figure 35. Excavation area after surface stripping and hand trenching, Area 2, LA 61286.

All pit features were excavated as they were in the 100N area. The pit-structure foundation was excavated in 1 by 1 m units and one level, since it was only 12 cm deep. Rarely more than two and often no artifacts were recovered from any one excavation unit.

Excavation was halted to the north where Stratum 4 dissipated and joined with the dense gravel and cobble deposit (Stratum 6). Features 38, 45, and 64 were exposed below and within Stratum 6, indicating that high-energy erosion episodes had followed site abandonment. Upslope, cobbles had been deposited on top of and intermixed with Stratum 4. The 10-percent grade of the north portion of the excavation area indicated that the near-surface Feature 19 and the more deeply buried features downslope and to the south were on the same old ground surface. This also appeared to be true of the Feature 17, 18, 22, and 23 cluster in the south portion of the excavation area, where the natural slope gradient from the main excavation area to the feature cluster appeared to connect.

Excavation was halted after all of Stratum 4 exposed in the mechanically excavated zone had been excavated. The high number and density of features strongly indicated that the main portion of the cultural deposit had been exhaustively examined. Final mapping entailed vertical cross sections across the excavation area. This data could be matched with the preexcavation elevation levels. This information will be used to examine the topographic characteristics of the area, which might have encouraged such intensive occupation.

Stratigraphy. Seven main strata were defined in the wall profiles of the initial excavation units (Fig. 36). Stratum 1 was a brown (7.5 YR 5/4), coarse, sandy loam of a weak, subangular blocky structure, 5 to 10 percent gravel, with a smooth, abrupt boundary. It was the topsoil that covered the upslope areas. Stratum 2 was a brown (10 YR 5/3, dry), coarse, alluvial sand, nonplastic when moist, weakly structured, with an abrupt, wavy boundary. Stratum 3 was a pale brown (10 YR 6/3, dry), hard, sandy loam, slightly plastic when wet. It had fine, sparse carbonate filaments and 5 percent calcium-carbonate-covered gravel and a clear, wavy boundary. Stratum 3 incorporated the cultural deposit, Stratum 4. Stratum 4 was the same as Stratum 3 but infused with charcoal and dark gray to gray brown (10 YR 5/2, dry). Stratum 5 was the remnant of the fossil slope, consisting of a pale to very pale brown (10 YR 7–6/3, dry), coarse, sandy loam with a weak, blocky structure, slightly plastic when moist. It had abundant carbonate filaments and 10 to 20 percent calcium-carbonate-covered gravel and cobbles, and an abrupt, distinct boundary. Stratum 6 was a brown (10 YR 5/3, dry), coarse sand with a weak structure, poorly consolidated, with an abrupt, wavy boundary. This deposit appears to be disintegrating bedrock of the Tesuque formation. Stratum 7 was similar to Stratum 2 except that it had a high organic content and was gray brown (10 YR 5/3, dry). It may have been a poorly preserved cultural deposit that postdated the main area occupation.

Strata 4 and 7 were excavated. Stratum 4 contained the majority of the features, cultural material, and other occupation evidence. Stratum 7 may remain from a later, more ephemeral occupation. Stratum 7 yielded few artifacts and was localized along the north bank of the arroyo. Contact between Stratum 3 and Strata 5 and 6 marked the San Jose phase occupation surface. This surface was exposed across a 10 m north-south by 13 m east-west area. Within this 23 sq m area, 23 features were exposed in Stratum 3 or at the contact of Stratum 3 and Stratum 5 contact. This gentle slope was exposed between 3100 and 2200 BC and apparently was a favored camp location. The coarse decomposing sandstone in Stratum 6 indicated that there were no deeply buried cultural deposits in this area. Excavation halted at Stratum 5 or 6.

Features. Excavation of Area 2 revealed two distinct occupation levels that are separated stratigraphically, and the vertical separation has been confirmed by radiocarbon dating. The latest dated cultural deposit, which was exposed by surface stripping within 5 to 10 cm below the modern ground surface, had two statistically distinct subcomponents. Feature 19, which was in 227–228N/36E, was the latest; Features 17, 22, and 23, in the 6 by 6 m surface-stripped area (204N/32E, southwest corner), were slightly older. These features date broadly to the Late Archaic period.

The second temporal component occurred 30 to 50 cm below the Late Archaic component and was radiocarbon dated to the Middle Archaic

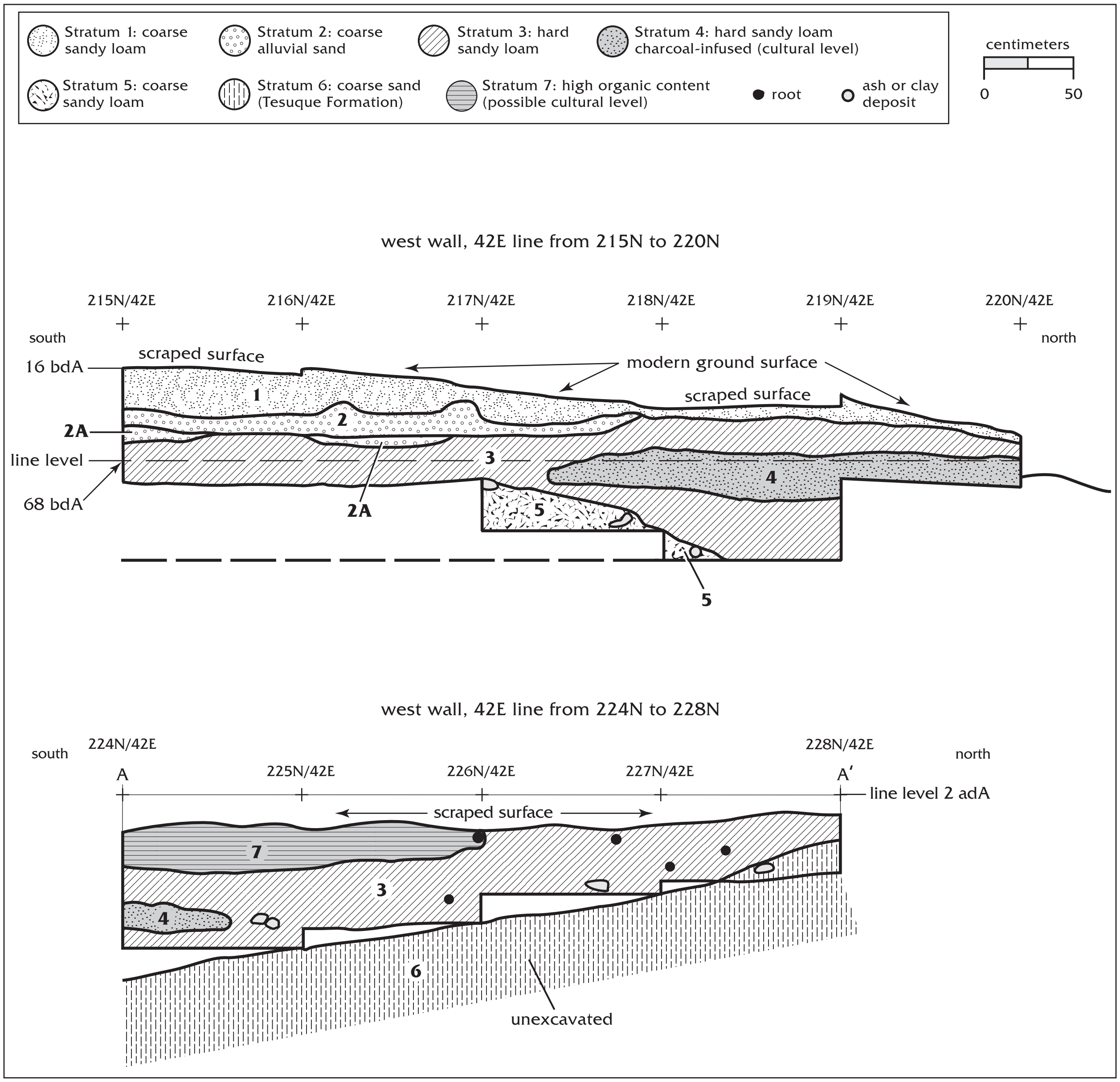


Figure 36. Stratigraphic profile along the west wall of 42 East from 215 to 228N, Area 2, LA 61286.

period. Three statistically distinct two-sigma ranges were identified using pooled estimates. Overall, the dated features range from 3337 to 1937 BC calibrated two-sigma combined ranges. Obviously, the Middle Archaic dates suggest a long history of repeated and probably discontinuous occupation. Features 20, 21, 24, and 26 cannot be tied to a specific occupation period. Features 20 and 21 are near the San Jose phase biface reduction debris cluster in 227–229N/53–55E area, but they are also associated with Late Archaic style projectile point fragment (FS 264-2). Assigned feature classes include undifferentiated burned pits (Features 17, 21, 22, 23, 25, 27, 34, 40, 43, 45, 48–52, 59, and 61–64), roasting pits (Features 30, 41, 44, 55, and 65), fire-cracked rock filled roasting pits (Features 19, 28, 29, 35, and 37), undifferentiated burned pits with fire-cracked rock (Features 38 and 39), roasting pits with an associated fire-cracked rock concentration (Feature 18), occupation stains or activity/ discard areas (Features 24 and 36), pit-structure foundations (Feature 60), storage pits (Features 66 and 67), and postholes (Features 31–33).

The Late Archaic occupation is represented by the surface scatter of 49 lithic artifacts and the five thermal features mentioned above (Features 17–19 and 22–23) that are on the periphery of and stratigraphically higher than the Middle Archaic deposits. Features 17, 18, 22, and 23 were tightly clustered (Figs. 37–40). Features 22 and 23 combined to form a bifurcated thermal feature. Feature 18 was bifurcated with a shallower, semicircular basin containing fire-cracked rock attached to the thermal feature along its southwest margin. Nearby, Feature 17 is a small, basin-shaped thermal pit. Wood charcoal from Features 18 and 22 yielded radiocarbon calibrated two-sigma ranges of 381–40 BC (Beta-132624) and 412–48 BC (Beta-143390), respectively. These dates are statistically from the same population, suggesting a contemporaneous or close temporal relationship.

Feature 19 was a large, shallow, fire-cracked rock roasting pit on the north side of the Area 2 excavation area. It had a charcoal-stained deposit that extended 2 m to the east, indicating maintenance and reuse of the feature (Figs. 41 and 42). It is isolated from other features and associated with a scatter of 49 lithic artifacts. Wood charcoal from Feature 19 yielded a calibrated two-sigma range of 122 BC–AD 133. This date range did not statistically overlap with the Feature 18 and 22 dates. Its isolated position and different content and morphology further support the idea that it was built and used at a different time.

The five Late Archaic period features were all burned. Three of the five contained or were associated with 10 to 337 pieces of fire-cracked rock. Feature 19 had the most associated fire-cracked rock and evidence that it had been used repeatedly. Four features had a circular outline, and one had an oval outline. They all had gentle to moderately steep walls. The features have a mean dimensions of 72 cm long by 69 cm wide by 15.4 cm deep and a mean area of 0.45 sq m. These features are large and more standardized than the Latest Archaic features, suggesting that capacity and function were important aspects of feature construction. The bifurcated pits, especially, may have been more specialized, reflecting resource targeting and processing with the intent to transport food or resources back to a residential site. A scatterplot of pit area by depth showed that the Late Archaic pits tended to be larger. Features 18, 19, and the combined areas of Features 22 and 23 were considerably larger than all the Latest Archaic extramural pits except Feature 5. This relationship is explored in the pit feature study in this report (see Badner and McBride, this volume).

These features had few associated artifacts. The ethnobotanical analysis yielded a narrow range of charred wild plant species, including a small amount of *Amaranthus* and *Juniperus*. Features 17, 22, and 23 yielded no charred wild plant remains. This paucity of charred remains is not the result of low sample sizes. A total of 23.7 liters of soil was processed, or an average of 4.7 liters per feature. Open pits with rock or cobbles may have been used to parch or roast fruits, seeds, or nuts. Since the pits are shallow, it is unlikely that the foodstuff or resource needed more than 4 to12 hours to bake or roast. Shallow pits would lose their heat faster than deeper pits, like those found with the San Jose components of this project. A variety of human and natural factors may have combined to leave such a sparse assemblage of charred remains. For example, the wild food that was processed lacked parts that would be charred and left behind, or none of the processed foods were accidentally spilled or intentionally discarded into the active thermal feature.

The Middle Archaic occupation surface sloped gently from northwest to southeast with a gradient of less than 5 percent. The surface consisted of gravelly sandy loam mixed with charcoal, fire-cracked rock, and scattered chipped and ground stone artifacts. Pit features, one discard area, and one pit-structure foundation were excavated into the colluvial substratum. The charcoal-infused cultural deposit where features were first exposed was 10 to 15 cm thick. Elevation differences in the excavation-defined tops of pits suggest microtopographic variations across the occupation area. The oldest radiocarbon dated features are not the lowest in relative elevation. However, the earliest features were more upslope than some of the features that dated later. Artifact counts from this occupation level were low, and artifact concentrations, with the exception of the biface-reduction area at the northeast periphery of the occupation area, were nonexistent. The smeared and expansive distribution of the charcoal-infused soil suggests that gradual downslope movement of soil and artifacts may have removed some of the artifacts

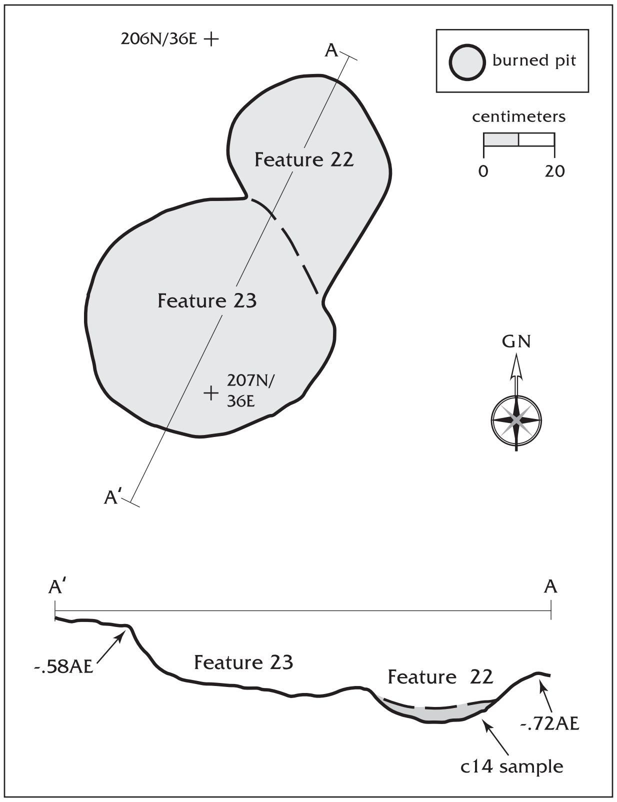


Figure 37. Plan and profile of Features 22 and 23, LA 61286.

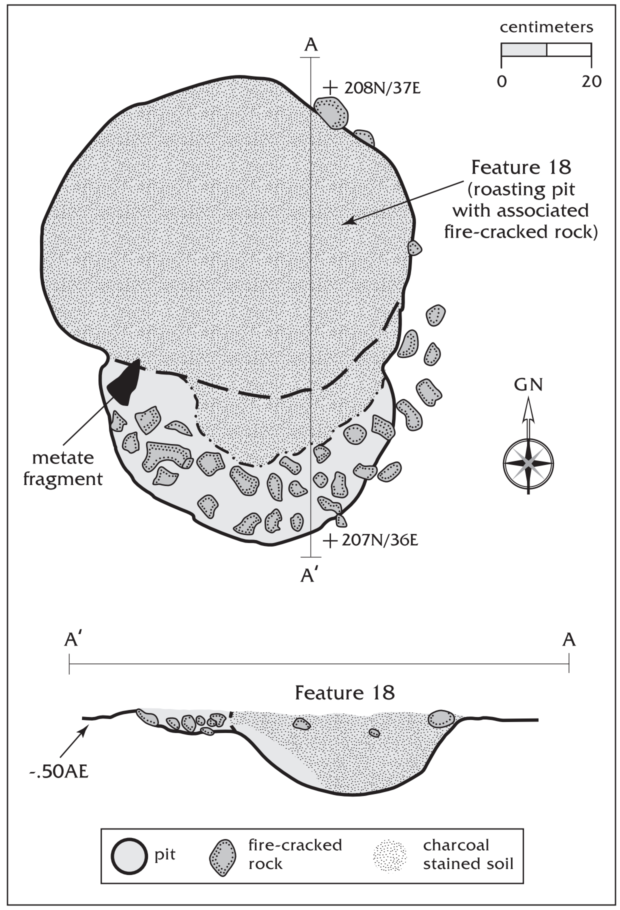


Figure 38. Plan and profile of Feature 18, LA 61286.

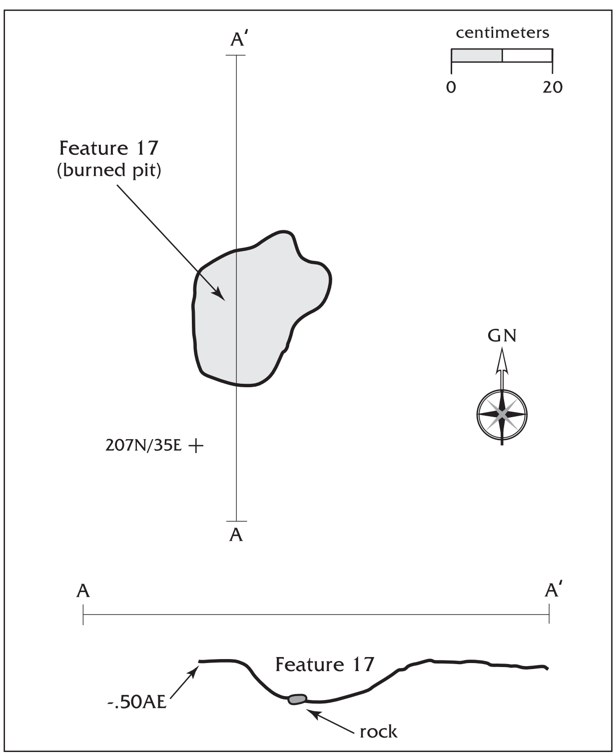


Figure 39. Plan and profile of Feature 17, LA 61286.

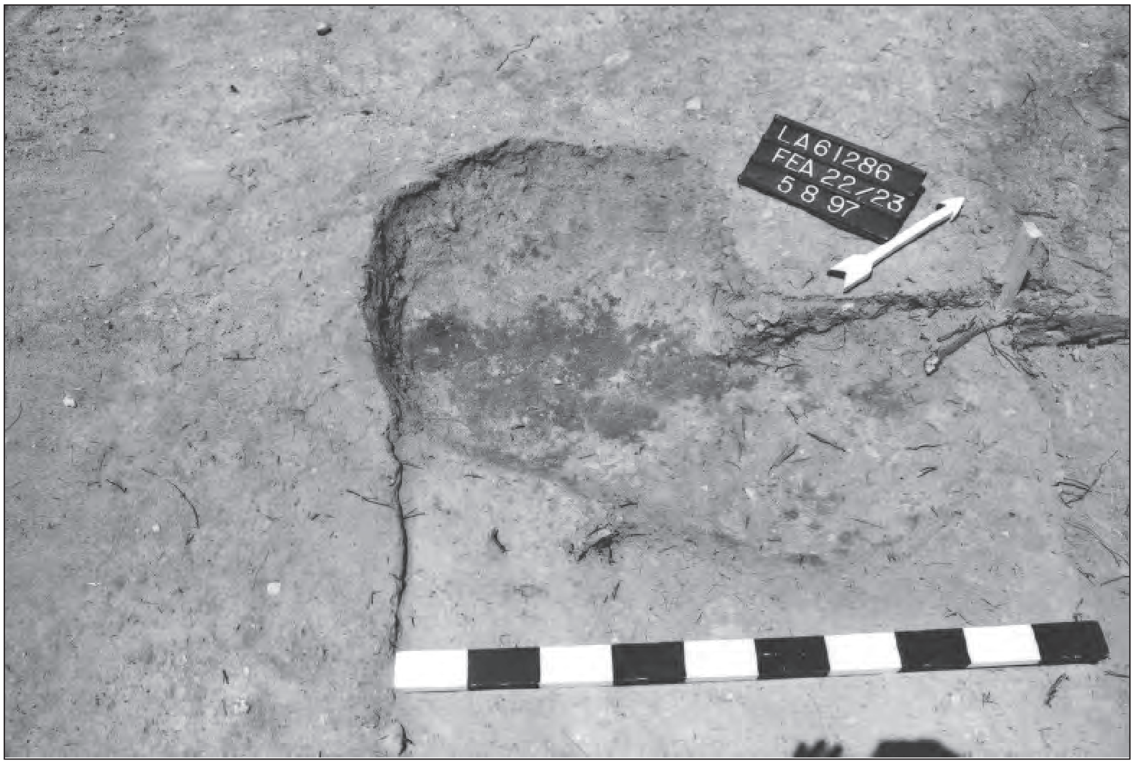


Figure 40. Features 22 and 23, LA 61286.

from the occupation surface.

The Middle Archaic feature assemblage is larger and more diverse than the Early Archaic, Late, and Latest Archaic components. Thirty-seven features were identified within the 23 sq m excavation area. Of these, thirty-two were pit features, three were postholes, one was a pit-structure foundation (Feature 60), and one was a fire-cracked rock discard area (Feature 36). Thirty-one features were extramural pits, and the one thermal feature was the intramural hearth in Feature 60.

Feature 60, a pit-structure foundation, was exposed while excavating the diffuse Stratum 4 cultural deposit that overlay the Middle Archaic occupation surface. The structure outline was identified within a dense cluster of burned and unburned pits. It was initially recognized as a shallow, oval-shaped basin filled with medium-grained sandy loam that was intermittently heavily to lightly stained by disseminated charcoal. The excavated limits were defined by a break in the darkly stained soil combined with a north wall defined by the cobble gravel layer that underlies the San Jose component, and the medium-grained sand on the south that remains from deflation and alluvial deposition exposed in the modern erosion channel. The southern limit of the structure was removed by the erosion channel.

The pit-structure foundation had a subrectangular outline with shallow, gently sloped walls and a basin-shaped floor of unprepared sandy loam (Figs. 43–45). The shallow foundation was excavated into native soil, and no other evidence of construction or formal modification was visible. Its estimated dimensions were 3.0 m long by 1.75 m wide by 5 to 15 cm deep. The floor area was estimated at 5.25 sq m. The only intramural feature was a reused pit that functioned as a hearth during the pit-structure occupation and an unburned pit after the structure was abandoned.

Feature 36, a fire-cracked rock and cobble concentration, was cut by the erosion channel (Fig. 46). The deposit was suspended within Stratum 4 and through deflation and erosion may have contributed to the gray, stained appearance of Stratum 4. The concentration partly or completely overlies Features 41, 44, 57, 58, and 61. Radiocarbon dates from Features 44 and 57 placed their use during the earliest Middle Archaic occupation.

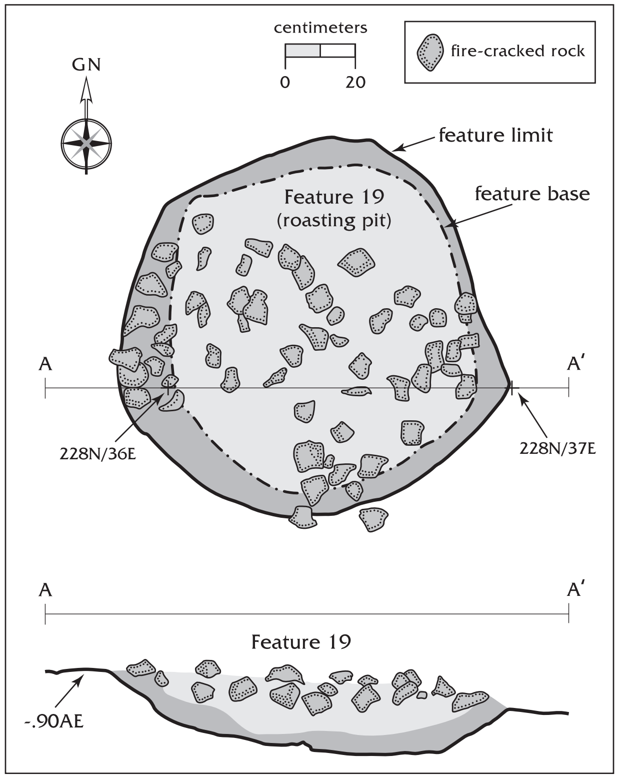


Figure 41. Plan and profile of Feature 19, LA 61286.

Figure 42. Feature 19, LA 61286.

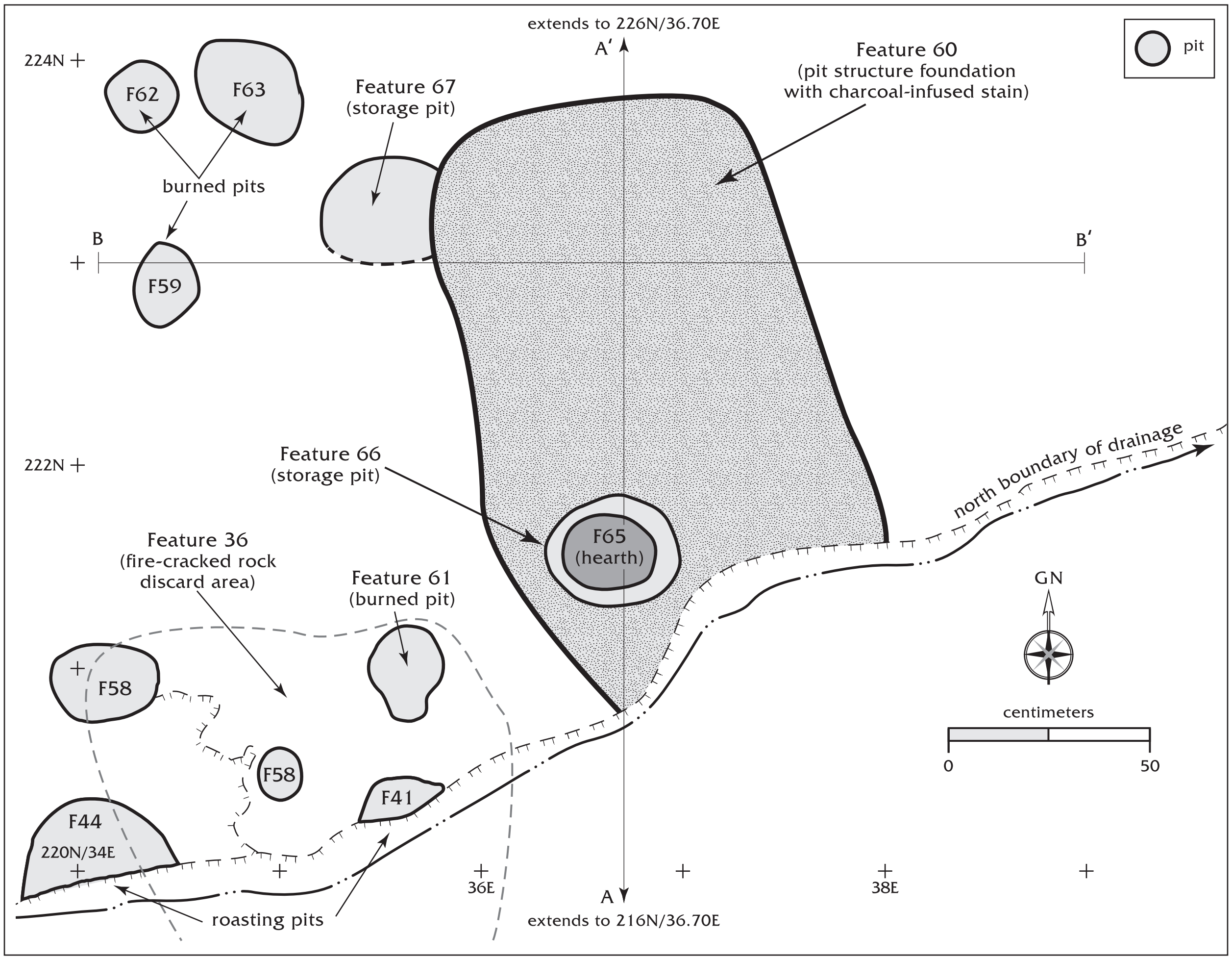


Figure 43. Plan of Feature 60, LA 61286.

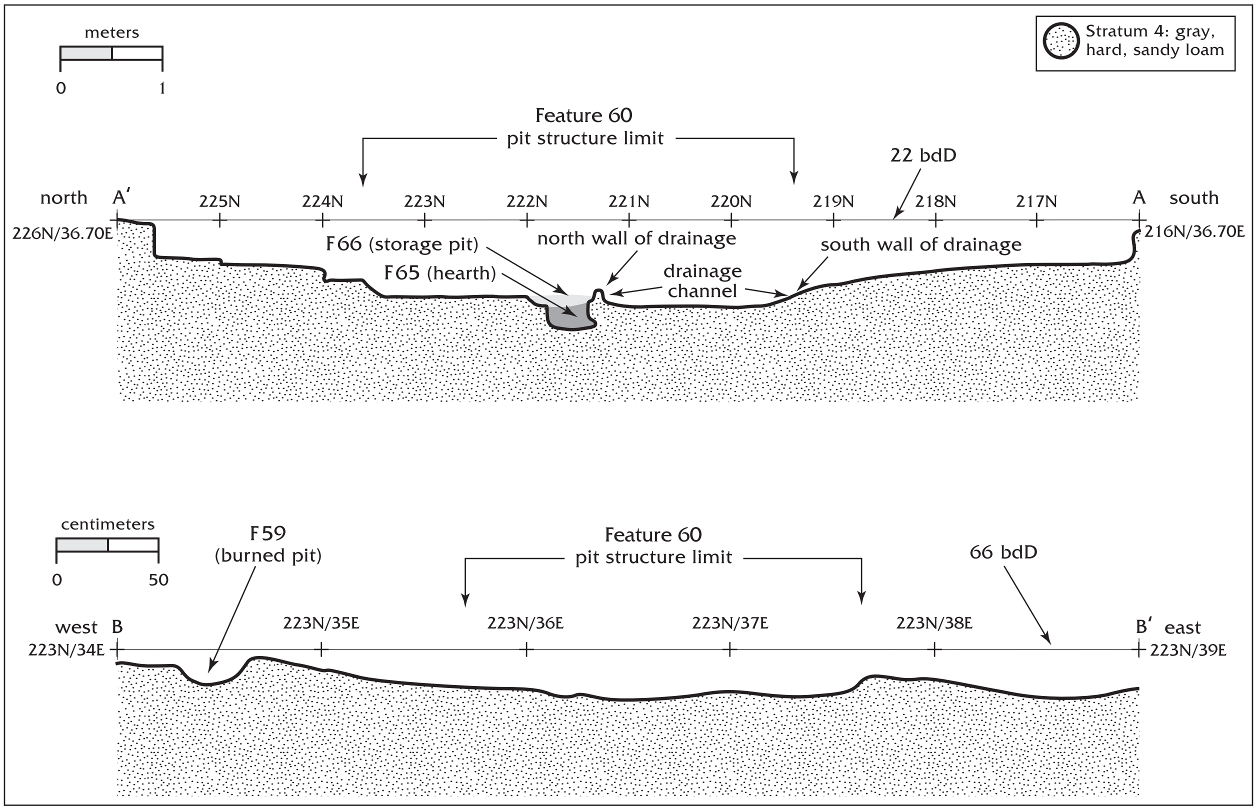


Figure 44. Profile of Feature 60, LA 61286.

Figure 45. Feature 60, LA 61286.

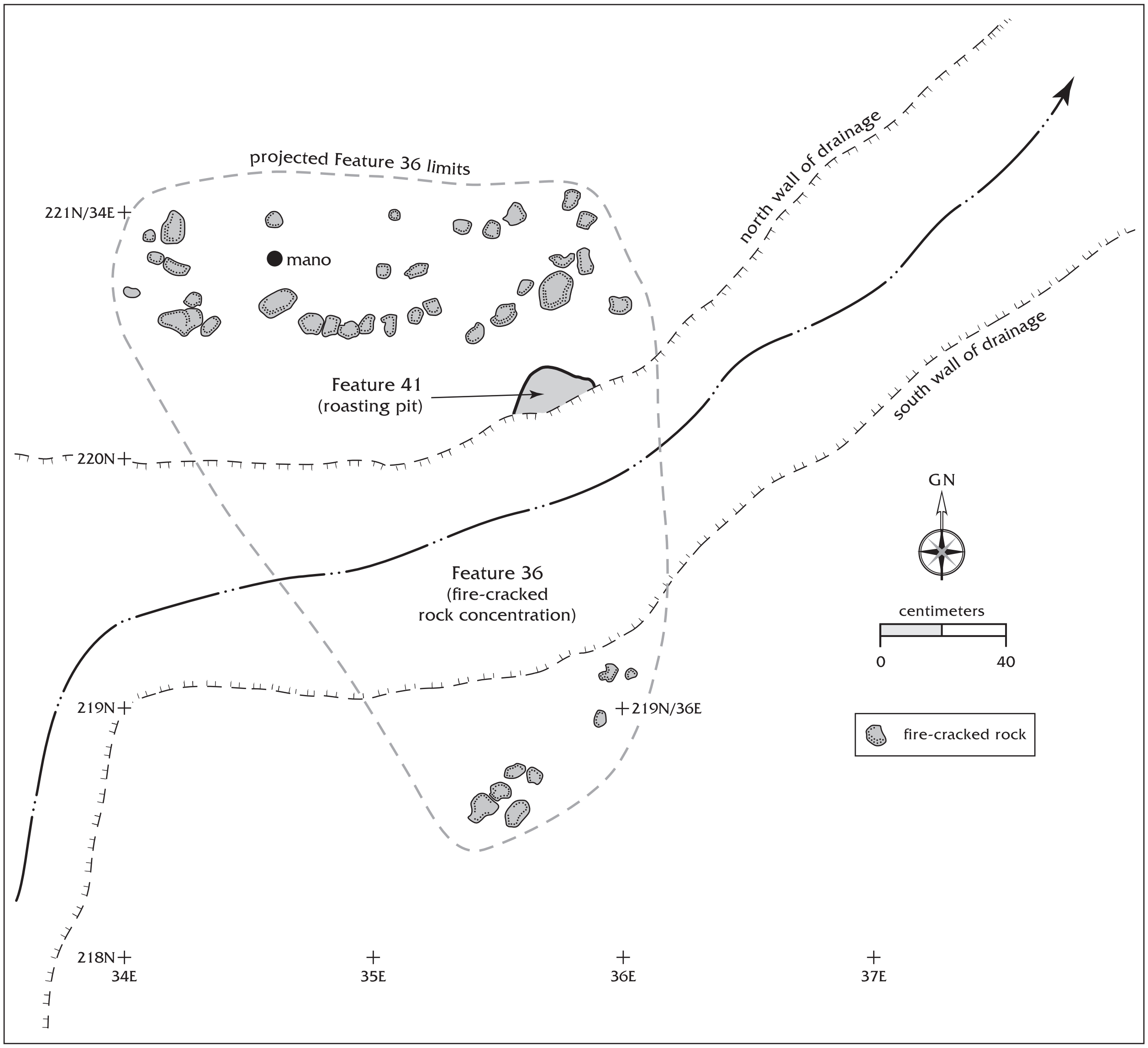


Figure 46. Plan of Feature 36, LA 61286.

Therefore, Feature 36 may be discard associated with the pit-structure occupation or later. The concentration of fire-cracked rock suggests repeated use of processing and roasting pits and reflects camp maintenance. Camp maintenance is most commonly associated with longer, planned occupations. Maintained space or concentrated refuse may also reflect anticipated return to the site.

All of the extramural pits were unlined and excavated into the native soil or Stratum 6. None of the pits showed any evidence of formal preparation. The unlined pits were in a deflated, erosional setting that may have reduced the pit edges. The actual shape and dimensions of the pits are estimated. On the other hand, all pits were subjected to the same deteriorating conditions. Figures 47–86 show the plan and profiles of these features. Certain pits are also shown in photographs. Of these 27 extramural unlined pits, 14 had circular outlines, and 15 had oval outlines. The majority (14) were steep-walled or moderately steep (10) basins, with only four gently sloped basins. Given the geomorphological setting, it is not surprising that the majority of the features contained fill that was a mixed deposit of primary and secondary material. Charcoal-stained soil with or without visible charcoal was the main indicator of a mixed deposit. It is assumed that the dark gray to black soil color resulted from abundant charcoal that was diffused through wet/dry and freeze/thaw processes. Twenty-one of the features were characterized as burned and seven as unburned. Features with a mixed primary and secondary deposit were usually interpreted as burned (or used with fire). It is possible that some of the features functioned as coal or ash pits, and that primary burning occurred in other pits. This would explain our observation that some pits did not show typical evidence of burning, yet they were filled or partly filled with charcoal-infused soil.

There are direct and indirect indicators of feature functions. Obvious direct indicators are charred faunal or plant remains that are recovered by screening or flotation. The indirect indicators include feature size, shape, and nonfood content that may indicate a general function such as parching, roasting, heating, or smoking. These activities have been observed ethnographically, and some descriptive data is available for the types of features used for certain processing or cooking activities. In the Southwest, observations on Apache groups (Opler 1941) may be the most informative, although they are qualified by the influence of outside technology, food, and goods. Obviously, care must be exercised when using ethnographic analogies, but such analogies can be useful in interpreting pit features.

Charred food remains in the 29 pit features are rare and not very diverse. Of the 27 pit features from which flotation samples were processed, only 12 yielded charred plant remains, and no charred faunal remains were recovered. Charred plant remains occur in pits of all depths and sizes. In general, the pits yielded a narrow range of plant species including *Chenopodium*, *Amaranthus*, *Portulaca*, and *Suaeda*, common wild species that may indicate consumption or the use of plants to cover foods during roasting or parching. These plants are available most of the summer and early fall and so are not precise indicators of the season of use.

Indirect evidence of feature function includes size, shape, and nonfood content. Mean feature length (or greatest dimension) is 0.56 m, ranging from 0.22 to 1.17 m. Mean depth is 0.17 m, ranging from 0.08 to 0.40 m. Mean area is 0.23 sq m, ranging from 0.04 to 0.78 sq m. Three groups of features are apparent in Figure 87. The main group is made up of features with areas of less than 0.30 sq m and depths of less than 0.20 m. The second group is made up of features that are deeper than 0.30 m. The third group is made up of features that are have areas of greater than 0.35 sq m area and depths of less than 15 cm. Few features occur between groups.

Fire-cracked rocks suggest roasting or parching and may result from the processing of plant or meat. In some areas, boiling with heated stones may have been a major way of cooking foods. Fire-cracked rock in this component may reflect both uses. A fire-cracked rock midden (Feature 36) and a general fire-cracked rock scatter across the occupation surface attest to the importance of rock in food processing. Of the 12 features with fire-cracked rock, the majority are shallow or less than 0.20 m deep. The largest and shallowest features all have fire-cracked rock. Two of the three deepest features have fire-cracked rock, but there were fewer than five pieces in each. Therefore, there is some correlation between feature depth

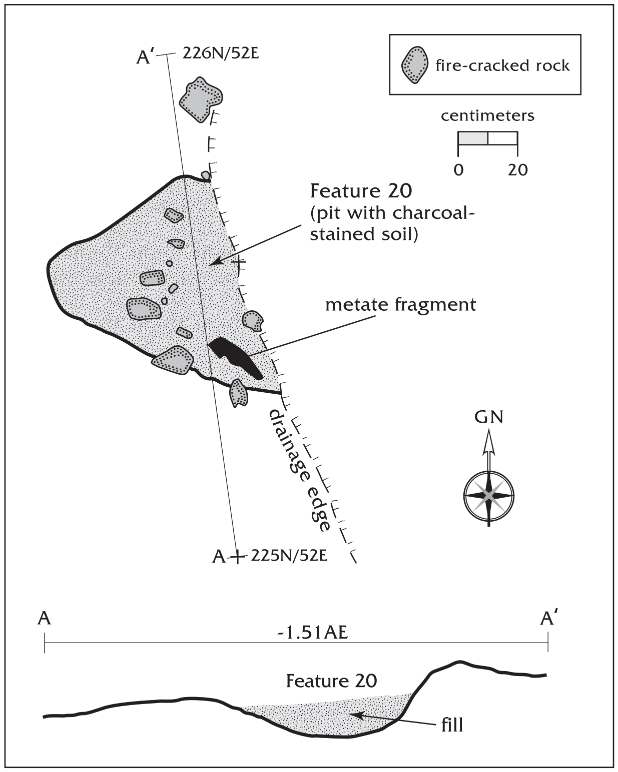


Figure 47. Plan and profile of Feature 20, LA 61286.

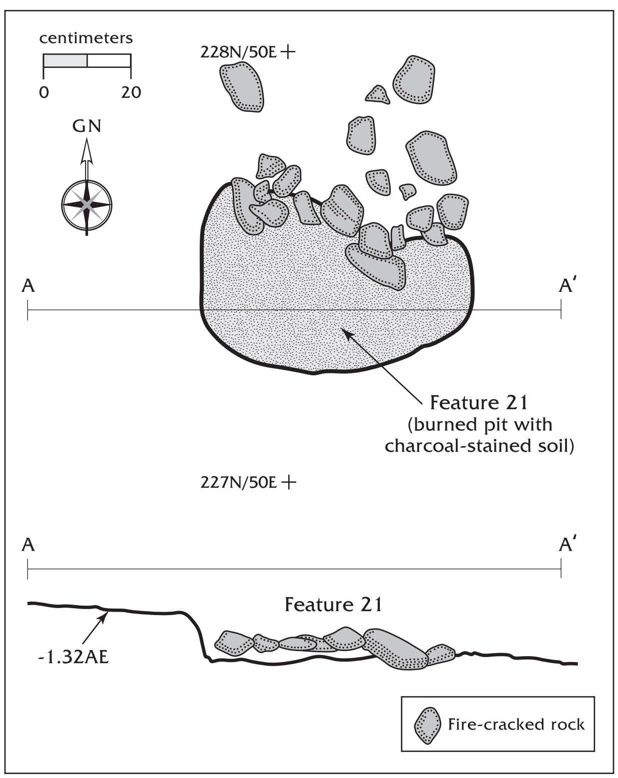


Figure 48. Plan and profile of Feature 21, LA 61286.

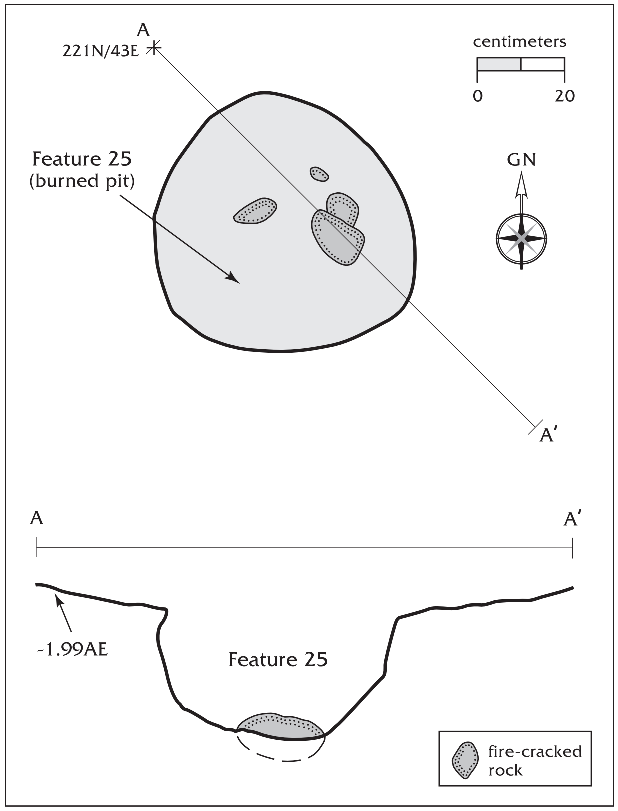


Figure 49. Plan and profile of Feature 25, LA 61286.

Figure 50. Feature 25, LA 61286.

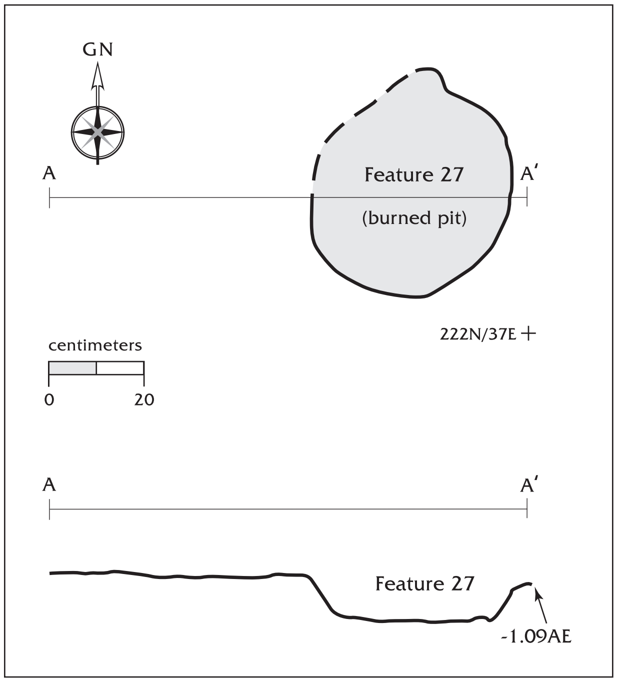


Figure 51. Plan and profile of Feature 27, LA 61286.

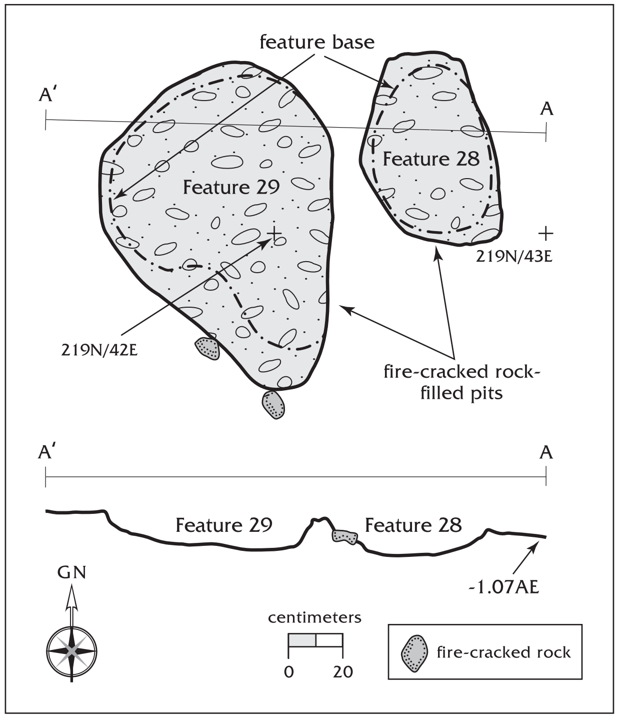


Figure 52. Plan and profile of Features 28 and 29, LA 61286.

Figure 53. Features 28 and 29, LA 61286.

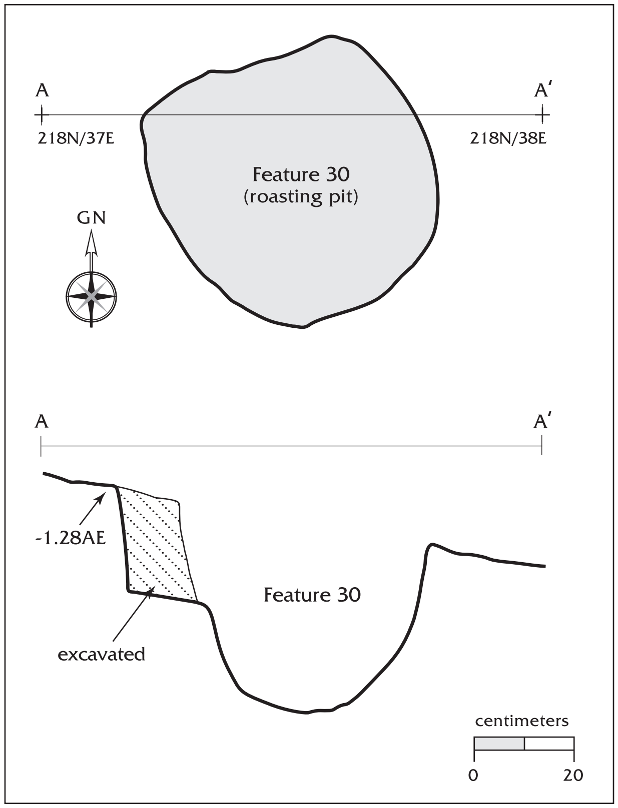


Figure 54. Plan and profile of Feature 30, LA 61286.

Figure 55. Feature 30, LA 61286.

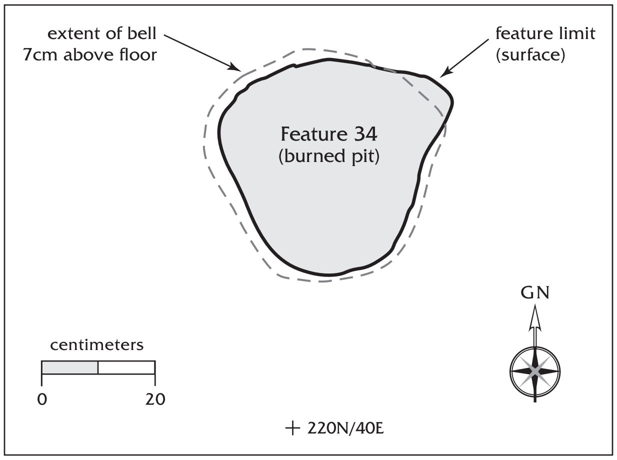


Figure 56. Plan of Feature 34, LA 61286.

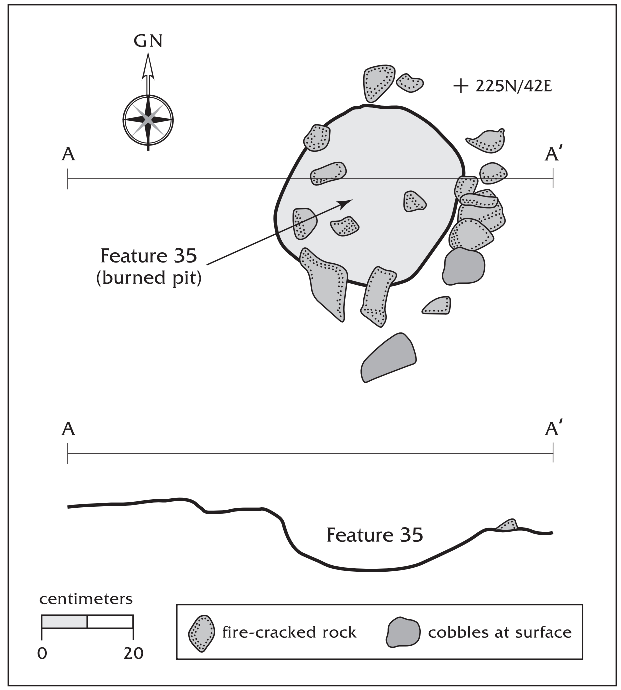


Figure 57. Plan and profile of Feature 35, LA 61286.

Figure 58. Feature 35, LA 61286.

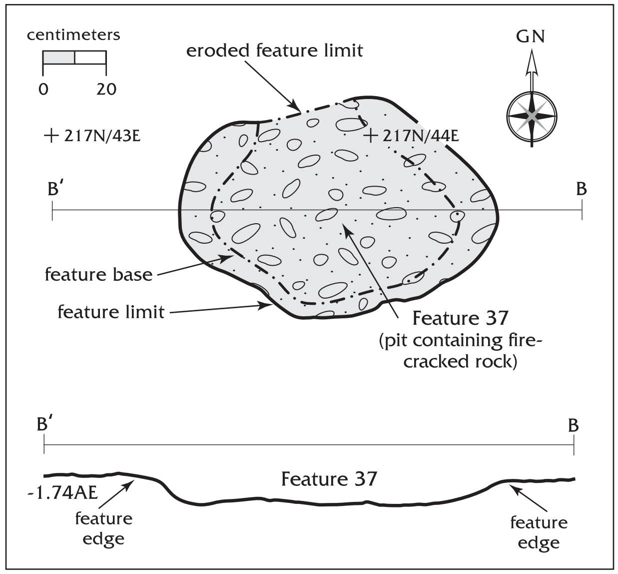


Figure 59. Plan and profile of Feature 37, LA 61286.

Figure 60. Feature 37, LA 61286.

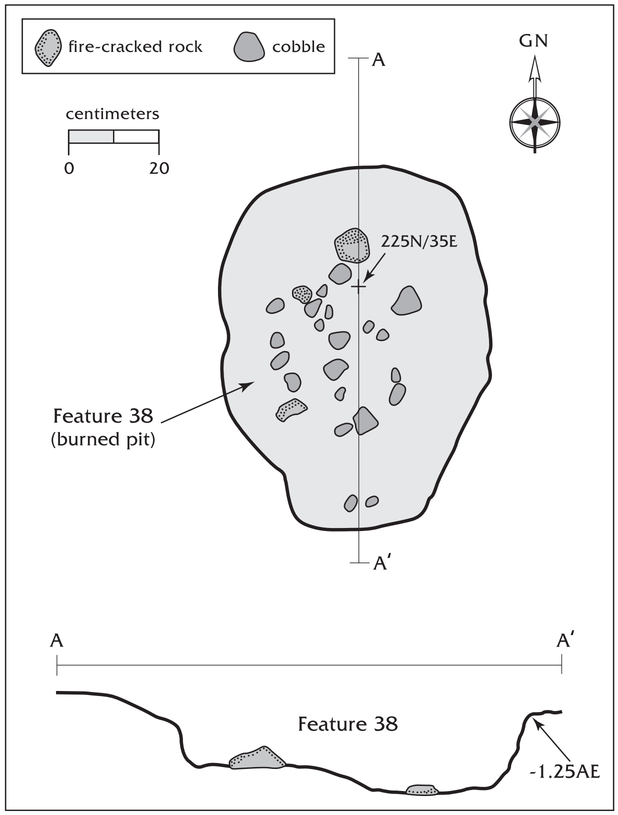


Figure 61. Plan and profile of Feature 38, LA 61286.

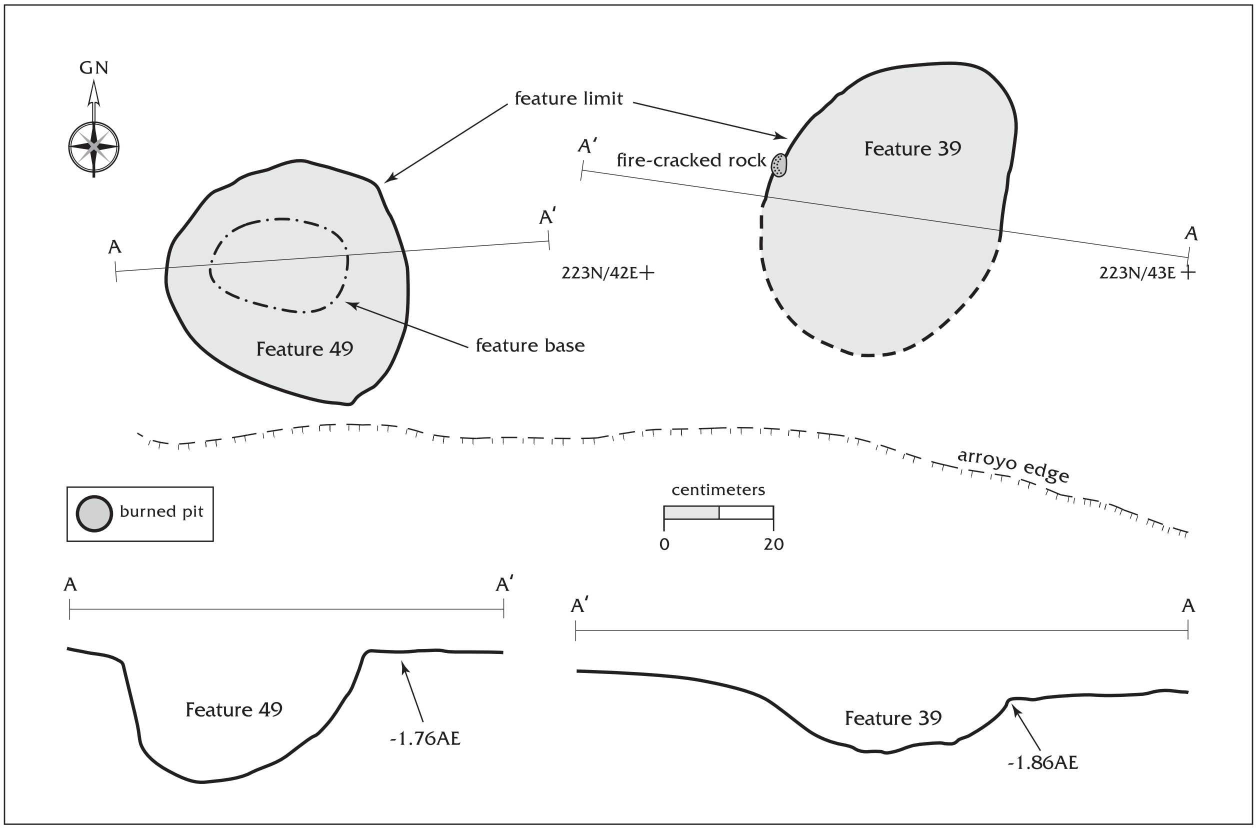


Figure 62. Plan and profile of Features 49 and 39, LA 61286.

Figure 63. Features 49 and 39, LA 61286.

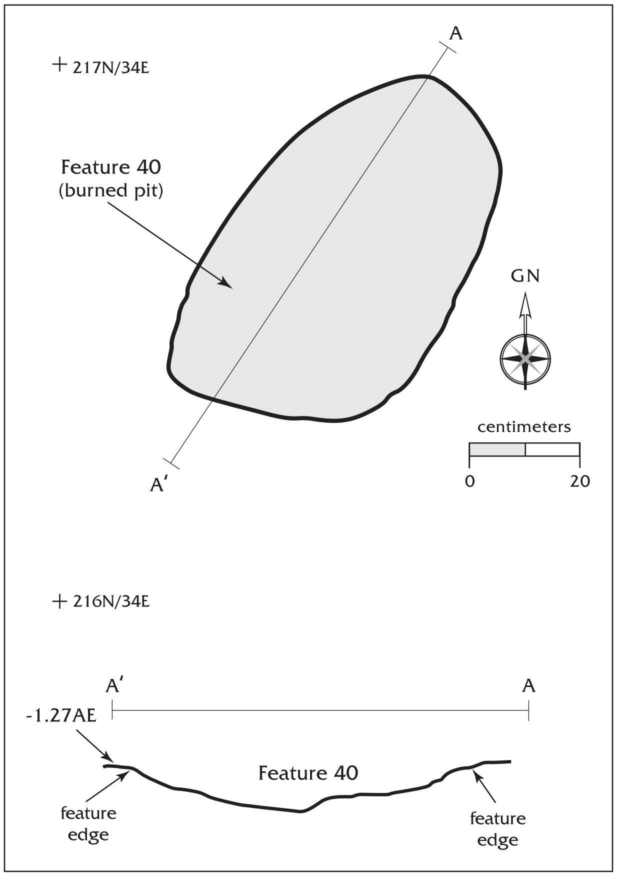


Figure 64. Plan and profile of Feature 40, LA 61286.

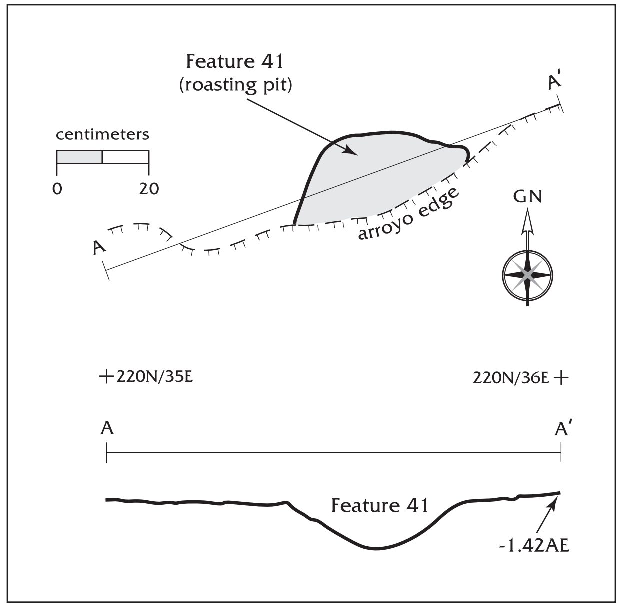


Figure 65. Plan and profile of Feature 41, LA 61286.

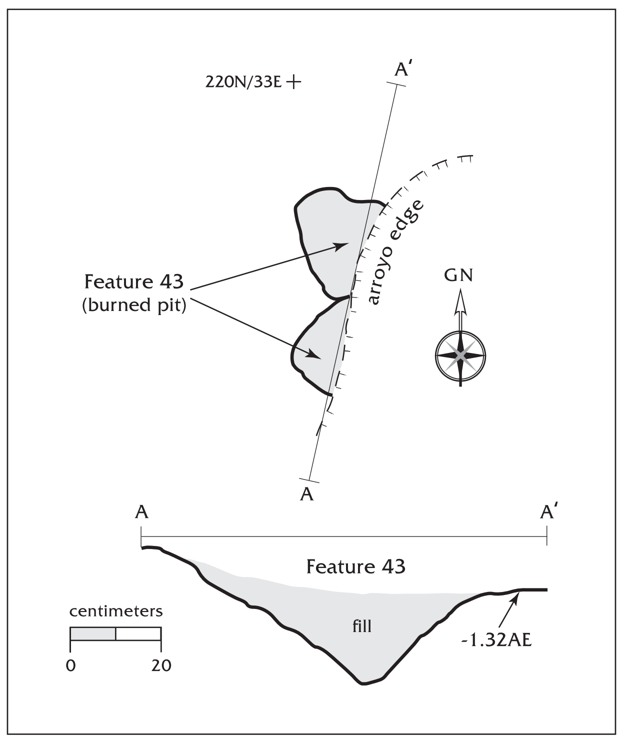


Figure 66. Plan and profile of Feature 43, LA 61286.

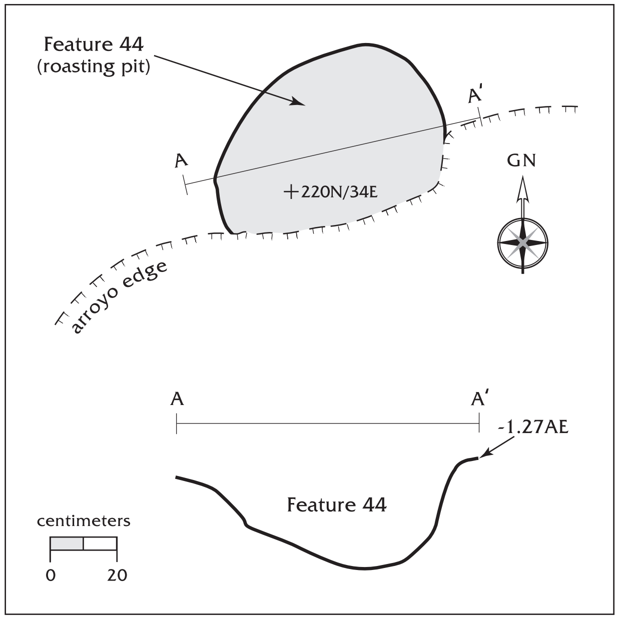


Figure 67. Plan and profile of Feature 44, LA 61286.

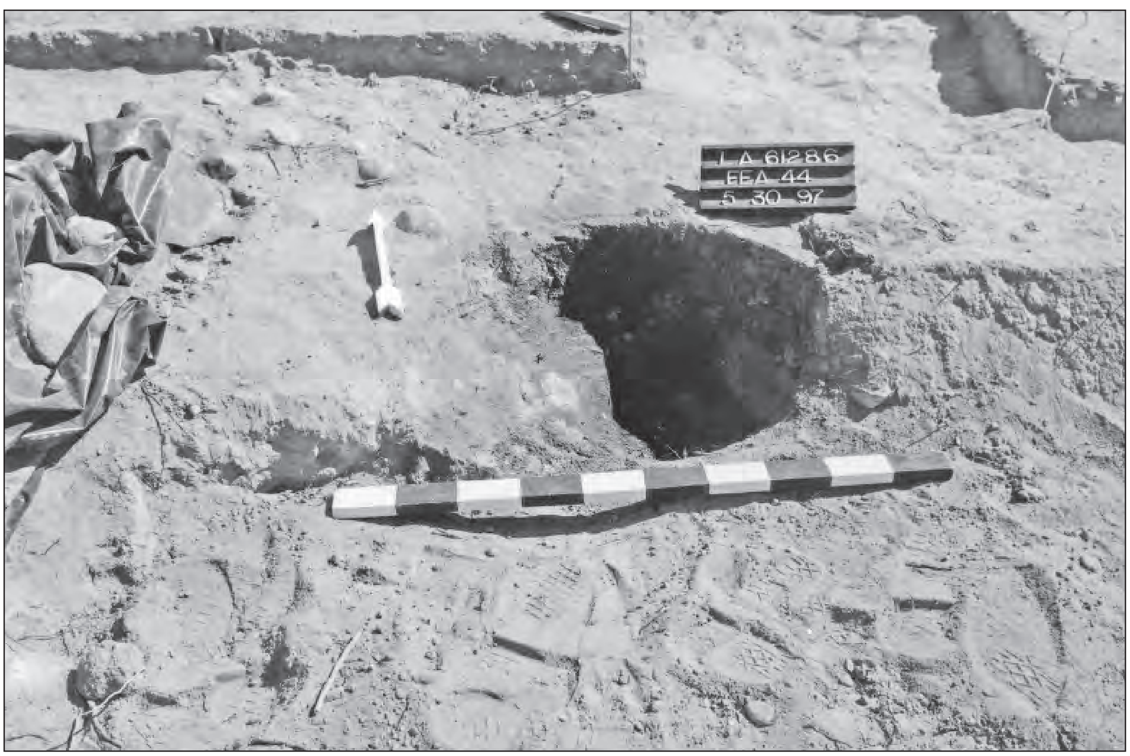


Figure 68. Feature 44, LA 61286.

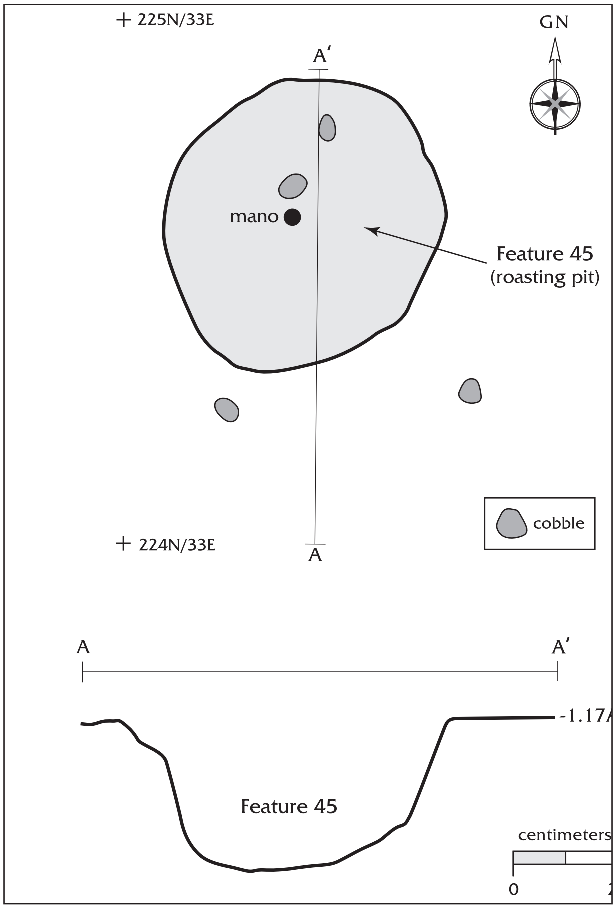


Figure 69. Plan and profile of Feature 45, LA 61286.

Figure 70. Features 38 and 45, LA 61286.

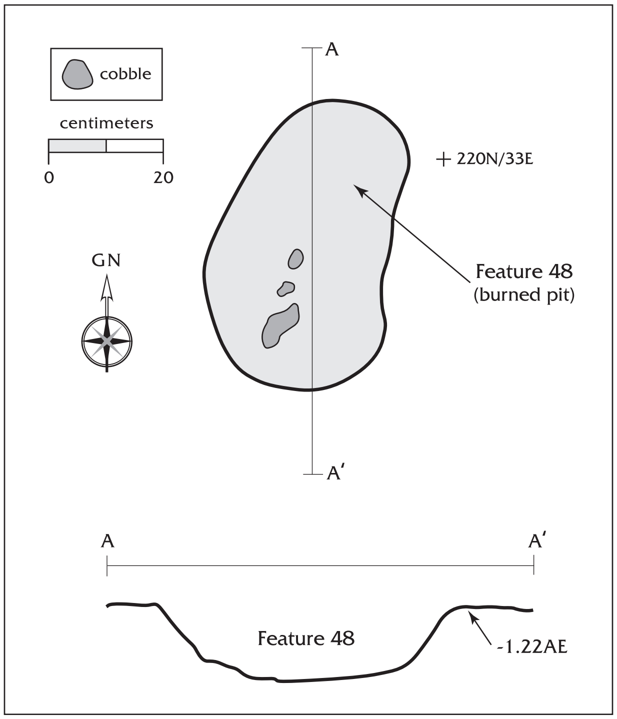


Figure 71. Plan and profile of Feature 48, LA 61286.

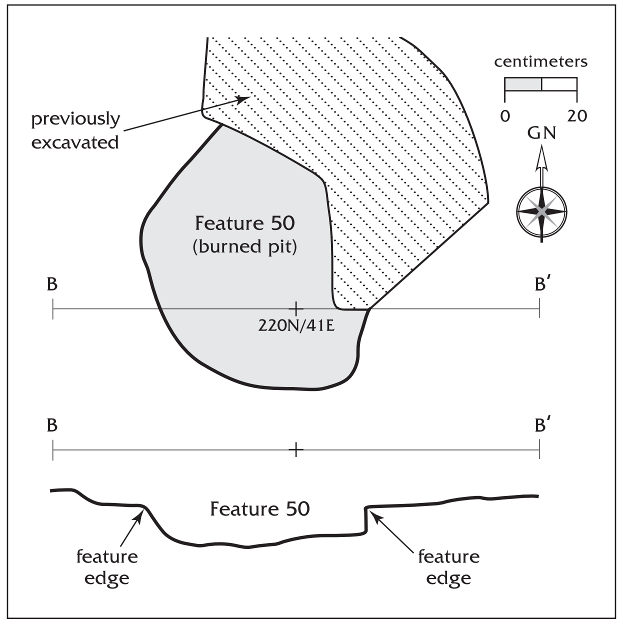


Figure 72. Plan and profile of Feature 50, LA 61286.

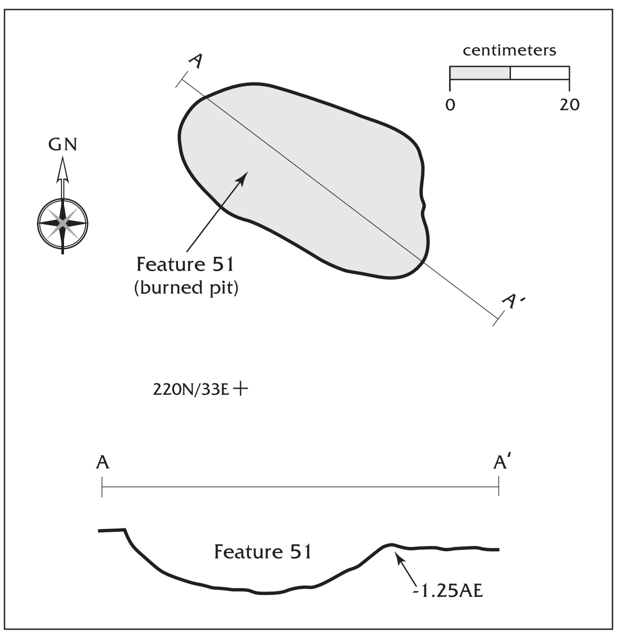


Figure 73. Plan and profile of Feature 51, LA 61286.

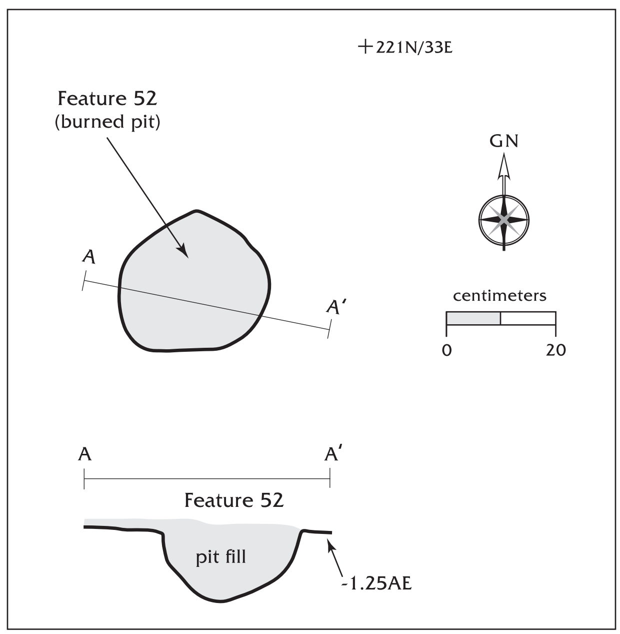


Figure 74. Plan and profile of Feature 52, LA 61286.

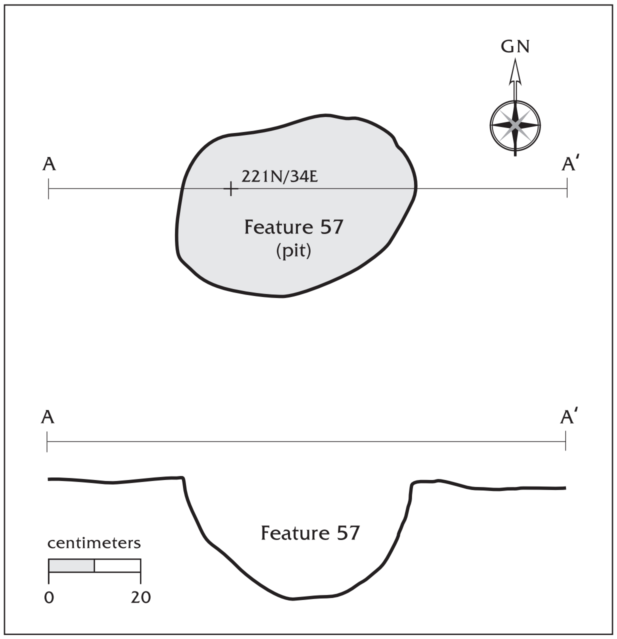


Figure 75. Plan and profile of Feature 57, LA 61286.

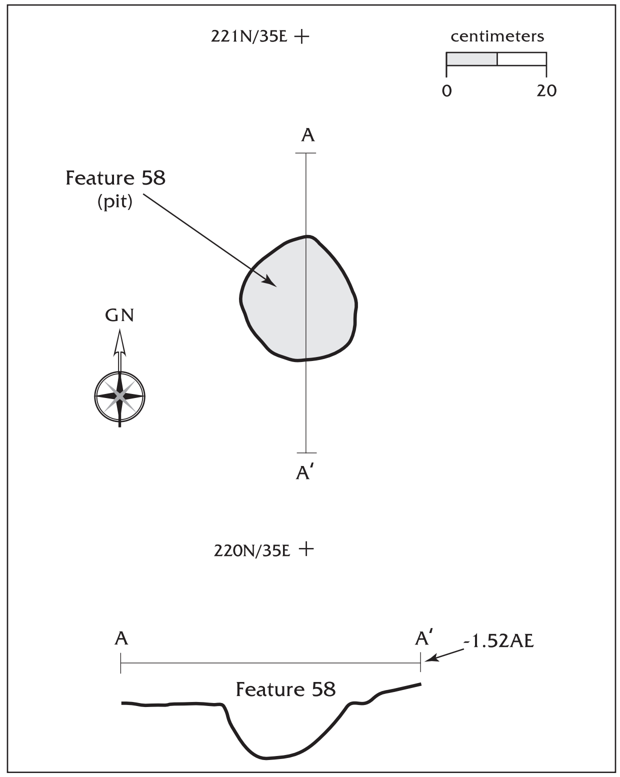


Figure 76. Plan and profile of Feature 58, LA 61286.

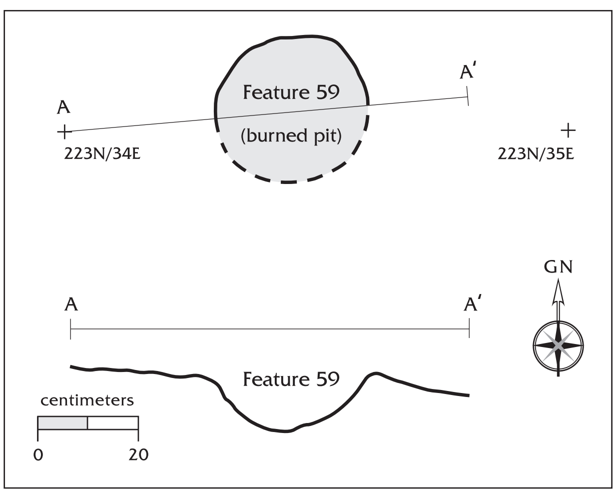


Figure 77. Plan and profile of Feature 59, LA 61286.

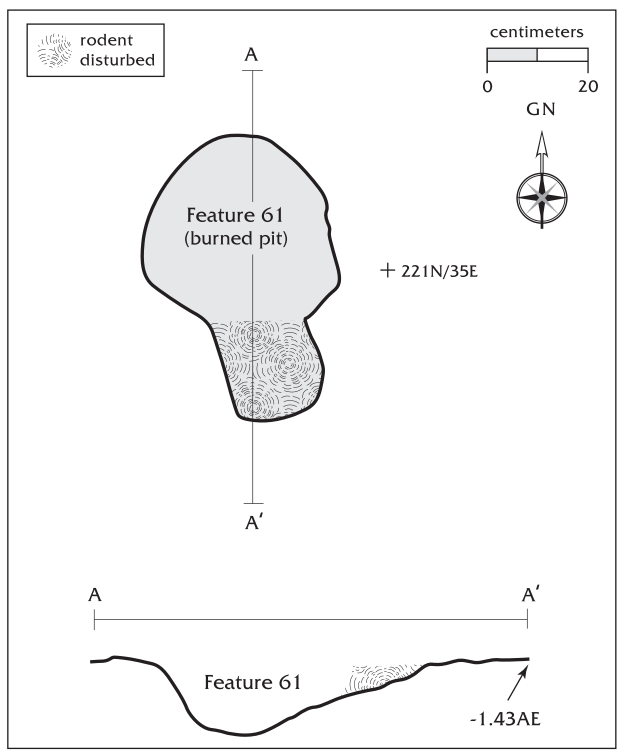


Figure 78. Plan and profile of Feature 61, LA 61286.

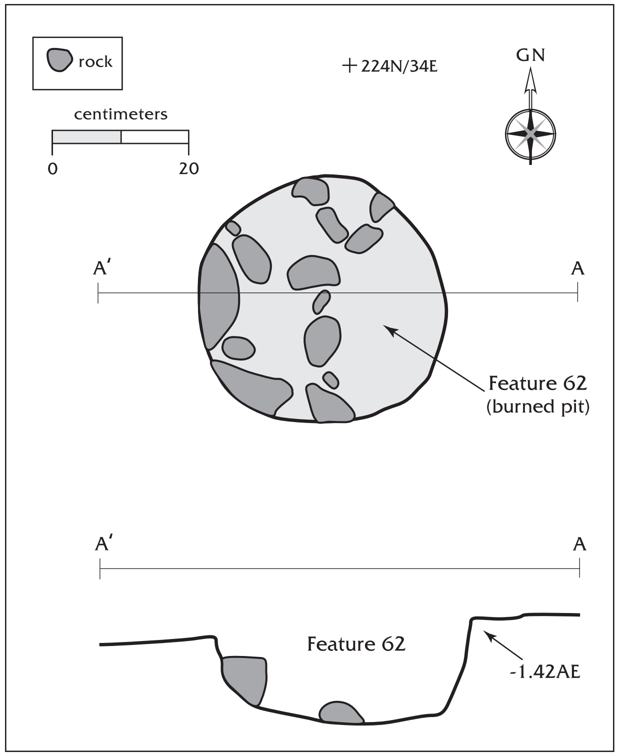


Figure 79. Plan and profile of Feature 62, LA 61286.

Figure 80. Feature 62, LA 61286.

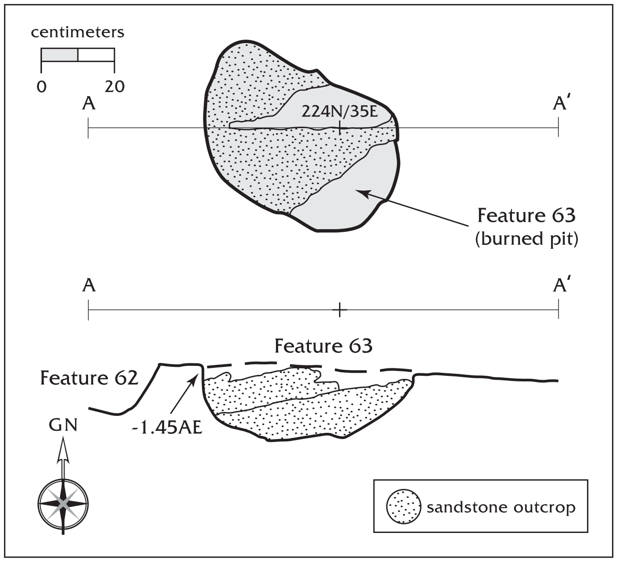


Figure 81. Plan and profile of Feature 63, LA 61286.

Figure 82. Feature 63, LA 61286.

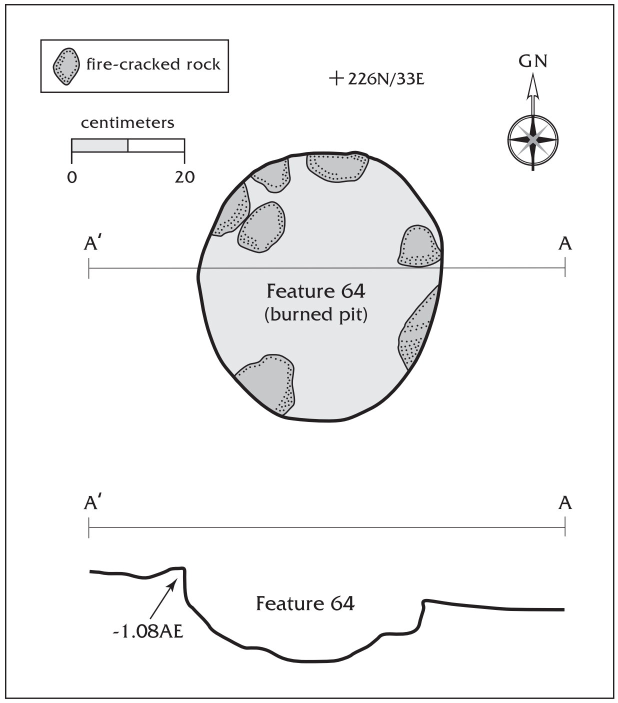


Figure 83. Plan and profile of Feature 64, LA 61286.

Figure 84. Feature 64, LA 61286.

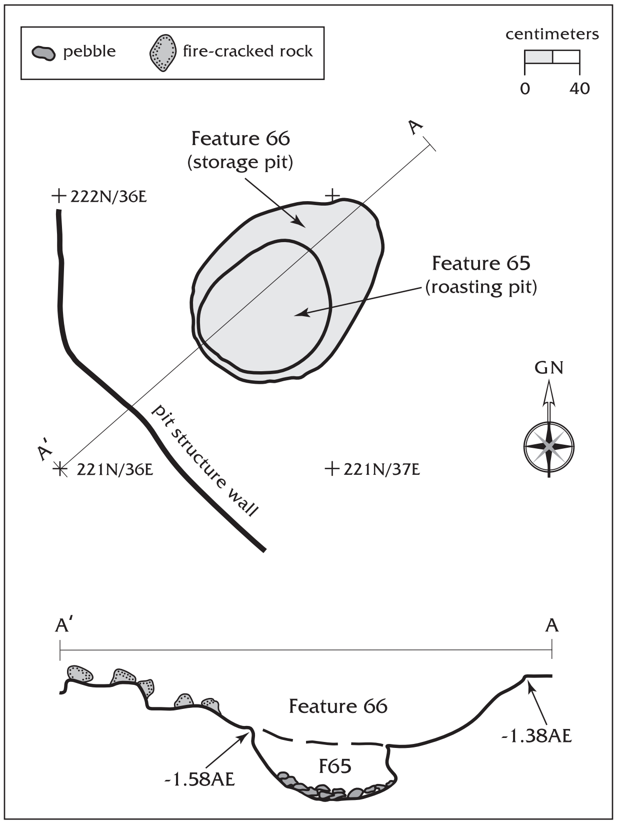


Figure 85. Plan and profile of Features 65 and 66, LA 61286.

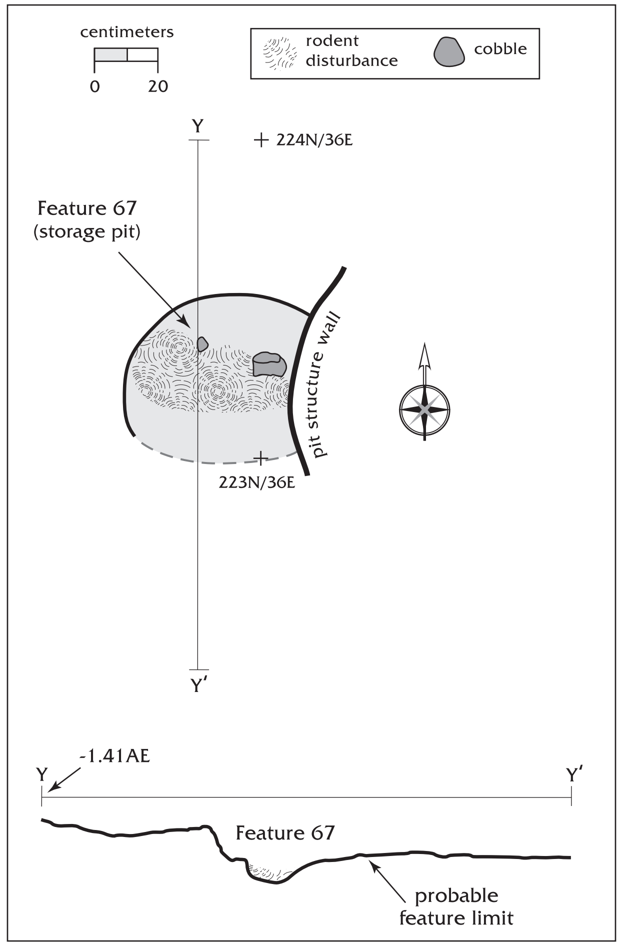


Figure 86. Plan and profile of Feature 67, LA 61286.

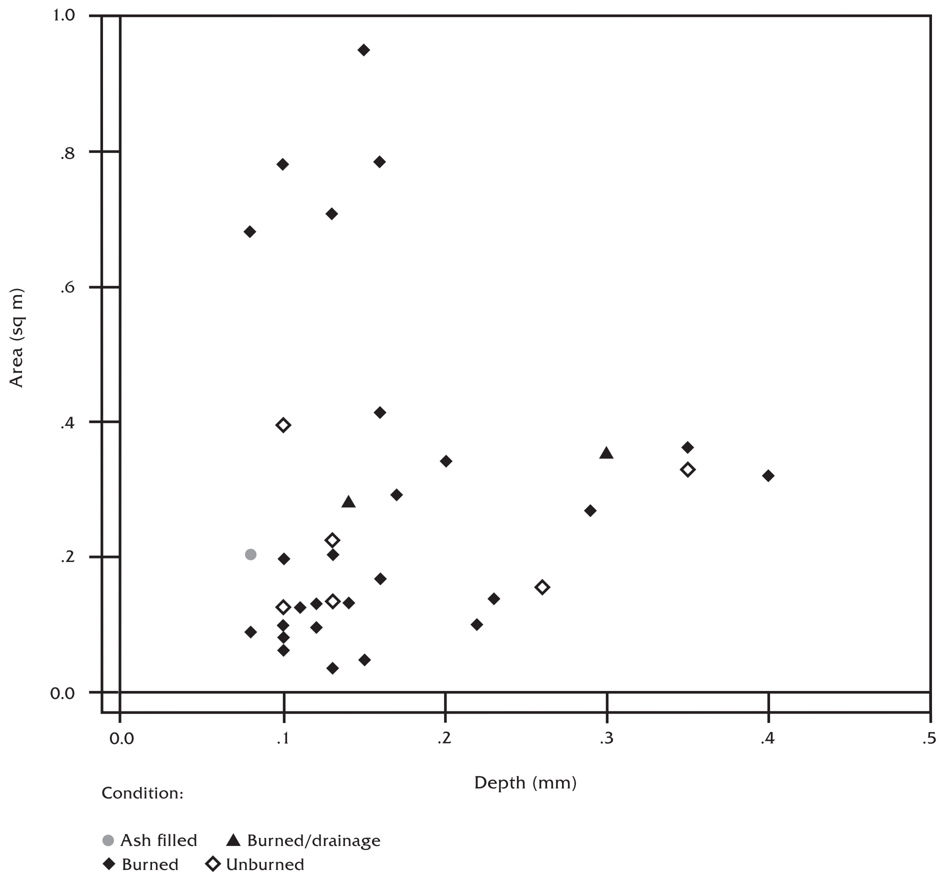


Figure 87. Scatter plot of feature depth and area, Area 2, LA 61286.

and the deposition and possibly the use of fire-cracked rock. Opler (1941:360) describes the late September roasting of unripe yucca on a bed of coals. No rock is mentioned. Mescal heads were sometimes roasted by placing them on heated rocks and covering them with dirt and grass to bake. This technique would leave a cluster of burned cobbles and a light charcoal stain without a pit or only a shallow "pseudo" pit formed by the downward diffusion of charcoal (Dello-Russo 1999).

The depth of a pit, its content (e.g., cobbles), and the use of moist grasses to line it may be partly determined by the food to be cooked, the time of year it was caught or harvested, and when it will be eaten (e.g., immediately or six months later). In an Archaic base camp (depending on the season), it is likely that foods would be cooked for immediate consumption and processed for transport and longer-term storage. Deeper, vertical or steep-walled pits have been shown to be effective for cooking fatty meat and the hydrolysis of inulin to fructose and glucose in certain plant tubers and roots (Wandsnider 1997:19–24). Shallow, open pits would be most suited to lean meats and low-carbohydrate or starchy wild plant foods. For example, most small game (unless they are trapped in the late fall) would be roasted on coals in an open pit. Most seeds and nuts would be parched and dried. Yucca and cactus fruits might be sun dried or pit baked. Southern Arizona groups bake cactus in a pit lined with seepweed (Wandsnider 1997), which adds moisture to the baking environment. Cheno-ams may have been used in the same way. After the seeds had been winnowed, the remaining stems could have been used as lining. This may partly account for the ubiquity of certain weedy species in pit fill, but rarely in substantial amounts.

The features that are greater than 0.30 m deep are the best candidates for pit ovens. These deeper features could accommodate layers of coals, grass cover, and a covering layer. Heat would be retained by the surrounding soil matrix.

Stratigraphic evidence of this kind of baking is a layer of heavily charcoal-infused soil capped by a mantle of mixed covering soil, charcoal-infused soil, and a natural deposit. The five deepest features—Features 25, 30, 44, 45, and 65—displayed this stratigraphic pattern. Only Feature 25 had basal cobbles that would have prolonged a higher temperature. While there is no faunal or ethnobotanical evidence of foods that could have been baked in these features, the general lack of rock and evidence of moist linings suggest dry baking to reduce moisture content and prevent spoilage or pit roasting small quantities of fatty meat.

The three large, shallow pits—Features 29, 37, and 50—were clustered in the southeast portion of the Middle Archaic occupation area. Two of these pits, Features 29 and 37, contained more than 37 fire-cracked rocks. Besides stone boiling, which may have been the preferred way to cook some meats (especially lean mammals) and wild plant foods, the rock may have prolonged a higher temperature. Certain foods required high temperatures for short times for optimal processing.

The remaining pits, which covered less than 0.30 sq m each and were less than 0.20 m deep, are distinguished by their low capacity and their abundance. These pits would have been suited to low-volume processing for daily consumption but not to large-scale processing necessary to produce surpluses to sustain a group from the late fall to the early spring. The size and distribution of these pits suggest sleeping hearths of the kind used by modern hunter-gatherers (Binford 1983:160–163). These smaller features and the clusters of larger or deeper features suggest reoccupation rather than a large group occupation. The feature density leaves little adjacent work space. Typically, for a household or extended household, there might be two hearths that are the focus of domestic activities and a third area where larger-scale, hazardous, or specialized processing was carried out. There is an element of this spatial arrangement in the placement of the larger, deep pits to the east of the main feature cluster.

Artifacts. All artifacts were recovered during surface stripping and feature excavation. Surface artifacts outside the excavation areas were not collected. The 240 chipped stone artifacts collected during the test excavation should typify the general site scatter (Wolfman et al. 1989:122–151).

Excavation of Area 2 yielded 480 pieces of chipped stone debris including core (292) and biface flakes (75) and angular debris (111). Obsidian was the most common raw material used, which was not the case at any other Northwest Santa Fe Relief Route site or component. Most of the obsidian was recovered from a concentration that was isolated from the main feature concentration. Only three pieces of chipped stone debris exhibited edge modification or wear. Eleven whole or fragmentary projectile points and bifaces were recovered. The projectile points most closely resembled En Medio and San Jose styles. One core/chopper was recovered, adding to the general impression of a balanced stone tool technology.

Only seven ground stone artifacts were recovered, including two whole one-hand manos, four whole or fragmentary basin metates, and one indeterminate fragment. One mano was found in Feature 45, a roasting pit. The other mano was on the occupation surface where Features 27, 28, 29, and 50 clustered. Metate fragments are scattered throughout Area 2. A basin metate fragment associated with Feature 20 and FS 467 lay on the occupation surface. The low frequency of ground stone is unusual given the high density of features that occur in Area 2.

One medium-to-large mammal bone was recovered from the sheet trash of the Middle Archaic component. It is interesting that no burned bone was recovered from the feature through dry-screening or flotation.

Summary. Area 2 represents a major Late and Middle Archaic component of the Arroyo Trampas north terrace settlement pattern. These temporally distinct occupations reflect changing uses of the piedmont environment as economic plant and animal resources changed in response to changing environmental conditions.

Excavation of Area 2 revealed two distinct occupation levels that are separated stratigraphically and temporally. The Latest Archaic component was exposed near the surface and included an isolated thermal feature (Feature 19) and Features 17, 18, 22, and 23, which were clustered in the southwest portion of Area 2. The few artifacts that are associated indicate a restricted range of activities and relatively brief, targeted occupation. Ethnobotanical analysis provided no additional information about feature function or subsistence. Shallow open pits could be adapted to a broad range of processing activities where short cooking times or immediate high heat were needed.

These features represent a small segment of the Latest Archaic subsistence strategy within the piedmont area. It is likely that they supported foraging activities that may have been staged more than a one day's travel from a base camp or residential site. The low frequency of refuse and subsistence debris is another indication that occupation was resource focused and not residential. Contemporaneous occupations in the Santa Fe area will be compared with Area 2 later in this report.

The second temporal component was buried 30 to 50 cm below the Latest Archaic component and was radiocarbon dated to the Middle Archaic or San Jose phase (Figs. 88 and 89). Three statistically distinct two-sigma date ranges were identified with an overall range of 3337–1937 BC. Obviously, this 1400-year span reflects a long history of repeated and discontinuous occupation. A pit-structure foundation, fire-cracked concentrations and discard areas, and a relatively broad range of burned and unburned features indicate that the site activities varied throughout the occupation history. These components reflect occupations that may result from seasonality in settlement and subsistence patterns. High feature frequency and density result from repeated occupations within the possible 1400-year span. The southeast exposure, gentle slope, and protection afforded by an apparent swale may have been important environmental factors that influenced settlement. A pit-structure foundation with intramural features suggests seasonal sedentism. This contrasts with the thermal feature clusters and low artifact frequencies that suggest focused, short-term seasonal occupation that accumulated little domestic debris. Features 20, 21, 24, and 26 cannot be tied to a specific occupation period. Features 20 and 21 are near the San Jose phase biface reduction debris cluster in the 227–229N/53–55E area and may represent an isolated and functionally different aspect of Middle Archaic occupation, or they may represent spatial segregation of certain activities within the base camp. Middle Archaic occupation of the Santa Fe River and piedmont is poorly known. More consideration will be given to how this component fits into Middle Archaic settlement and subsistence later in this report.

Area 3

Area 3 (234N/100E) was identified during the excavation of Area 2. It is 120 m north of Area 1 along the centerline at 655+20.00 (Fig. 3). It initially appeared as a 50 cm long basin-shaped charcoal-infused soil stain 145 cm below datum and exposed in the north bank of the arroyo that heads at the 220N/40E area, 60 m to the west. No artifacts were observed in association with the exposed feature, and no other potential cultural deposits were noted in the immediate area. Radiocarbon dating of the two features from the lowest stratigraphic level (Features 55 and 56) indicated an occupation range of cal. 4538–4362 BC, two-sigma. A third feature (Feature 46) was stratigraphically higher and may have been contemporaneous with the Middle Archaic occupation of Area 2.

Area 3 is 10 m upstream from the confluence of the arroyo that exposed the feature and the main arroyo that drains this area. The immediate area is a gentle southeast-facing slope interrupted by surface or near-surface exposures of Tesuque sandstone. These tilted bedrock layers are capped by deep, highly erodible colluvial sandy loam with intermittent lenses of high-energy coarse sands and redeposited pebbles and cobble-sized clasts. These deep colluvial deposits reflect a long-term aggradation process that has created deep accumulations on the lower slopes of the piedmont, which form the north terrace of Arroyo de las Trampas. Features 55 and 56 were at the same stratigraphic level as the Tesuque sandstone, suggesting that the bedrock was exposed and incorporated into the camp setting. This incorporation of bedrock into camp layout is a common aspect of Archaic period sites in the piedmont area. Other instances of this siting have been observed at LA 67959 and LA 61289 (this project) and LA 61315, to the east (Post 2000b).

A 3 m north-south by 4 m east-west area was excavated to expose the features in the north wall of the arroyo (Figs. 90 and 91). Datum H was established at 239N/100E. The upper 80 to 90 cm of overburden were removed by hand without screening because there were no upper

Figure 88. Middle Archaic occupation surface, Area 2, LA 61286, looking west.

Figure 89. Middle Archaic occupation surface, Area 2, LA 61286, looking east.

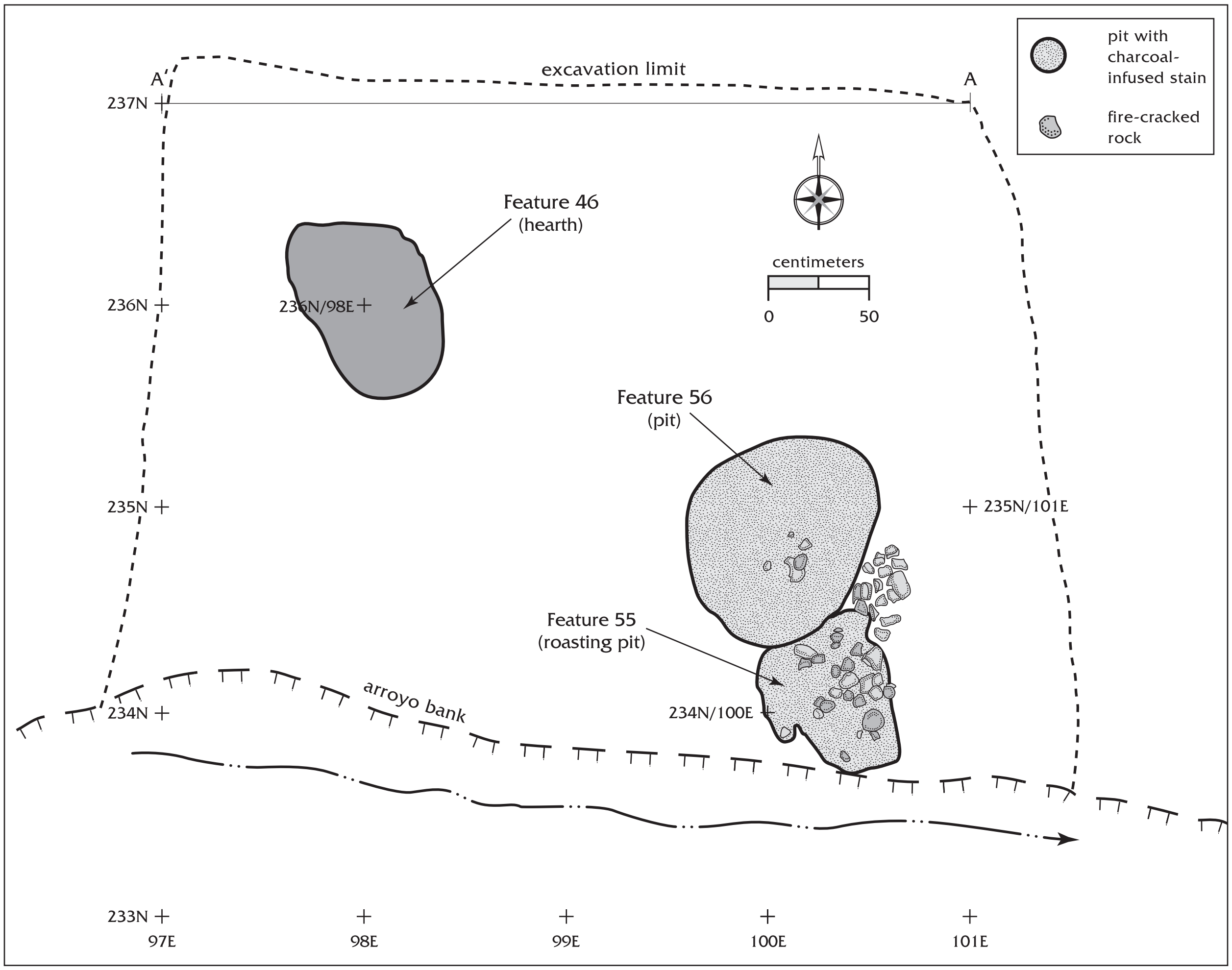


Figure 90. Excavation plan, Area 3, LA 61286.

Figure 91. Excavation area, Area 3, LA 61286.

cultural deposits. At 80 to 90 cm below Datum H, there was a lens of gray brown, charcoal-infused, clayey, sandy loam. Starting at this level, the soil was screened through 1/4-inch mesh. The 2 to 5 cm thick cultural deposit was excavated as a stratigraphic unit. This soil change appeared to be the deflated remains of a shallow basin-shaped hearth (Feature 46). However, no artifacts, fire-cracked rock, or other cultural material were encountered.

After Feature 46 was excavated, the remaining 40 to 50 cm of fill was excavated in 10 cm levels through alternating layers of coarse sand and fine-grained sandy loam. All fill was screened through 1/4-inch mesh. The charcoal-stained outlines of two overlapping thermal features (Features 55 and 56) were exposed at 136 cm below Datum H. These outlines were accompanied by a cluster of fire-cracked rock. The features were excavated by the methods employed for the 100N features. Upon completion of the feature excavation and recording, stratigraphic profiles were drawn of the north and west excavation walls. A pollen column was collected from the north wall using the five main strata for control.

Excavation was halted because the limit of the cultural deposit had been reached and there was no evidence of an extensive cultural deposit in the excavated grid walls or in the banks of the arroyo. The banks in the immediate area were shovel-scraped to expose additional buried stains, but none were encountered.

Stratigraphy. Excavation of the 234N/100E area revealed seven strata that were easily defined in the north wall of 236N and mapped between 97E and 101E (Fig. 92). Stratum 1 was a pinkish gray, low-energy, unsorted, homogenous sandy loam with silt to pea-gravel size grains. It had a very loose structure, slightly plastic when moistened, and was moderately intruded by roots. Stratum 2 was a pale brown, unsorted, low-energy sandy loam with silt to pea gravel size grains, slightly plastic when wet, with a slightly blocky structure. Stratum 3 was similar to Stratum 2, except that it contained more clay and was more plastic when moistened, with a more consolidated and blocky structure. Carbonate filaments occur throughout the deposit in low to moderately low abundance. Stratum 4 was a high-energy, coarse sand that was poorly consolidated and interspersed with thin silty lenses, suggesting that the high-energy deposition was episodic. Stratum 5 was similar to Stratum 3, reflecting an old, gradually formed hillslope that contained the cultural deposit and

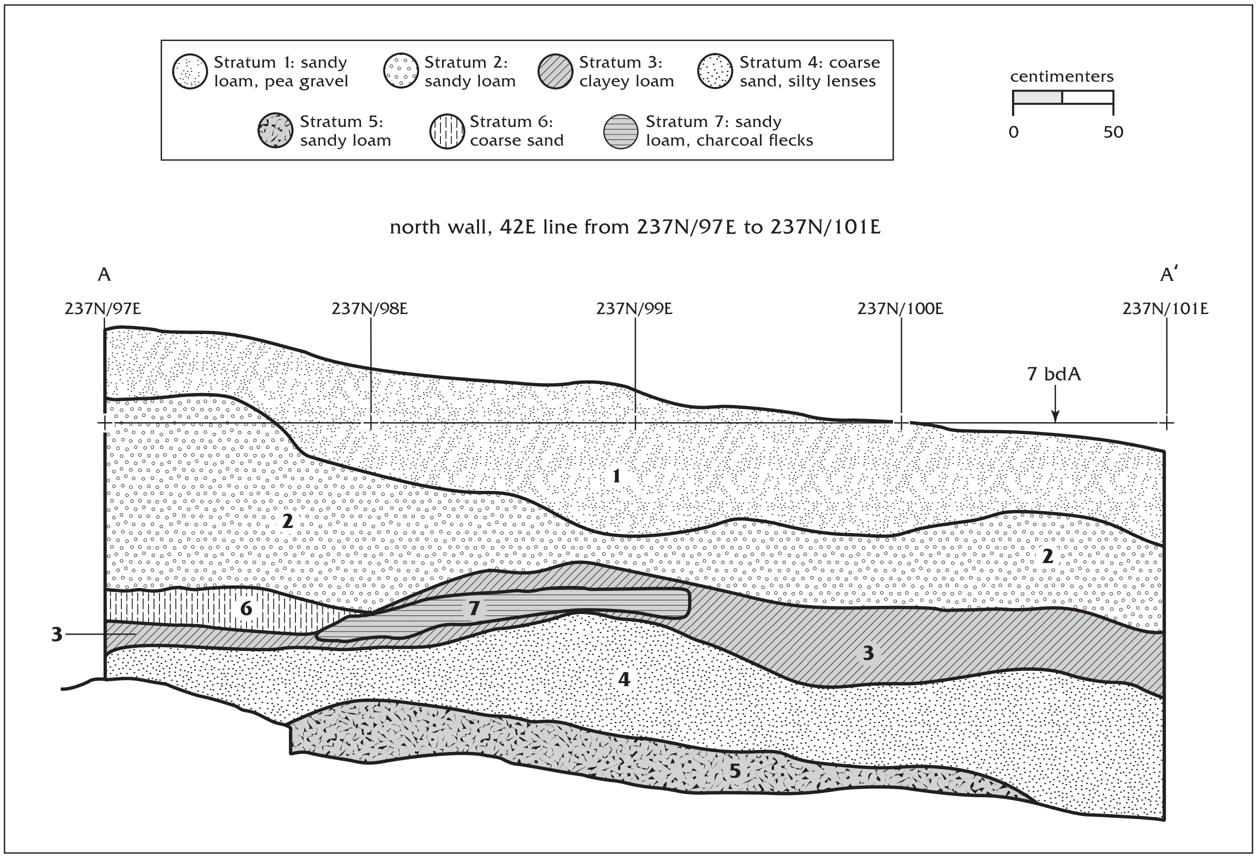


Figure 92. North wall profile of 236N/97-101E, Area 3, LA 61286.

Features 55 and 56. Stratum 6 was a high-energy, poorly consolidated, loosely structured coarse sand deposit that was interrupted by Stratum 7. Stratum 7 was the thin cultural layer defined as Feature 46. It appears that Stratum 6 may have replaced or removed a portion of Stratum 7. Stratum 7 is dark gray sandy loam with charcoal flecks. It represented a brief occupation interlude in the depositional history of Stratum 3.

The stratigraphy suggests that this lower slope area experienced long periods of gradual colluvial deposition. This was especially evident in the Stratum 1 to 3 sequence, where there was very limited evidence of rapid deposition or downslope movement of gravel or cobble deposits. Stratum 4 reflected a change in the erosion or drainage pattern that resulted in shallow and repeated intervals of channel cutting and filling. This episode of increased erosion succeeded the Stratum 5 cultural layer, indicating that occupation and abandonment were followed by a change in precipitation patterns and, perhaps, increased upslope vegetative cover.

Features. Excavation revealed three features in the 234N/100E area: Features 46, 55, and 56 (see Table 1). Feature 46 occurred 40 cm above Features 55 and 56 and represented a later component that may be contemporaneous with the main occupation in the 220N/40E area. Feature 46 was shallow and not associated with artifacts. It reflected a very ephemeral occupation. It may have been a deflated hearth.

Features 55 and 56 were superimposed, undifferentiated burned pits. Feature was 55 the lowest and perhaps oldest (Figs. 93 and 94). The two features were 1.35 to 1.50 m below the modern ground surface. Radiocarbon dating of wood charcoal placed them in the Early Archaic period. Feature 55 has a calibrated two-sigma range of 4584–4353 BC, and Feature 56 has a calibrated two-sigma range of 4538–4361 BC. However, dates obtained from wood charcoal are not precise. Field observation of stratigraphy indicates two occupations that were closely spaced in time during the Early Archaic period. Feature 55 had associated fire-cracked rock within and on the perimeter of the pit. The pit fill was dark brown to black (10YR 2/2–1) sandy loam. The

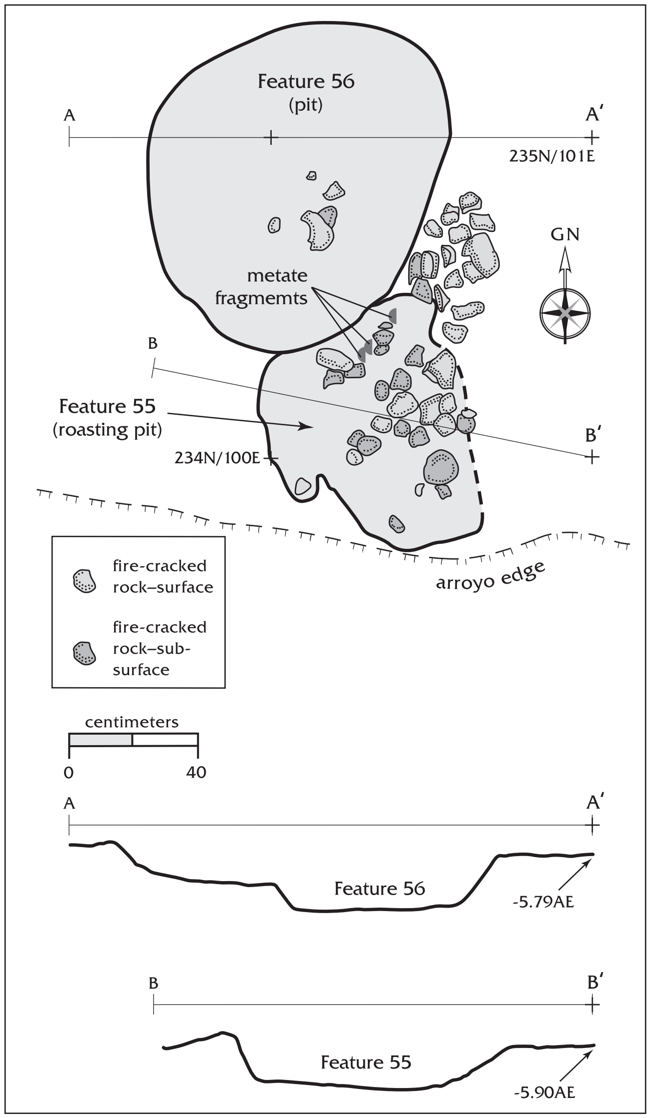


Figure 93. Plan and profile of Features 55 and 56, Area 3, LA 61286.

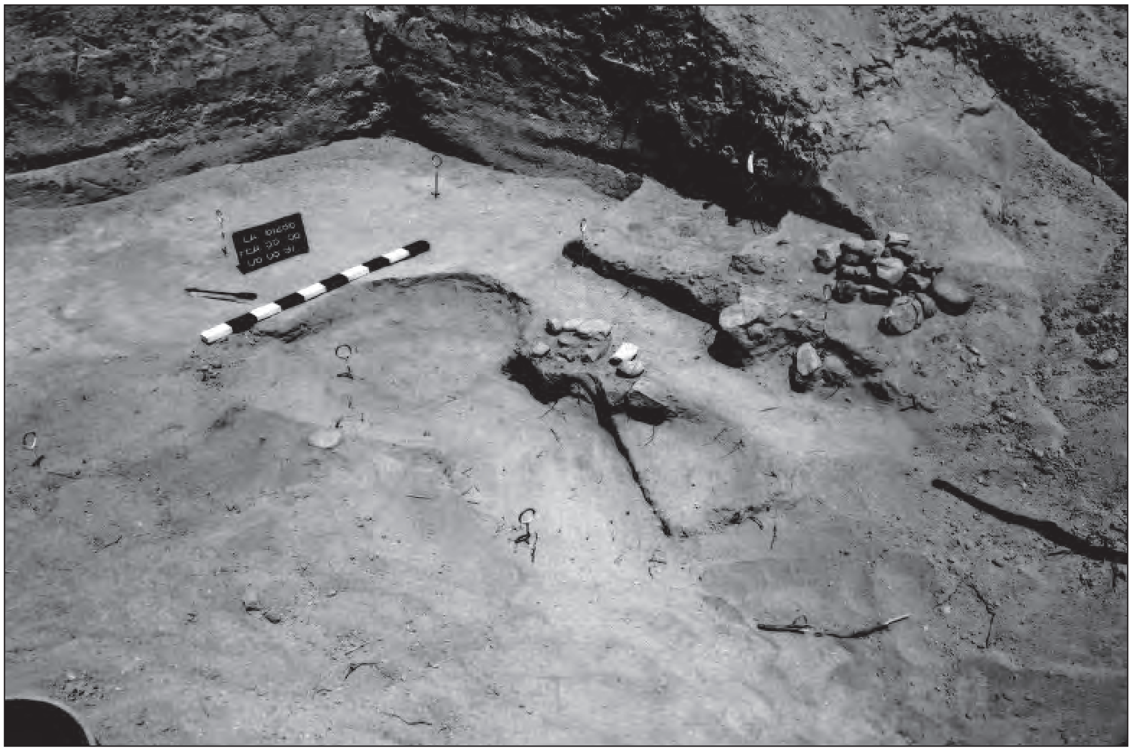


Figure 94. Features 55 and 56, Area 3, LA 61286.

dark color indicates substantial charcoal remained in the pit and diffused into the gradual colluvial deposit after abandonment. Feature 56 was partly built into the north wall of Feature 55. It was a large basin-shaped pit with a shelf or work space appended to the west wall. This work space was 10 cm above the pit bottom. The darkly charcoal-stained very dark brown to black (10YR 2/2–1) sandy loam filled the pit and the work space or cleanout. While the heavily charcoal-infused soil indicates Feature 56 was a thermal feature, no oxidation or heavy burning of the pit walls was evident. They were mottled and charcoal stained. Features 55 and 56 yielded charred *Chenopodium* seeds. Feature 55 yielded charred *Opuntia*. Feature 56 yielded charred *Suaeda* and cheno-am. Clearly, these features were used for plant processing. Their size indicates greater potential volume than the later Middle Archaic period features.

Artifacts. Two Madera chert core flakes and two fragments from Feature 55. They were mixed with the fire-cracked rock and represent discard from feature use. Low artifact counts are common in Early Archaic components in the Santa Fe area (Anschuetz 1998). Postabandonment erosion may have washed away other artifacts. However, the plant-processing focus suggested by the features is more consistent with limited expedient tool use and the low numbers of tool-production debris.

Summary. Excavation in Area 3 exposed a multicomponent and stratified Archaic camp location with an undated upper component (Feature 46) and a lower component dated to between 4600 and 4300 BC. The features are associated with a Tesuque sandstone formation outcrop, underlying the importance that local rock formations had in influencing Archaic camp locations. It is possible that sheltered locations above Arroyo Trampas were favored for short-term foraging camps. Superimposition of features indicates that sheltered topographic features were a stable part of the landscape and were desired camp locations. Charred seeds and cactus suggest that these features were used for plant processing. This is weakly supported by the low numbers of chipped stone debris from tool manufacture. Low artifact numbers may also reflect an unstable depositional setting in which artifacts were washed away after abandonment.

Chipped Stone Artifacts

A total of 985 chipped stone artifacts weighing 11.18 kg were recovered from LA 61286. They consisted mainly of debitage with smaller proportions of cores and tools. Nonutilized debitage weighs 6.94 kg, accounting for 62.1 percent of the total. In general, the assemblage reflects core reduction, tool production and maintenance, and a diversity of tool use.

Since all cortical chert (303), silicified wood (4), chalcedony (2), Pedernal chert (4), and quartzite (47) artifacts have waterworn cortex, it is likely that these artifacts were obtained from secondary sources. A total of 20 obsidian artifacts also display waterworn cortex, indicating they were acquired from a secondary source. With the exception of undifferentiated igneous and orthoquartzite, all material types exhibit flaws. Flawed material accounts for 24.3 percent of the total assemblage. The flaws mainly take the form of cracks or incipient fracture planes but also crystals and voids.

The undifferentiated chert ranges from fine to medium grained. The Madera cherts range from fine to coarse grained. Chalcedony, Pedernal chert, and silicified wood are fine grained. Obsidian is glassy. The single piece of undifferentiated igneous material is fine grained. The metaquartzite and orthoquartzite range from fine to medium grained.

The Cenozoic era Santa Fe group gravel, namely the Ancha formation, contain chert. These sedimentary deposits also contain metaquartzite cobbles and small amounts of silicified wood. The Sangre de Cristo foothills contain Precambrian era granite and gneiss overlain by Paleozoic era Pennsylvanian deposits of sandstone, shale, and limestone. Within some of this limestone, namely of the Madera formation, are bedded nodules and veins of chert, which were quarried prehistorically (Lang 1993:6, 13; Lang 1995:5; Viklund 1994:1; Ambler and Viklund 1995:5). Madera chert also occurs as residual cobbles and pebbles in the later Santa Fe group gravel. For the project lithic artifact analysis, Madera chert was differentiated by color as red or variations on red, and nonred. Red Madera chert was initially thought to be more prevalent in the deposits above and east of Santa Fe. White and gray chert was expected to reflect sources east of Bishop's Lodge, north of Santa Fe. Further examination of color differentiation within primary source areas proved this assumption difficult to substantiate as the lithic analysis progressed. Therefore, all chert artifacts that were not red or a variation of red were lumped into a nonred category. Nonlocal materials such as obsidian and Pedernal chert are found in the axial gravel of the Rio Grande. However, the primary sources of these materials are the Jemez Mountains. A small amount of obsidian can also be found scattered across Caja del Rio Mesa (Kelley 1980:11–17). Six obsidian artifacts from Feature 1 were submitted for source provenance identification through x-ray fluorescence spectroscopy. These samples were identified as coming from Valle Grande and would have been obtained from the Valles Caldera in the Jemez Mountains (Shackley, this report). Valle Grande obsidian occasionally occurs as nodules on the East Fork of the Jemez River. Therefore, Valle Grande obsidian must be obtained by traveling to the source or by trade.

Area 1

Debitage. Area 1 yielded 476 pieces of debitage: 317 core flakes, 116 pieces of angular debris, 42 biface flakes, and 1 resharpening flake (Table 2). Debitage accounts for 96.4 percent of the Area 1 assemblage. The core flake to biface flake ratio is 1:0.13, indicating an emphasis on core reduction.

Core flake and angular debris material types were consolidated into three material classes: local chert, nonlocal material, and quartzite. Chalcedony and silicified wood were included with local chert. Pedernal chert and obsidian comprise the nonlocal material class. Orthoquartzite was included with metaquartzite to comprise the quartzite material class. The single undifferentiated igneous core flake is not included in these material classes nor in the tables that follow. This whole nonutilized flake has a single-facet platform. The dorsal surface manifests two dorsal scars and lacks cortex. It measures 33 mm long by 27 mm wide by 7 mm thick and weighs 7.4 g. The platform measures 6.5 mm wide. The following discussion is geared toward discerning core-reduction trajectories and exploring differences between material classes. The small sample of nonlocal material may lead to skewed distributions. Therefore, interpretation

Table 2. Debitage artifact type by material type, Area 1, LA 61286

Number Row % Column %	Chert	Madera Chert, Yellow/Red Mottled	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Chalcedony	Pedernal Chert	Silicified Wood	Obsidian	Polvadera Peak Obsidian	Igneous	Metaquartzite	Orthoquartzite	Total
Indeterminate fragment	-	-	2	-	-	-	-	-	-	-	-	-	2
	-	-	100.0%	-	-	-	-	-	-	-	-	-	100.0%
	-	-	0.8%	-	-	-	-	-	-	-	-	-	0.4%
Angular debris	10	3	67	14	-	-	1	-	1	-	20	-	116
	8.6%	2.6%	57.8%	12.1%	-	-	0.9%	-	0.9%	-	17.2%	-	100.0%
	20.4%	25.0%	27.0%	20.9%	-	-	25.0%	-	50.00%	-	27.8%	-	23.5%
Core flake	37	2	161	46	2	6	2	7	1	1	51	1	317
	11.7%	0.6%	50.8%	14.5%	0.6%	1.9%	0.6%	2.2%	0.3%	0.3%	16.1%	0.3%	100.0%
	75.5%	16.7%	64.9%	68.7%	100.0%	75.0%	50.0%	25.0%	50.00%	100.0%	70.8%	100.0%	64.2%
Biface flake	-	5	13	5	-	2	-	17	-	-	-	-	42
	-	11.9%	31.0%	11.9%	-	4.8%	-	40.5%	-	-	-	-	100.0%
	-	41.7%	5.2%	7.5%	-	25.0%	-	60.7%	-	-	-	-	8.5%
Resharpening flake	-	-	-	-	-	-	-	1	-	-	-	-	1
	-	-	-	-	-	-	-	100.0%	-	-	-	-	100.0%
	-	-	-	-	-	-	-	3.6%	-	-	-	-	0.2%
Unidirectional core	-	1	-	-	-	-	-	-	-	-	1	-	2
	-	50.0%	-	-	-	-	-	-	-	-	50.0%	-	100.0%
	-	8.3%	-	-	-	-	-	-	-	-	1.4%	-	0.4%
Multidirectional core	1	-	3	2	-	-	-	-	-	-	-	-	6
	16.7%	-	50.0%	33.3%	-	-	-	-	-	-	-	-	100.0%
	2.0%	-	1.2%	3.0%	-	-	-	-	-	-	-	-	1.2%
Early-stage uniface	1	-	1	-	-	-	-	-	-	-	-	-	2
	50.0%	-	50.0%	-	-	-	-	-	-	-	-	-	100.0%
	2.0%	-	0.4%	-	-	-	-	-	-	-	-	-	0.4%
Late-stage uniface	-	-	-	-	-	-	1	-	-	-	-	-	1
	-	-	-	-	-	-	100.0%	-	-	-	-	-	100.0%
	-	-	-	-	-	-	25.0%	-	-	-	-	-	0.2%
Early-stage biface	-	1	1	-	-	-	-	-	-	-	-	-	2
	-	50.0%	50.0%	-	-	-	-	-	-	-	-	-	100.0%
	-	8.3%	0.4%	-	-	-	-	-	-	-	-	-	0.4%
Middle-stage biface	-	-	-	-	-	-	-	1	-	-	-	-	1
	-	-	-	-	-	-	-	100.0%	-	-	-	-	100.0%
	-	-	-	-	-	-	-	3.6%	-	-	-	-	0.2%
Late-stage biface	-	-	-	-	-	-	-	2	-	-	-	-	2
	-	-	-	-	-	-	-	100.0%	-	-	-	-	100.0%
	-	-	-	-	-	-	-	7.1%	-	-	-	-	0.4%
Total	49	12	248	67	2	8	4	28	2	1	72	1	494
	9.9%	2.4%	50.2%	13.6%	0.4%	1.6%	0.8%	5.7%	0.4%	0.2%	14.6%	0.2%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.00%	100.0%	100.0%	100.0%	100.0%

regarding these materials is tentative.

Local chert and quartzite core flakes have similar amounts of dorsal cortex (Table 3). It appears that all stages of reduction are represented by both material classes. Both appear to emphasize middle-stage reduction. The majority of the nonlocal material core flakes (85.7 percent) lack cortex, reflecting middle- to late-stage reduction, while a small proportion (14.3 percent) retain 60–100 percent cortex, indicating early-stage reduction.

Table 3. Core flake dorsal cortex by material class, Area 1, LA 61286

Number Row % Column %	Local Chert	Nonlocal Material	All Quartzite	Total
Noncortical	109	12	23	144
	75.7%	8.3%	16.0%	100.0%
	43.6%	85.7%	44.2%	45.6%
10-50%	69	-	11	80
	86.3%	-	13.8%	100.0%
	27.6%	-	21.2%	25.3%
60-100%	72	2	18	92
	78.3%	2.2%	19.6%	100.0%
	28.8%	14.3%	34.6%	29.1%
Total	250	14	52	316
	79.1%	4.4%	16.5%	100.0%
	100.0%	100.0%	100.0%	100.0%

The distribution of dorsal scars indicates that all stages of reduction are reflected by all material classes (Table 4). The majority of all core flakes regardless of material class display 1–2 dorsal scars, suggesting middle-stage reduction. Substantial proportions of both local chert and nonlocal material core flakes (20.0 percent and 28.6 percent, respectively) display three or more dorsal scars, indicating late-stage reduction. More quartzite core flakes (32.7 percent) lack dorsal scarring, indicating early-stage reduction. The indeterminate number of dorsal scars represented by the local chert and nonlocal material classes is the result of a fracture that is inhibited by a flaw in the material, which complicates an accurate dorsal scar count.

The majority of local chert core flakes (60.0 percent) have single-facet or cortical platforms, suggesting early- to middle-stage reduction (Table 5). Complex platform types are represented by a small proportion (2.0 percent) of local chert core flakes. These platforms include four multifaceted and one abraded platform. The majority of nonlocal material and quartzite core flakes (92.9 percent and 55.8 percent, respectively) display various platform breakage. A substantial proportion of quartzite core flakes (44.2 percent) have single-facet or cortical platforms, suggesting early-stage reduction.

Table 4. Core flake dorsal scars by material class, Area 1, LA 61286

Number Row % Column %	Local Chert	Nonlocal Material	All Quartzite	Total
0	51	2	17	70
	72.9%	2.9%	24.3%	100.0%
	20.4%	14.3%	32.7%	22.2%
1-2	134	6	30	170
	78.8%	3.5%	17.6%	100.0%
	53.6%	42.9%	57.7%	53.8%
3-5	50	4	5	59
	84.7%	6.8%	8.5%	100.0%
	20.0%	28.6%	9.6%	18.7%
6 or more	2	-	-	2
	100.0%	-	-	100.0%
	0.8%	-	-	0.6%
Indeterminate	13	2	-	15
	86.7%	13.3%	-	100.0%
	5.2%	14.3%	-	4.7%
Total	250	14	52	316
	79.1%	4.4%	16.5%	100.0%
	100.0%	100.0%	100.0%	100.0%

The whole-to-fragmentary core flake ratio is 1:2.5, indicating a prevalence of fragmentary core flakes (Table 6). The most frequent fragmentary portions are lateral (38.6 percent) and proximal (18.0 percent). Generally, flake breakage increases in the later stages of reduction as flakes get thinner; however, other postreduction cultural and natural processes such as trampling or solifluction must be considered as well (Moore 1996:247). The high frequency of core flake breakage (71.5 percent) may indicate the later stages of reduction. Yet comparable proportions of distal and proximal portions can indicate postreduction breakage, whereas a prevalence of distal portions points to breakage during reduction (Moore 1996:254). For all material classes, there are disparities in the frequencies of proximal and distal portions. Larger proportions of distal portions of nonlocal materials (28.6 percent) and quartzite (15.4 percent) may indicate breakage during reduction. Material flaws should also be taken into account when examining flake breakage distributions. A

Table 5. Core flake platform type by material class, Area 1, LA 61286

Number Row % Column %	Local Chert	Nonlocal Material	All Quartzite	Total
Single-facet and cortical platforms	150	1	23	174
	86.2%	0.6%	13.2%	100.0%
	60.0%	7.1%	44.2%	55.1%
Multifacted, abraded, and retouched platforms	5	-	-	5
	100.0%	-	-	100.0%
	2.0%	-	-	1.6%
Absent, collapsed, crushed, and broken-in-manufacture platforms	95	13	29	137
	69.3%	9.5%	21.2%	100.0%
	38.0%	92.9%	55.8%	43.4%
Total	250	14	52	316
	79.1%	4.4%	16.5%	100.0%
	100.0%	100.0%	100.0%	100.0%

Table 6. Core flake portion by material class, Area 1, LA 61286

Number Row % Column %	Local Chert	Nonlocal Material	All Quartzite	Total
Whole	75	3	12	90
	83.3%	3.3%	13.3%	100.0%
	30.0%	21.4%	23.1%	28.5%
Proximal	52	1	4	57
	91.2%	1.8%	7.0%	100.0%
	20.8%	7.1%	7.7%	18.0%
Medial	11	2	4	17
	64.7%	11.8%	23.5%	100.0%
	4.4%	14.3%	7.7%	5.4%
Distal	18	4	8	30
	60.0%	13.3%	26.7%	100.0%
	7.2%	28.6%	15.4%	9.5%
Lateral	94	4	24	122
	77.0%	3.3%	19.7%	100.0%
	37.6%	28.6%	46.2%	38.6%
Total	250	14	52	316
	79.1%	4.4%	16.5%	100.0%
	100.0%	100.0%	100.0%	100.0%

substantial proportion of core flakes (37.9 percent) are flawed. The majority of flawed material is local chert, while one core flake each of nonlocal material and quartzite exhibit flaws. Breakage along an incipient fracture plane or other flaw can contribute to the representation of all fragmentary portions and can occur in all stages of reduction, although it seems less likely that a flawed material would be intensely reduced if a more suitable raw material were easily obtainable.

Table 7. Angular debris cortex by material class, Area 1, LA 61286

Number Row % Column %	Local Chert	Nonlocal Material	All Quartzite	Total
Noncortical	49	-	15	64
	76.6%	-	23.4%	100.0%
	51.6%	-	75.0%	55.2%
10-50%	42	1	5	48
	87.5%	2.1%	10.4%	100.0%
	44.2%	100.0%	25.0%	41.4%
60-100%	4	-	-	4
	100.0%	-	-	100.0%
	4.2%	-	-	3.4%
Total	95	1	20	116
	81.9%	0.9%	17.2%	100.0%
	100.0%	100.0%	100.0%	100.0%

The majority of local chert and quartzite angular debris (51.6 percent and 75.0 percent, respectively) lacks cortex, indicating middle- to late-stage reduction (Table 7). A small proportion of local chert angular debris (4.2 percent) that retains 60–100 percent cortex reflects early-stage reduction. The one piece of nonlocal material angular debris may reflect middle-stage reduction.

The consistently smaller mean statistics for nonlocal material suggest that it was more intensely reduced (Table 8). The local chert core flakes have smaller mean statistics for platform

Table 8. Core flake mean whole measurements by material class, Area 1, LA 61286

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Local Chert					
Number	155	112	127	127	75
Mean	6.8	30.9	28.8	9.3	14
SD	4.5	15.1	15.2	7.1	29.7
Minimum	1	6	9	1	0.1
Maximum	20.5	77	77	39	176.6
Nonlocal Material					
Number	1	3	4	4	3
Mean	3.2	26	21.8	4.5	2.7
SD	-	14.7	6.9	1.3	2.2
Minimum	3.2	10	16	3	0.2
Maximum	3.2	39	31	6	4.6
All Quartzite					
Number	23	21	16	16	12
Mean	8.8	35.6	26.8	8.3	10.7
SD	5	18.7	10.5	6.3	17.2
Minimum	2.4	11	6	2	0.1
Maximum	21.3	79	45	26	61.3
All Materials					
Number	179	136	147	147	90
Mean	7	31.5	28.4	9.1	13.2
SD	4.6	15.7	14.7	7	27.8
Minimum	1	6	6	1	0.1
Maximum	21.3	79	77	39	176.6

width and length than the quartzite core flakes, while the quartzite has smaller mean statistics for width, thickness, and weight than the local chert. This may suggest overlap of the reduction trajectories of local chert and quartzite. However, size is not always a good indicator of reduction stage and may be related to parent raw-material size. In this case, the empirical data on dorsal scars and platform types indicates that the local chert is the most intensely reduced, but the metric data does not necessarily support this inference. For the core flakes, the dorsal cortex distributions suggest that all stages of reduction are represented by the local chert and the quartzite, while the nonlocal material is mainly reflective of late-stage reduction. More specifically, taking all empirical evidence into consideration, it appears that all stages of reduction are represented by the local chert and quartzite, but with an emphasis on middle- to late-stage reduction for the chert, and early- to middle-stage reduction for the quartzite. The nonlocal material debitage emphasizes late-stage reduction. The metric data appears to be in keeping with this interpretation.

Twelve core flakes and angular debris manifest various evidence of thermal alteration. This number includes two core flakes and two pieces of angular debris of an undifferentiated chert and a red or mottled red Madera chert with potlids. The potlids on the core flakes are on its ventral surface. Crazing is exhibited by four pieces of angular debris and three core flakes of nonred and red or mottled red Madera chert. Also, a color change is exhibited by one red or mottled red Madera chert core flake.

The remaining debitage, 42 biface flakes and 1 resharpening flake, reflect tool production and maintenance. This debitage accounts for 8.7 percent of the total chipped stone assemblage. The resharpening flake was removed to rejuvenate a dulled tool edge (OAS 1994:11). It has part of a dulled tool edge along its platform and a portion of one lateral margin. This proximal portion lacks cortex and measures 21 mm long by 10 mm wide by 3 mm thick. It weighs 0.4 g, and its platform measures 3.0 mm. All biface flakes lack cortex. The biface flakes exhibiting 3–5 dorsal scars are the most frequent (64.3 percent), followed by 16.7 percent that exhibit 6 or more dorsal scars. The majority of biface flakes (50.0 percent) have multifaceted, abraded, and/or retouched platforms, while 47.6 percent exhibit various platform breakage, including crushing and collapsing. Biface flakes are most frequently whole (47.6 percent), followed by proximal portions (35.7 percent; Table 9).

Table 9. Biface flake mean whole measurements, Area 1, LA 61286

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Number	22	22	35	35	20
Mean	1.7	11.7	9.7	1.7	0.4
SD	0.8	6.7	5.5	0.9	0.6
Minimum	0.6	4	4	1	0.1
Maximu	4.1	29	28	4	2.5

Informal tools. In Area 1, excavation yielded 16 pieces of utilized/retouched debitage. These include whole and fragmentary portions of Madera chert, Pedernal chert, undifferentiated chert, and chalcedony core flakes and angular debris (Table 10).

The majority of artifacts (11) have one utilized/retouched edge. The remaining five have two utilized/retouched edges each. For core flakes, edge location most frequently includes lateral margins (12). Angular debris cannot be oriented by definition, so edge location cannot be determined. Edge outline forms are sinuous (8), slightly concave (6), convex (4), and slightly convex (3).

Unidirectional wear is included in nine wear patterns, while bidirectional wear is included in seven. Unidirectional retouch accounts for five wear patterns. Bidirectional scars suggest use in a longitudinal motion such as cutting, slicing, or sawing, whereas unidirectional scars suggest use in transverse motion such as scraping, whittling, or planing (Chapman and Schutt 1977:86–92; Odell and Odell-Vereecken 1980:98–99). The wear patterns of two artifacts (FS 6 and FS 122-3) include discontinuous step-fracturing. Step fractures or stepped terminations are diagnostic of wear incurred by working a hard or resistant material such as bone or antler (Odell and Odell-Vereecken 1980:101). One (FS 91-42) includes unidirectional rounding. Rounding can indicate relatively extended use in a transverse motion (Vaughan 1985:26). One (FS 114-1) includes discontinuous crescentic scars. Crescentic scars are produced during unidirectional and bidirectional movements and may be related to the angle at which the tool contacts the worked surface (Chapman and Schutt 1977:90). Some use-wear analysts who use high-power magnification (100–200X) to examine experimental stone tools, caution against the reliability of interpretations based solely on scarring. Patterned scarring can also be attributed to natural processes such as solifluction or cryoturbation as well as trampling. In experimental context, both bidirectional and unidirectional scarring has been produced by transverse and longitudinal motions (Keeley 1980:30–36; Vaughan 1985:10–12, 19–24).

The majority of edge angles (14) measure over 40 degrees. The remaining seven edges measure 40 degrees or less. Citing experiments by Schutt (1981), Post (1996a:418) suggested that tools with edge angles of 40 degrees or less are better suited for cutting, while tools with edge angles above 40 degrees are better suited for scraping. Furthermore, he suggests that tools with edge angles measuring over 60 degrees could accommodate more heavy-duty or intensive use. Six edges have angles measuring over 60 degrees, and all display unidirectional retouch/wear.

Formal tools. Excavation yielded seven whole and fragmentary bifaces, including two fragmentary projectile points manufactured from fine-grained Madera chert or glassy obsidian (Table 11).

The projectile points (FS 54 and FS 92) are late-stage bifaces that exhibit a regular facial scarring pattern. Both display discontinuous bimarginal step-fracturing. FS 92 also shows a discontinuous bimarginal scalar scarring. Both are proximal portions consisting of an expanded stem with a slightly convex base. A high representation of proximal to distal portions or bases to tips may suggest that after breakage the bases were curated, probably still attached to the haft (Schiffer 1987:287). Whole measurements can be

Table 10. Utilized/retouched debitage, Area 1, LA 61286

FS No.	Material Type	Morphology	Portion	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Utilized Edge Location	Wear Pattern	Utilized Edge Outline	Utilized Edge Length (mm)	Utilized Edge Angle (degrees)
6	Madera chert, red and mottled red	core flake	distal	30	30	14	13.6	proximal	unidirectional retouch and wear, step fracturing	sinuous	45	55
17	Madera chert, red and mottled red	core flake	whole	28	46	13	17.4	lateral	unidirectional retouch	sinuous	45	67
84	chert	angular debris	indeterminate	30	13	12	4.6	indeterminate	bidirectional retouch and wear	slightly concave	14	49
85	chert	core flake	lateral	42	19	8	6.2	lateral	bidirectional wear	sinuous	25	31
91-42	Madera chert, red and mottled red	core flake	distal	36	38	13	16.5	lateral/distal	unidirectional retouch and wear, rounding	convex	66	48
98-8	Madera chert, red and mottled red	angular debris	indeterminate	39	21	11	7.2	indeterminate	unidirectional retouch and wear	slightly convex	28	55
114-1	chalcedony	core flake	lateral	30	31	7	6.9	lateral	bidirectional retouch and wear, discontinuous crescentic scars	convex	40	41
114-4	Madera chert, red and mottled red	angular debris	indeterminate	40	24	17	12	indeterminate	unidirectional retouch	sinuous	50	35
116-1	chert	core flake	lateral	31	19	11	5.1	lateral	unidirectional retouch and wear	convex	25	69
								distal	unidirectional wear	slightly concave	18	65
122-3	Madera chert, nonred	core flake	lateral	49	22	12	11.8	lateral	unidirectional retouch and wear, discontinuous step fracturing	sinuous	55	70
								lateral	unidirectional retouch and wear	slightly convex	45	60
123-5	chert	angular debris	indeterminate	38	36	13	14	indeterminate	unidirectional retouch	convex	42	58
								indeterminate	unidirectional retouch	slightly concave	16	85
150-3	Madera chert, red and mottled red	core flake	proximal	23	25	8	4.4	lateral	bidirectional retouch and wear	slightly convex	21	25
								lateral	bidirectional wear	slightly concave	21	30
159-4	chert	core flake	distal	16	24	5	1.3	proximal	unidirectional wear	slightly concave	11	46
166-2	Madera chert, red and mottled red	angular debris	indeterminate	53	43	20	40.6	proximal/ lateral	unidirectional retouch	sinuous	100	40
166-3	Pedernal chert	core flake	whole	39	31	5	4.6	lateral	bidirectional wear	sinuous	35	30
								distal	bidirectional wear	slightly concave	24	30
169-2	Madera chert, red and mottled red	core flake	lateral	38	39	11	16.1	lateral/distal	unidirectional retouch and wear	sinuous	72	55

Table 11. Bifaces, Area 1, LA 61286

FS No.	Material Type	Morphology	Function	Portion	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Facial Scarring Pattern	Marginal Scarring Pattern
34-3	Madera chert, red and mottled red	early-stage biface	biface	whole	44	37	18	22.4	irregular	discontinuous step fracturing
50	obsidian	middle-stage biface	biface	indeterminate fragment	17	20	8	2.2	semiregular	discontinuous scalar scarring and step fracturing
54	obsidian	late-stage biface	En Medio projectile point	proximal	15	20	6	2	regular	discontinuous step fracturing
92-1	obsidian	late-stage biface	En Medio projectile point	proximal	12	21	4	0.9	regular	discontinuous scalar scarring and step fracturing
92-3	obsidian	biface flake (outrepassé)	biface fragment	distal	5	12	3	0.1	indeterminate	continuous scalar scarring
140-1	obsidian	biface flake (outrepassé)	biface fragment	distal	10	13	3	0.3	indeterminate	continuous scalar scarring, step fracturing, and slight rounding
178-5	Madera chert, yellow/red mottled	early-stage biface	biface	whole	52	37	19	39.6	irregular	absent

obtained for stem width, stem or tang length, and neck thickness. For FS 54, these measurements are 19.8 mm, 10.1 mm, and 4.7 mm, respectively. For FS 92, these measurements are 21.3 mm, 11.4 mm, and 4.1 mm, respectively. These stems closely resemble the stems of the En Medio Corner-notched type as described by Turnbow (1997:182–186). All whole measurements fall within the reported ranges. Thoms (1977:132–141) distinguishes six types, including Española Wide Blade, Santa Cruz Barbed, Jemez Short Barb, Short Wide Barbed, Ojo Barbed, and Echo Shouldered, all of which may be subsumed by the En Medio Corner-notched type (Turnbow 1997:185–186). For all six, a Late Archaic date of 1000 BC to AD 400 is suggested (Thoms 1977:132–141). The stems also appear similar in form to those of whole En Medio phase points (Irwin-Williams 1973: Figs. 6d and 6g). FS 92 is distally truncated by a haft snap, which suggests use breakage (Johnson 1979:26; OAS 1993:18). FS 54 exhibits a lateral snap in the neck area. The crack initiated along the edge in one notch. Lateral snaps can be attributed to manufacture breakage. This breakage probably occurred during notching.

Two whole early-stage bifaces (FS 34-3 and FS 178-5) manufactured from Madera chert display irregular facial scarring patterns. FS 178-5 lacks marginal scarring. FS 34-3 exhibits discontinuous step-fracturing. Step-fracturing often results from wear, but it can also be produced during manufacture or maintenance.

FS 50 is a middle-stage biface fragment manufactured from obsidian with a semiregular facial scarring pattern and discontinuous bimarginal scarring and step-fracturing. It is truncated by an irregular fracture.

FS 92-3 and FS 140-1 are distal portions of overshoot or outrepassé biface flakes. Outrepassé flakes, which typically occur during soft hammer percussion, are produced when the crack of a flake continues to the end of a biface and bends, removing a portion of the opposing biface edge (Whittaker 1994:19, 163). This type of flake, diagnostic of a biface production failure, has also been called reverse fracture (Johnson 1979:25). The fragmentary condition of the biface edge included with this flake precludes a facial scarring pattern determination. FS 92-3 has discontinuous bimarginal scars. FS 140-1 displays continuous bimarginal scarring with discontinuous step-fracturing.

FS 26 is an early-stage uniface with an irregular facial scarring pattern manufactured from a fine-grained chert. This end/side scraper has two utilized/retouched edges. Both are convex. The end shows bimarginal scarring and measures 33 mm with an edge angle of 51 degrees. The side displays unimarginal scarring and measures 31 mm with an edge angle of 41 degrees. There are no polished ridges or other indications of hafting modification. It retains 10 percent waterworn cortex. The artifact measures 49 mm long by 37 mm wide by 14 mm thick and weighs 23.2 g.

FS 58 is a late-stage uniface with a regular facial scarring pattern manufactured from a fine-grained silicified wood. It displays three slightly convex edges with bimarginal wear scars. These edges measure 21 mm, 29 mm, and 35 mm with edge angles of 25 degrees. It appears to lack hafting modification. The artifact measures 37 mm long by 26 mm wide by 7 mm thick and weighs 4.7 g.

FS 81-3 is an early-stage uniface with an irregular facial scarring pattern manufactured from a fine-grained, mottled red-gray Madera chert. The marginal scarring pattern consists of discontinuous step-fracturing. The edge outline form is roughly oval. It retains 60 percent waterworn cortex. The artifact measures 43 mm long by 31 mm wide by 21 mm thick and weighs 24.8 g.

Hand tools. Six whole and fragmentary choppers were recovered (Table 12). Five are Madera chert, and one is metaquartzite. All whole artifacts are unidirectional or multidirectional cores with nine or more flake scars. All whole artifacts retain at least 30 percent waterworn cortex, some of which opposes the utilized/retouched edge. This opposing cortex may serve as a natural backing (Chapman and Schutt 1977:92). Utilized edge outline forms include sinuous, convex, straight, and slightly convex. Edge angles range between 60 and 72 degrees. Wear patterns include crushing and step-fracturing, which are consistent with battering a hard or resistant material such as wood, bone, or antler.

Cores. Five cores were recovered in Area 1: three multidirectional cores, one unidirectional core, and one piece of angular debris that exhibits further flake removal (Table 13). With the exception of the angular debris, which is medium grained and flawed, all are fine grained

Table 12. Choppers and core choppers, Area 1, LA 61286

FS No.	Material Type	Artifact Morphology	Cortex (percentage retained)	Negative Scars	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Utilized Edge Outline	Utilized Edge Length (mm)	Utilized Edge Angle (degrees)
9	metaquartzite	unidirectional core	40%	11	121	120	45	575.8	straight	74	65
38	Madera chert, nonred	multidirectional core	30%	> 15	85	81	55	349.5	convex	105	72
72-4	Madera chert, red and mottled red	indeterminate fragment	0%	3	66	41	20	41.8	sinuous	54	66
83	Madera chert, red and mottled red	multidirectional core	30%	9	88	62	36	162.5	sinuous	77	65
98-7	Madera chert, red and mottled red	indeterminate fragment	0%	5	44	16	16	7.1	convex	37	65
161	Madera chert, red and mottled red	multidirectional core	40%	> 15	97	77	57	416.9	slightly convex	54	60

Table 13. Cores, Area 1, LA 61286

FS No.	Morphology	Material Type	Flake Scars	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
155	Multidirectional core	chert	15	61	61	39	139.1
166	Multidirectional core	Madera chert, nonred	15	78	74	46	269.3
501	Multidirectional core	Madera chert, red and mottled red	10	82	62	26	147.7
502	Unidirectional core	Madera chert, yellow/red mottled	8	69	58	31	131.5
504	Angular debris	Madera chert, nonred	6	81	65	31	142.6

and flawed. All retain 10–50 percent waterworn cortex. The unidirectional core exhibits one formal platform with discontinuous abrasion along its margin, suggesting platform preparation. Core material type and cortex retention reflects raw-material procurement from a local gravel source. The relatively informal platforms of the angular debris and the multidirectional cores as well as their discard prior to exhaustion suggests the practice of an expedient core-reduction strategy. See for tabulation of additional core attributes including dimensional data.

Area 2

Debitage. A total of 489 pieces of debitage were recovered from Area 2 (Table 14). Debitage accounts for 97.5 percent of the Area 2 assemblage. The core flake to biface flake ratio is 1:0.25, indicating an emphasis on core reduction. None of the debitage shows evidence of thermal alteration.

Core flake and angular debris material types were classified as chert, nonlocal material, and quartzite. Chalcedony and silicified wood were included with chert. Pedernal chert, undifferentiated obsidian, and Cerro Toledo rhyolite obsidian comprise the nonlocal material class. The quartzite material class is solely comprised of metaquartzite. The following discussion is geared toward discerning core-reduction trajectories and exploring differences between material classes. The small amount of quartzite material may lead to skewed distributions. Therefore, interpretation regarding quartzite is tentative. Cerro Toledo rhyolite was also formed in the Valles Caldera. However, in contrast to the Valles Grande source, Cerro Toledo obsidian is commonly found in the Rio Grande alluvium and in the Puye Formation north of the Santa Fe. This material could have been obtained during travel between the Arroyo de las Trampas base camp and Jemez Mountain hunting grounds. The pervasive distribution of this obsidian throughout the Middle Archaic component suggests consistent travel routes, as within a group's annual or lifetime territory. The presence of obsidian indicates a strong Rio Grande aspect to seasonal movement.

Dorsal cortex distributions give the impression that all stages of reduction are represented by all material classes (Table 15). The chert core flakes dorsal cortex appears to be relatively evenly distributed, with only a slight emphasis on middle- to late-stage core reduction. The majority of quartzite core flakes (60.0 percent) retain 60–100 percent cortex, reflecting early-stage reduction, while the majority of nonlocal material core flakes (53.2 percent) lack cortex, indicating a later stage of reduction.

The majority of all core flakes, regardless of material class, exhibit 1–2 dorsal scars, suggesting early- to middle-stage reduction (Table 16). Substantial proportions of core flakes of both local chert and nonlocal material (29.1 percent and 37.1 percent, respectively) exhibit three or more dorsal scars, suggesting later-stage reduction. The relatively high proportion of nonlocal material core flakes (29.6 percent) retaining 60–100 percent cortex suggests some curation of this material, namely obsidian, in its natural state. These are most likely in the form of small cortical nodules from secondary nonlocal sources such as Caja del Rio.

The majority of chert core flakes (65.6 percent) have single-facet or cortical platforms, reflecting early- to middle-stage reduction, as do a substantial proportion of quartzite core flakes (50.0 percent) (Table 17). A small proportion of both local chert and nonlocal chert (2.1 percent and 2.7 percent, respectively) have complex platform types, suggesting late-stage reduction.

The whole-to-fragmentary core flake ratio is 1:3.4, indicating a predominance of fragmentary core flakes (Table 18). The most frequent portions are lateral (31.8 percent), proximal (25.3 percent), and whole (22.9 percent). Generally, flake breakage increases in the later stages of reduction as flakes get thinner; however, other postreduction cultural and natural processes such as trampling and solifluction must also be considered (Moore 1996:247). The high frequency of core flake breakage (77.0 percent) may indicate the later stages of reduction. Yet comparable proportions of distal and proximal portions can indicate post-reduction breakage, whereas a prevalence of distal portions points to breakage during reduction (Moore 1996:254). Core flake distal portions are more frequent than proximal portions for quartzite, suggesting breakage during reduction. Material flaws should also be taken into account when examining flake breakage

Table 14. Debitage artifact type by material type, Area 2, LA 61286

Number Row % Column %	Chert	Madera Chert, Yellow/Red Mottled	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Chalcedony	Pedernal Chert	Silicified Wood	Obsidian	Polvadera Peak Obsidian	Metaquartzite	Total
Angular debris	3	3	27	10	-	2	1	50	11	4	111
	2.7%	2.7%	24.3%	9.0%	-	1.8%	0.9%	45.0%	9.9%	3.6%	100.0%
	15.8%	42.9%	33.3%	27.8%	-	40.0%	50.0%	17.9%	25.6%	28.6%	22.7%
Core flake	15	2	52	24	2	2	1	161	23	10	292
	5.1%	0.7%	17.8%	8.2%	0.7%	0.7%	0.3%	55.1%	7.9%	3.4%	100.0%
	78.9%	28.6%	64.2%	66.7%	100.0%	40.0%	50.0%	57.5%	53.5%	71.4%	59.7%
Biface flake	-	-	-	1	-	1	-	64	9	-	75
	-	-	-	1.3%	-	1.3%	-	85.3%	12.0%	-	100.0%
	-	-	-	2.8%	-	20.0%	-	22.9%	20.9%	-	15.3%
Notching flake	-	-	-	-	-	-	-	1	-	-	1
	-	-	-	-	-	-	-	100.0%	-	-	100.0%
	-	-	-	-	-	-	-	0.4%	-	-	0.2%
Hammerstone flake	-	1	-	-	-	-	-	-	-	-	1
	-	100.0%	-	-	-	-	-	-	-	-	100.0%
	-	14.3%	-	-	-	-	-	-	-	-	0.2%
Multidirectional core	1	-	1	1	-	-	-	-	-	-	3
	33.3%	-	33.3%	33.3%	-	-	-	-	-	-	100.0%
	5.3%	-	1.2%	2.8%	-	-	-	-	-	-	0.6%
Early-stage biface	-	1	-	-	-	-	-	1	-	-	2
	-	50.0%	-	-	-	-	-	50.0%	-	-	100.0%
	-	14.3%	-	-	-	-	-	0.4%	-	-	0.4%
Middle-stage biface	-	-	1	-	-	-	-	-	-	-	1
	-	-	100.0%	-	-	-	-	-	-	-	100.0%
	-	-	1.2%	-	-	-	-	-	-	-	0.2%
Late-stage biface	-	-	-	-	-	-	-	3	-	-	3
	-	-	-	-	-	-	-	100.0%	-	-	100.0%
	-	-	-	-	-	-	-	1.1%	-	-	0.6%
Total	19	7	81	36	2	5	2	280	43	14	489
	3.9%	1.4%	16.6%	7.4%	0.4%	1.0%	0.4%	57.3%	8.8%	2.9%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 15. Core flake dorsal cortex by material class, Area 2, LA 61286

Number Row % Column %	Local Chert	Nonlocal Material	All Quartzite	Total
Noncortical	37	99	2	138
	26.8%	71.7%	1.4%	100.0%
	38.5%	53.2%	20.0%	47.3%
10-50%	32	32	2	66
	48.5%	48.5%	3.0%	100.0%
	33.3%	17.2%	20.0%	22.6%
60-100%	27	55	6	88
	30.7%	62.5%	6.8%	100.0%
	28.1%	29.6%	60.0%	30.1%
Total	96	186	10	292
	32.9%	63.7%	3.4%	100.0%
	100.0%	100.0%	100.0%	100.0%

Table 16. Core flake dorsal scars by material class Area 2, LA 61286

Number Row % Column %	Local Chert	Nonlocal Material	All Quartzite	Total
0	19	38	2	59
	32.2%	64.4%	3.4%	100.0%
	19.8%	20.4%	20.0%	20.2%
1-2	47	77	7	131
	35.9%	58.8%	5.3%	100.0%
	49.0%	41.4%	70.0%	44.9%
3-5	27	63	1	91
	29.7%	69.2%	1.1%	100.0%
	28.1%	33.9%	10.0%	31.2%
6 or more	1	6	-	7
	14.3%	85.7%	-	100.0%
	1.0%	3.2%	-	2.4%
Indeterminate	2	2	-	4
	50.0%	50.0%	-	100.0%
	2.1%	1.1%	-	1.4%
Total	96	186	10	292
	32.9%	63.7%	3.4%	100.0%
	100.0%	100.0%	100.0%	100.0%

Table 17. Core flake platform type by material class, Area 2, LA 61286

Number Row % Column %	Local Chert	Nonlocal Material	All Quartzite	Total
Single-facet and cortical platforms	63	43	5	111
	56.8%	38.7%	4.5%	100.0%
	65.6%	23.1%	50.0%	38.0%
Multifacted, abraded, and retouched platforms	2	5	-	7
	28.6%	71.4%	-	100.0%
	2.1%	2.7%	-	2.4%
Absent, collapsed, crushed, and broken-in-manufacture platforms	31	138	5	174
	17.8%	79.3%	2.9%	100.0%
	32.3%	74.2%	50.0%	59.6%
Total	96	186	10	292
	32.9%	63.7%	3.4%	100.0%
	100.0%	100.0%	100.0%	100.0%

Table 18. Core flake portion by material class, Area 2, LA 61286

Number Row % Column %	Local Chert	Nonlocal Material	All Quartzite	Total
Whole	32	31	4	67
	47.8%	46.3%	6.0%	100.0%
	33.3%	16.7%	40.0%	22.9%
Proximal	23	51	-	74
	31.1%	68.9%	-	100.0%
	24.0%	27.4%	-	25.3%
Medial	2	16	1	19
	10.5%	84.2%	5.3%	100.0%
	2.1%	8.6%	10.0%	6.5%
Distal	6	31	2	39
	15.4%	79.5%	5.1%	100.0%
	6.3%	16.7%	20.0%	13.4%
Lateral	33	57	3	93
	35.5%	61.3%	3.2%	100.0%
	34.4%	30.6%	30.0%	31.8%
Total	96	186	10	292
	32.9%	63.7%	3.4%	100.0%
	100.0%	100.0%	100.0%	100.0%

Table 19. Angular debris cortex by material class, Area 2, LA 61286

Number Row % Column %	Local Chert	Nonlocal Material	All Quartzite	Total
Noncortical	17	45	3	65
	26.2%	69.2%	4.6%	100.0%
	38.6%	71.4%	75.0%	58.6%
10-50%	27	16	1	44
	61.4%	36.4%	2.3%	100.0%
	61.4%	25.4%	25.0%	39.6%
60-100%	-	2	-	2
	-	100.0%	-	100.0%
	-	3.2%	-	1.8%
Total	44	63	4	111
	39.6%	56.8%	3.6%	100.0%
	100.0%	100.0%	100.0%	100.0%

Table 20. Core flake mean whole measurements by material class, Area 2, LA 61286

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Local Chert					
Number	65	49	55	55	32
Mean	7.2	31.5	33	10.4	15.2
SD	3.8	16.4	16.7	6.6	29.9
Minimum	0.7	9	11	2	0.2
Maximum	22.2	82	83	30	117.7
Nonlocal Material					
Number	48	37	82	82	31
Mean	2.7	18.2	15.2	3.9	1.4
SD	1.1	8.9	5.9	2.3	1.9
Minimum	1.3	9	7	2	0.1
Maximum	7.5	37	38	18	7.8
All Quartzite					
Number	5	5	4	4	4
Mean	11.3	48.8	45.5	17	46.9
SD	9.1	23.4	14.4	5.7	43.3
Minimum	5.1	33	28	11	9
Maximum	27.2	88	63	24	104.2
All Materials					
Number	118	91	141	141	67
Mean	5.5	27	23	6.8	10.7
SD	4.2	16.4	14.9	5.8	25.2
Minimum	0.7	9	7	2	0.1
Maximum	27.2	88	83	30	117.7

distributions. A relatively small proportion of core flakes (13.3 percent) exhibit flaws. With the exception of eight nonlocal material core flakes, all core flakes exhibiting flaws are local chert. Breakage along an incipient fracture plane or other flaw can contribute to the representation of all fragmentary portions and can occur in all stages of reduction, although it seems less likely that a flawed material would be intensely reduced if a more suitable raw material were easily obtainable.

Angular debris lacking cortex is most frequent for both nonlocal material (71.4 percent) and quartzite (75.0 percent) (Table 19). This lack of cortex represents middle- to late-stage reduction. The majority of local chert core flakes (61.4 percent) retain 10–50 percent cortex, reflecting middle-stage reduction.

Although it remains untested, a cursory examination of Table 20 gives the impression that size may be discriminated by material class. Mean whole measurements are consistently the smallest for nonlocal material and consistently the largest for quartzite. The mean statistics for local chert core flakes consistently lie somewhere in between the other two classes. There is considerable overlap in the distributions of each measurement among the material classes, but the mean differences may reflect differential core-reduction intensity. However, size is not always a good indicator of reduction stage and may simply be related to parent raw-material size. In this case, the empirical data described above indicates that all stages of reduction are represented by each material class, but quartzite core flake emphasize early- to middle-stage reduction, local chert core flakes emphasize middle- to late-stage reduction, and nonlocal material core flakes emphasize late-stage reduction. The metric data appears to support this interpretation.

The remaining debitage is reflective of tool production and maintenance. This includes 75 biface flakes, 1 notching flake, and 1 hammerstone flake. A notching flake results from notching a biface. These flakes often exhibit an indented and crushed platform that has a scallop or bird-in-flight shape in transverse profile resulting from the prior removal of notching flakes, scars of which are also evident on the dorsal surface (Titmus 1985:251; Austin 1986:96; OAS 1994:12). This is a proximal portion of a notching flake with a crushed platform that has a slight indentation at the point of flake initiation as well as the characteristic platform profile. It lacks dorsal cortex and has six dorsal scars, one of which appears to be a previous notching flake scar. It measures 6 mm long by 9 mm wide by 1 mm thick and weighs 0.1 g. A hammerstone flake results from the rejuvenation of a hammerstone and generally exhibits battering wear on the dorsal surface (OAS 1994:12). This hammerstone flake retains 20 percent waterworn cortex and exhibits three scars and battering wear on its dorsal surface. The flake is whole, with a single-facet platform measuring 16.4 mm. The flake measures 43 mm long by 44 mm wide by 12 mm thick and weighs 18.1 g. Edge bites, which can represent a considerable portion of biface edge, are discussed in the formal tool section and are not considered here. The majority of biface flakes (94.4 percent) lack cortex. A preponderance of biface flakes (79.2 percent) have three or more dorsal scars, including 13.9 percent with six or more dorsal scars. The predominant biface flake platform types (54.2 percent) are multifaceted, abraded, and/or retouched platforms, while 44.4 percent exhibit various platform breakage. Biface flakes are most frequently whole (38.9 percent), followed by proximal (37.5 percent) and medial (9.7 percent) portions (Table 21).

Table 21. Biface flake mean whole measurements, Area 2, LA 61286

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Number	40	29	55	55	28
Mean	1.8	16.28	12.1	2.6	0.7
SD	0.7	9.6	5	1.1	0.9
Minimum	0.8	4	4	1	0.1
Maximu	3.6	43	26	6	3.4

Informal tools. FS 226 is a fine-grained Pedernal chert core flake. Its distal termination is obscured by a utilized/retouched projection, which may have served as a graver. Retouch is unidirectional, while wear in the form of discontinuous scalar scarring and step-fracturing is bidirectional. The projection is roughly V-shaped, and its perimeter measures 14 mm with an edge angle of 34 degrees. The artifact measures 23 mm long by 24 mm wide by 6 mm thick and weighs 3.0 g.

FS 407 is an obsidian core flake with utilized distal and lateral edges. It was recovered from Feature 49. The distal edge is slightly convex and measures 26 mm with an edge angle of 26 degrees. The lateral edge is sinuous and measures 30 mm with an edge angle of 55 degrees. Both edges manifest continuous unidirectional scalar scarring and discontinuous step-fracturing. The distal edge also displays discontinuous crescentic scars. The artifact measures 33 mm long by 23 mm wide by 18 mm thick and weighs 6.1 g.

FS 506 was recovered from Feature 5. It is the lateral portion of an obsidian core flake. Its intact lateral/distal margin is unidirectionally retouched and utilized. This edge is slightly convex and measures 37 mm with an edge angle of 44 degrees. The artifact measures 32 mm long by 30 mm wide by 11 mm thick and weighs 7.1 g.

Formal tools. Excavation yielded 11 whole and fragmentary bifaces, including 3 fragmentary projectile points, all of which are manufactured from fine-grained Madera chert or glassy obsidian (Table 22).

The projectile points (FS 264-2, FS 314, and FS 386-6) are proximal portions of late-stage bifaces that exhibit a regular facial scarring pattern. A high representation of proximal to distal portions or bases to tips may suggest that after breakage the bases were curated, probably still attached to the haft (Schiffer 1987:287). All display continuous bimarginal scalar scarring and discontinuous step-fracturing. All are lenticular in transverse cross section.

FS 264-2 is distally truncated by a snap fracture. The expanded stem, a small portion of one blade edge, and one broad and relatively deep

Table 22. Bifaces, Area 2, LA 61286

FS No.	Material Type	Morphology	Function	Portion	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Facial Scarring Pattern	Marginal Scarring Pattern
216	obsidian	Early-stage biface	biface	indeterminate fragment	24	18	5	1.9	irregular	discontinuous scalar scarring and step fracturing
260-1	obsidian	biface flake (outrepassé)	biface fragment	whole	28	26	6	2.7	irregular	continuous scalar scarring and discontinuous rounding
264-2	obsidian	late-stage biface	En Medio corner-notched projectile point	proximal	18	19	4	1.4	regular	continuous scalar scarring and step fracturing
307-16	obsidian	biface flake (edge bite)	biface fragment	proximal	8	12	4	0.2	indeterminate	continuous scalar scarring and discontinuous rounding
314	obsidian	late-stage biface	San Jose point	proximal	12	17	6	0.9	regular	continuous scalar scarring and discontinuous step
316-4	obsidian	biface flake (outrepassé)	biface fragment	distal	12	30	7	1.7	indeterminate	continuous scalar scarring and discontinuous rounding
319-7	obsidian	biface flake (edge bite)	biface fragment	proximal	13	21	6	0.9	indeterminate	discontinuous scalar scarring and rounding
324-4	Polvadera Peak obsidian	biface flake (edge bite)	biface fragment	whole	11	26	6	1	indeterminate	continuous scalar scarring, discontinuous step fracturing and rounding
386-6	obsidian	late-stage biface	small projectile point	proximal	13	10	4	0.4	regular	continuous scalar scarring and discontinuous step fracturing
388	Madera chert, red and mottled red	middle -stage biface	biface	whole	48	32	10	13.9	semiregular	continuous scalar scarring and discontinuous step fracturing
391	Madera chert, yellow/red mottled	early-stage biface	biface	whole	54	31	13	21.8	irregular	discontinuous scalar scarring

corner notch are intact. Whole measurements for stem width, stem length, and neck thickness are 12.6 mm, 9.0mm, and 4.0 mm, respectively. Its form closely resembles the stems of the En Medio Corner-notched type (Turnbow 1997:182–186). All whole measurements fall within the reported ranges. Thoms (1977:132–141) distinguishes six types, including Española Wide-blade, Santa Cruz Barbed, Jemez Short Barb, Short Wide Barbed, Ojo Barbed, and Echo Shouldered, all of which may be subsumed by the En Medio Corner-notched type (Turnbow 1997:185–186). For all six, a Late Archaic period date of 1000 BC to AD 400 is suggested (Thoms 1977:132–141).

FS 314 is distally truncated by a haft snap. It is likely that haft snaps indicate use breakage (Johnson 1979:26; OAS 1993:18). It is an excurvate stem with rounded tangs and a concave base. All stem edges are ground. Whole measurements for stem width, stem length, and neck thickness are 16.6 mm, 11.0 mm, and 5.7 mm, respectively. In form, including metric attributes and in the presence of basal grinding, this stem closely resembles those of San Jose points (Turnbow 1997:173–175). This artifact also resembles the stems of Thoms's (1977:107) San Jose Short Blade type, which, following Irwin-Williams (1973:8), he dates to the Middle Archaic period between 3300 and 1800 BC. Irwin-Williams contends that the Southwest was occupied by the Picosa continuum, with its western San Dieguito–Pinto tradition, northern Oshara tradition, and southern Cochise tradition, by about 3000 BC (Irwin-Williams 1979:38). San Jose points, which are part of the cultural material inventory of the Oshara tradition, bear a striking resemblance to Pinto points of the San Dieguito–Pinto tradition and Pinto points from southern and central Arizona (Huckell 1984:193 and 206).

FS 386-6 is an unidentifiable small projectile point stem. It is laterally snapped. This type of fracture occurs during biface manufacture (Johnson 1979:25; OAS 1993:18). Its diminutive size and the rounding of the one shoulder that is present indicate that this point was reworked or broken during reworking.

Two early-stage bifaces (FS 216 and FS 391) were recovered. Both exhibit irregular facial scarring patterns and discontinuous bimarginal scalar scarring. In addition, FS 216 manifests discontinuous step-fracturing. In edge outline form, FS 391 is roughly oval, and FS 216 is irregular.

FS 388 is a fine-grained Madera chert middle-stage biface. It displays a semiregular facial scarring pattern and continuous bimarginal scarring with discontinuous step-fracturing. In plan view, it is a tapered ovate form. This tapering may have facilitated hafting.

FS 260 and FS 316-4 represent overshoot or outrepassé flakes. Outrepassé flakes, which typically occur during soft hammer percussion, are produced when the crack of a flake continues to the end of a biface and bends, removing a portion of the opposing biface edge (Whittaker 1994:19, 163). This type of flake, diagnostic of a biface production failure, has also been termed reverse fracture (Johnson 1979:25). FS 260 is whole, while FS 316-4 is a distal portion. The facial scarring pattern of FS 260 is irregular. The fragmentary condition of the biface edge on FS 316-4 precludes determining its facial scarring pattern. Both flakes show continuous bimarginal scalar scarring and rounding.

Three whole and fragmentary obsidian edge bite flakes (FS 307-16, FS 319- 7, and FS 324-4) were recovered. An edge bite flake is a biface flake, typically produced during soft hammer percussion, in which the crack initiates too far in from the intended marginal platform and removes a portion of biface edge (Whittaker 1994:190). Due to its fragmentary condition, the facial scarring pattern cannot be ascertained. All three display continuous bimarginal scalar scarring and discontinuous rounding. In addition, FS 316-4 manifests discontinuous step-fracturing.

Hand tool. FS 367-1 is a fine-grained, Madera chert, multidirectional core that was used as a chopper. It displays crushing and step-fracturing along a convex ridge created by bidirectional flake removal. It exhibits over 15 flake scars but still retains 10 percent cortex. Backing was provided by the removal of two flakes that created a flattened area opposing the utilized edge. This edge measures 135 mm with an edge angle of 64 degrees. The artifact measures 94 mm long by 87 mm wide by 71 mm thick and weighs 543.8 g.

Cores. Area 2 yielded two multidirectional cores. FS 219 is a medium-grained, flawed, mottled red-gray Madera chert core that exhibits 15 flake scars but retains 40 percent waterworn cortex. It measures 106 mm long by 101 mm by 70 mm thick and weighs 842.4 g. FS 257 is a fine-grained, gray chert core that displays 13 flake scars but retains 30 percent waterworn cortex. This core appears to be near exhaustion, which implies rather intensive core reduction. It measures 53 mm long by 46 mm wide by 42 mm thick and weighs 98.4 g.

Area 3

Debitage. Excavation in Area 3 yielded two core flakes. One is a lateral portion that lacks a platform. This nonred Madera chert core flake lacks cortex and has one dorsal scar. It measures 24 mm long by 34 mm wide by 8 mm thick and weighs 3.8 g. The second is red or mottled red Madera chert with 10 percent dorsal cortex and three dorsal scars. It is whole with a cortical platform measuring 10.2 mm. The flake measures 60 mm long by 32 mm wide by 12 mm thick and weighs 21.4 g.

Ground Stone Artifacts

Area 1

Five ground stone artifacts, including four whole one-hand manos and one shallow basin metate, were recovered from Area 1 (Table 23).

Manos. One mano (FS 175) is of a nonlocal, fine-grained, red basalt scoria. Warren (1977:24, 28) noted that this material is usually red to reddish gray and much lighter than vesicular basalt. It occurs abundantly on Cerros del Rio and outcrops on both sides of the river at the confluence of Bland Canyon and the Rio Grande. She mentions its use as a tempering material and as ground stone artifacts including stone balls and mortars. She does not mention its use for hand stones. The vesicles of this material give it a coarse grinding texture. It is oval in plan and irregular in cross section with a convex grinding surface.

The wear pattern of FS 175, which consists of rounded and polished high points between vesicles, does not appear consistent with grinding wear. It is plausible that this artifact functioned as a hide-processing stone. After a six-hour hide-processing experiment, Adams (1988:312–313) reported a similar wear pattern, including a decreased angularity of individual grains and the tribochemical deposition of polish. A similar mano was recovered from Area 1 of LA 127578, a habitation site with Archaic affiliation that was excavated during the North Ridgetop Road project.

Pumice is commonly part of the contemporary hide worker's toolkit. Edholm and Wilder (1997:38, 217, 218, 247) noted that other types of lithic material may also be used, but gritty or coarse-textured materials are preferred. These stones are used to remove unwanted soft tissue or hair from the grain or hair side of the hide and the membrane from the flesh side. To avoid scarring, a material with a fine-grained texture is necessary for the flesh side, so it is more likely that this hand stone was reserved for the grain side of a hide.

Three manos were manufactured from flattened cobbles of medium-grained metaquartzite. All are oval in plan and biconvex in transverse cross section, and display pecking wear, which indicates ground-surface sharpening. One mano has a wear pattern of consistently oriented, linear furrow striations, suggesting it was used in a reciprocal motion. One mano shows evidence of use as a hammerstone along the edge of its short axis. Three manos show some degree of production input, suggesting the anticipation of intense use. The mean length of these manos is 130.3 mm with a standard deviation of 5.1 mm. Their mean width is 103.3 mm with a standard deviation of 8.2 mm. Their mean thickness is 57.0 mm with a standard deviation of 12.2 mm. Their mean weight is 968.6 g with a standard deviation of 303.2 g.

Metates. A shallow basin metate is of a flattened cobble of medium-grained metaquartzite. It is oval in plan and has a concave ground surface. It shows evidence of ground-surface sharpening and exhibits linear furrow striations parallel to its long axis, indicating that it was used with a mano that was moved in a reciprocal rather than rotary motion. The ground surface is roughly ovoid and has an area of 62,014 sq mm.

Area 2

Area 2 yielded two whole one-hand manos, four whole or fragmentary basin metates, and one indeterminate fragment (Table 24).

Manos. Two manos are of flattened cobbles of medium-grained metaquartzite. Both are oval in

Table 23. Ground stone, Area 1, LA 61286

FS No.	Function	Material Type	Production Input	Shaping	No. of Use Surfaces	Primary Wear	Secondary Wear	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
62	one-hand mano	metaquartzite	none	pecking	1	grinding	pecking	123	103	69	1331.1
154	one-hand mano	metaquartzite	slightly modified	pecking	1	polishing	furrow striation, linear, oblique orientation to short axis	135	104	46	1000.9
175	one-hand mano	basalt scoria	none	none	1	polishing	none	132	113	66	590.4
165	one-hand mano/ hammerstone	metaquartzite	slightly modified	pecking	2	polishing	pecking	131	93	47	951.9
150	basin metate	metaquartzite	none	none	1	grinding	furrow striations, linear, parallel to long axis	439	253	145	24000

Table 24. Ground stone, Area 2, LA 61286

FS No.	Function	Material Type	Production Input	Shaping	Number of Use Surfaces	Primary Wear	Secondary Wear	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
409-21	one-hand mano/ hammerstone	metaquartzite	none	none	2	grinding	furrow striations, linear, oblique orientation to short axis	114	103	49	874
513-3	one-hand mano/ hammerstone	metaquartzite	mostly modified	pecking	2	grinding	none	121	97	60	1187.2
283	basin metate	metaquartzite	slightly modified	flaking	1	grinding	furrow striations, linear, parallel to long axis	318	205	40	3700
270	basin metate fragment	sandstone	indeterminate	indeterminate	1	grinding	furrow striations, linear, orientation indeterminate	83	56	16	109.7
276	basin metate fragment	sandstone	slightly modified	pecking	1	grinding	furrow striations, linear, parallel to long axis	366	252	25	2800
467	basin metate fragment	limestone	none	none	1	grinding	furrow striations, linear, orientation indeterminate	243	239	111	9300
444	indeterminate fragment	sandstone	slightly modified	flaking	1	grinding	furrow striations, linear, orientation indeterminate	88	59	18	135.4

plan and biconvex in transverse cross section. Both exhibit battering wear along the edge of the short axis, indicating use as a hammerstone. FS 409-21 displays pecking wear across the ground surface, indicating sharpening, as well as linear furrow striations paralleling the short axis, suggesting use of the mano in a reciprocal motion. All other ground stone displays wear that is compatible with a reciprocal mano stroke as well. The other one-hand mano (or hammerstone) shows a slight degree of investment in tool production, which implies the anticipation of relatively intense use.

A whole, shallow basin metate was manufactured from a flattened cobble of fine-grained metaquartzite. It is oval in plan, and its ground surface is concave in both transverse and longitudinal cross section. The ground surface is ovoid and has an area of 48,556 sq mm. It exhibits some degree of production input, which suggests the anticipation of relatively intense use.

FS 276 is five fragments of a shallow basin metate that can be refitted. FS 270 appears to be another fragment of the same metate. This fragment cannot be directly refitted but was closely associated with FS 276. All fragments appear to be from the same very thin slab of fine-grained sandstone. These fragments represent a metate that is subrectangular in plan and has a slightly concave ground surface in transverse and longitudinal cross section. Pecking to sharpen is evident on the ground surface. These fragments exhibit a slight degree of investment in tool production, which may reflect the anticipation of relatively intense use.

FS 467 is an end fragment of a shallow basin metate. It is of a thick slab of fine-grained limestone. The ground surface is concave and exhibits sharpening.

Indeterminate ground stone. An edge fragment of an indeterminate ground stone artifact, manufactured from a very thin slab of medium-grained sandstone, has a flat ground surface with evidence of sharpening.

Site Summary

Excavation of LA 61286 initially focused on a small number of thermal features in a relatively restricted area of a spatially extensive sherd and lithic artifact scatter in Area 1. The artifacts were scattered over the southeast-facing slope above Arroyo de las Trampas. The spatial extent and low density of the artifact scatter suggested short-term, ephemeral foraging activities conducted by Ancestral Pueblo populations of the Santa Fe River. Data recovery revealed a much more complex and extensive site than expected.

LA 61286 was expanded to include three spatially discrete components from the Early, Middle, Late, and Latest Archaic periods, spanning from 4600 BC to AD 400. The site area as defined by excavation covered an area of 130 m north-south by 70 m east-west.

Area 1 had sixteen features. A Latest Archaic period component with a pit-structure foundation with two intramural features and a superimposed large roasting pit, a midden, and a large burned pit were excavated. This collection of features exemplifies a residential occupation with well-defined intramural and extramural activity spaces. Often this kind of formal site structure is accompanied by a partial reliance on agriculture. Ethnobotanical analysis failed to yield any evidence of cultivation or consumption of domesticates. Chipped and ground stone artifacts were not abundant, but they reflect technology geared to generalized subsistence pursuits in which expedient and formal tools were manufactured and used on site. The formal entry to the structure and the central hearth suggest use during cold weather. However, the majority of the features were extramural, and the ethnobotanical evidence indicated late summer and fall harvesting of grass seeds and perennials.

The occurrence of three thermal features within and below the Feature 1 midden and the construction of a large roasting pit in the pit structure after abandonment indicate continued use of the site during the Latest Archaic period. Seven extramural features scattered throughout the excavation area could not be assigned to the Latest Archaic occupation, but they may be related. Use of Area 1 reoccurred during the Coalition period on the basis of pottery recovered from the testing project. However, no other evidence of a Coalition period occupation was encountered during the excavation.

In Area 2, we examined 500 sq m that had not been identified during the testing project. The excavation focused on a charcoal-infused soil lens exposed in an erosion channel bank with darkly stained concentrations indicating thermal features. Surface stripping revealed five and possibly seven features from the Late Archaic period. These near-surface features occurred in three separate places, indicating three different occupation episodes between 412 BC and AD 131. Limited ethnobotanical evidence weakly suggests late summer or fall occupation. No animal bones were recovered. Chipped stone artifacts reflect core reduction of local raw material. The narrow range of artifacts and subsistence remains recovered indicate short-term, targeted occupations. These occupation episodes may have been logistically organized forays from residential base camps closer to a reliable water source.

Excavation of the buried cultural deposit revealed a complicated and densely distributed assemblage of pits, a pit-structure foundation, discard areas, and sheet trash. This component dated to the Middle Archaic (3340 to 1930 BC), indicating accumulation through many occupations. Using pooled estimates for radiocarbon assays, three temporal components were identified. The two-sigma midpoints for the total range were 2905 BC, 2675 BC, and 2341, suggesting 250- to 300-year occupation intervals, although there could have been other occupations within each interval. Feature morphology and content indicate some functional variability spread across the full time range. Features, artifacts, and ethnobotanical remains suggest little change in subsistence strategy and technology during this 1400-year span. The ephemeral structure foundation and fire-cracked discard areas and sheet trash suggest that occupations were partly residential. Refuse was concentrated, at least for part of the occupation. The core- and biface-reduction area suggests that activities were spatially segregated, which is another characteristic of base camp organization. Surprisingly few grinding tools were recovered given the high number of thermal features and pits. Most were fragmentary, and they were scattered. While it is possible that functional manos and metates were scavenged or recycled, a low number of ground stone artifacts were found in all Middle Archaic components from the Santa Fe Relief Route project.

Area 3 was the smallest excavation area, but it had the most deeply buried cultural deposit. Two occupations were represented by Feature 46, which may date to the Middle Archaic period, and the two lowest features, Feature 55 and 56, which were dated to 4500–4400 BC. Aside from the thermal features, occupation evidence was slim. Only two artifacts were recovered from the lowest component. Ethnobotanical remains indicate that plant gathering and processing were the main activities. Erosion undoubtedly removed part of the occupation surface and any associated artifacts and features, so the actual extent and intensity of the occupation is underrepresented. The lack of chipped stone suggests that early occupations along the Santa Fe River emphasized foraging. Superpositioning of Features 55 and 56 indicates that the setting was important and influenced the decision to reoccupy.

LA 61287

LA 61287 was between centerline stations 665+50 and 669+00 on a gentle, southeast-facing slope at the head of a broad, grassy swale. Artifacts were observed scattered on both sides of the proposed road centerline. The site was test excavated in 1988 (Wolfman et al. 1989:29–31).

The site was on a gravel terrace formed above and 150 m east of Arroyo Gallinas. This terrace is part of a ridge system that separates the Arroyo Gallinas and Arroyo de los Frijoles drainage basins. The deep colluvium is of the Pojoaque Rough Broken Land association with a thin mantle of the A2 sandy loam and the deeper C1ca reddish brown loam (Folks 1975). A sparse Ancha formation mantle is exposed on the deflated slope. The site area was dissected by four minor erosion channels that join below the Feature 2 area and drain into the grassy swale at the far eastern limit of the site. Vegetative cover was sparse to moderate, with grasses, prickly pear, narrowleaf yucca, and a sparse to moderately dense overstory of piñon and juniper.

Preexcavation Description

The artifact scatter extended 150 m northeast-southwest by 115 m east-west, covering an estimated area of 17,250 sq m. An isolated hearth, Feature 1, was visible on the surface as a fire-cracked rock concentration and stained soil. Artifacts recovered by test excavation included 46 pieces of core-reduction debris of local raw material, a complete basin metate, and 5 sherds of corrugated and undecorated white ware pottery.

Two test pits were excavated. Test Pit 1 was placed above the hearth, Feature 1, which became well defined at approximately 10 cm below ground surface. The hearth consisted of flat cobbles set upright to form its outer edge. The inner area contained dark-stained soil. It measured 30 cm north-south by 71 cm east-west. Feature depth was not determined because excavation was stopped when it became apparent that the hearth had intact deposits. A charcoal sample was obtained from 10 cm below ground surface. No artifacts were associated.

Test Pit 2 was placed in the sherd concentration, excavated to 30 cm and augered to 105 cm below ground surface. Two lithic flakes were found in the top 10 cm of the pit in a gravelly sand. At 30 cm below modern ground surface, a much finer sand was found. An auger test indicated that a dense clay deposit existed at 90 cm below modern ground surface. No subsurface cultural materials were recovered.

General observations on the site can be made from the testing results. The lithic artifact assemblage remained from the reduction of locally occurring lithic materials that were used for the production of expedient flakes for use at the site or transport elsewhere. The debitage lacked observable wear from which site activities could be inferred. The hearth suggested use as a temporary campsite, while the metate suggested activities related to plant processing. The ceramics indicate a prehistoric Pueblo component, which may account for the artifacts and feature (Wolfman et al. 1989:29–31).

Excavation Methods and Results

The research design specified the excavation of Feature 1. The site was reexamined, and two features and an indeterminate soil stain associated with a dispersed chipped stone scatter were found near the centerline and primarily on the east side of the right-of-way. Feature 1, as described in this report, was found near the location given in Wolfman et al. (1989), but once it was completely excavated, it did not fit Wolfman's description. The "Feature 1" identified during testing was not relocated; however, three other features were found and excavated in the course of redefining the site limits and structure. The site limits were revised. As redefined, the site measured 150 m east-west by 50 m north-south and covered 7,500 sq m (Fig. 95).

A grid system was established, and 87 units

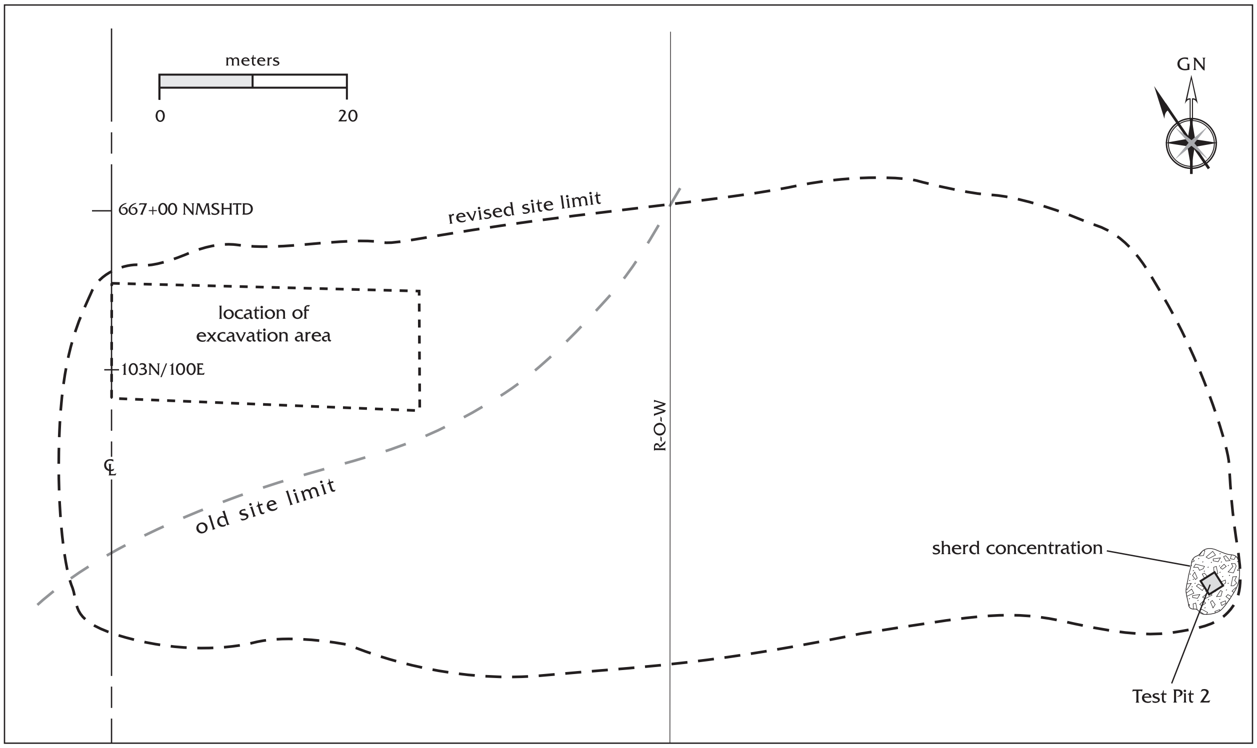


Figure 95. New site limits and excavation area of LA 61287.

were surface-stripped, removing the loose, sandy loam colluvium (Fig. 96). Two features and associated rock concentrations were exposed and excavated following standard procedures. A fourth gray charcoal-infused stained-soil deposit was defined within a 2 m wide by 7 m long area. Excavation within the stain revealed no cultural material. Six auger holes yielded no cultural material. The stain was judged to be a natural or noncultural deposit.

The erosion channel and arroyo cuts within the site limits were examined for buried cultural deposits. No buried charcoal-infused soil stains or cultural deposits were found. We determined that all cultural deposits were on or near the surface. The excavation of the three surface features and retrieval of the associated artifacts exhausted the site's potential to provide information, so no further excavation was conducted.

Surface stripping revealed three possible activity areas, two of which had remains of thermal features. The Feature 1 area was 8 m north-south by 5 m east-west and yielded 30 chipped stone artifacts. There was roughly a 3 m diameter halo of charcoal-stained sandy loam extending from Feature 1. This stain was associated with a cluster of chipped stone debris. The feature and chipped stone debris remain from one occupation, and the artifact distribution was a result of postabandonment erosion and deflation.

A second activity area (102N/105E, southwest corner) appeared as a gray brown organic soil stain within a 40 sq m area. Excavation in this area failed to yield evidence of a cultural deposit. Six lithic artifacts and one sherd of Santa Fe Black-on-white were recovered. No charcoal or other feature evidence was found. Six auger tests in the darkest part of the stain also revealed no evidence that the deposit was cultural.

A third activity area was identified by a surface stain and possible thermal feature 13 m east of the 102N/105E activity area. Excavation of a 17 sq m area revealed deflated hearth remains (Feature 2). One chipped stone artifact was recovered. This area is bounded on the north and south by two shallow erosion channels that have contributed to postabandonment deflation. Artifacts formerly associated with Feature 2 may have been displaced by erosion and moved outside the excavation limit.

Excavation revealed three possible occupation components. The Santa Fe Black-on-white bowl sherd indicates that at least one component dates

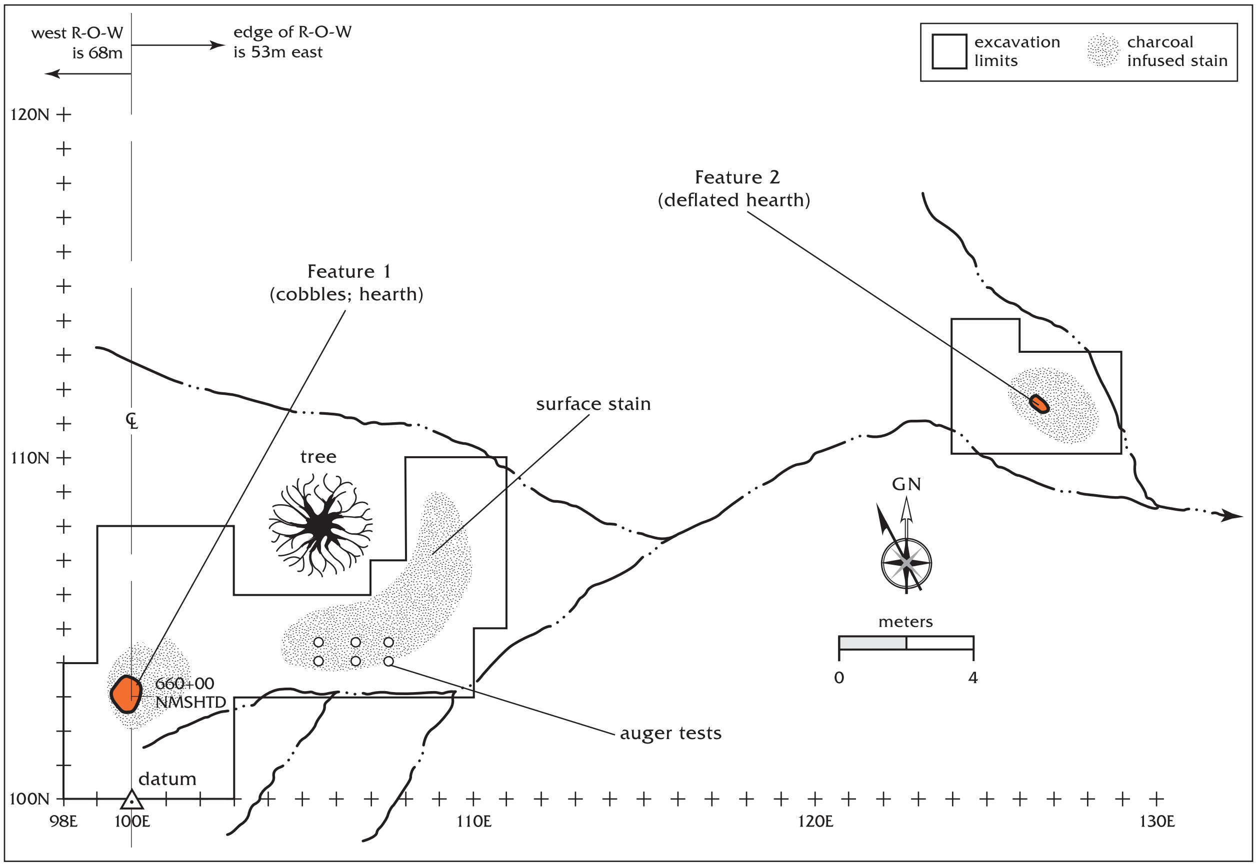


Figure 96. Plan of excavation area, LA 61287.

to the Coalition period. The other components may be contemporaneous, but that observation cannot be confirmed.

Features

Two features were identified during site reexamination and surface stripping. Feature 1, a large thermal feature, was a large, dark, charcoal-infused soil stain. Feature 2 was a shallow, deflated thermal feature discovered while examining the site surface before excavation.

Feature 1 was a possible cobble-lined thermal feature with considerable depth and potential for intact deposits. Excavation revealed a 113 cm long (east-west) by 91 cm wide (north-south) by 20 cm deep pit with steeply angled sides and a regular bottom (Figs. 97 and 98). Except for the cobbles visible near the surface, the feature contained no burned cobbles or fire-cracked rock. The interior fill was a mix of primary and secondary fill that was a black (10YR 2/1, dry) silty sandy loam with 10 percent pea gravel. The dark soil had abundant charcoal left from a smothered or incompletely burned fire. The feature floor is lightly oxidized. No artifacts were recovered from within Feature 1. Six flotation samples were taken. A radiocarbon sample yielded a two-sigma calibrated range of AD 780 to 1024 and a calibrated intercept of AD 902. This range seems early given the potential for old wood in the sample. Correcting for old wood extends the range into the AD 1200s, which is a more likely date given the pottery types that were recorded during the testing phase. The date range indicates an Ancestral Pueblo occupation during the Developmental or Coalition periods, although the latter seems more likely.

Feature 2 was a charcoal-infused soil stain on the surface of the deflated, gentle, south-southeast-facing slope. Excavation revealed a shallow, oval-outlined, basin-shaped pit 78 cm long by 42 cm wide by 10 cm deep (Fig. 99). The fill, a charcoal-infused secondary deposit, was a very dark gray (10YR 3/1, dry) fine sand. The fill lacked sufficient charcoal for a radiocarbon sample. Five flotation samples were collected from 100 percent of the feature fill and yielded *Zea mays*. Consumption of *Zea mays* could indicate

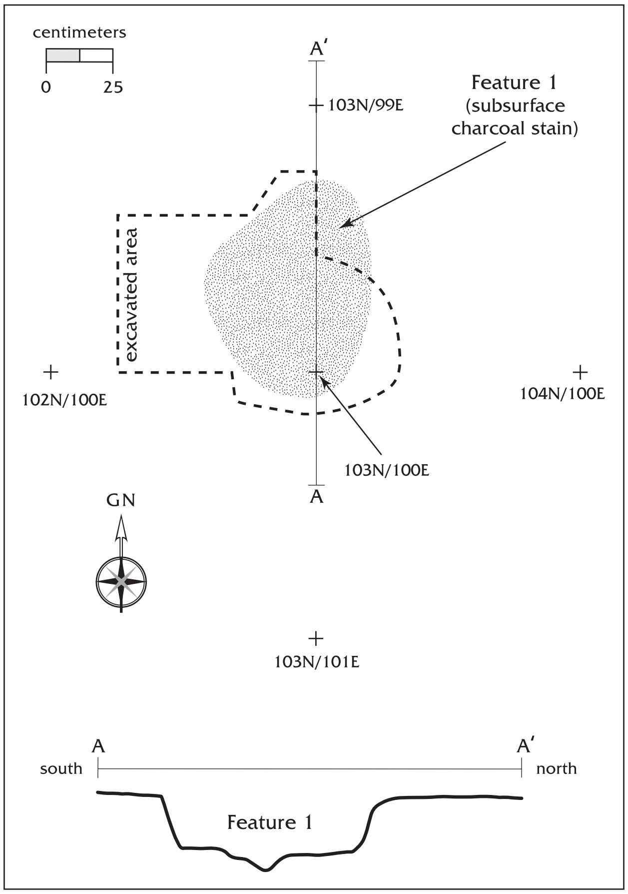


Figure 97. Plan and profile of Feature 1, LA 61287.

Figure 98. Feature 1, LA 61287.

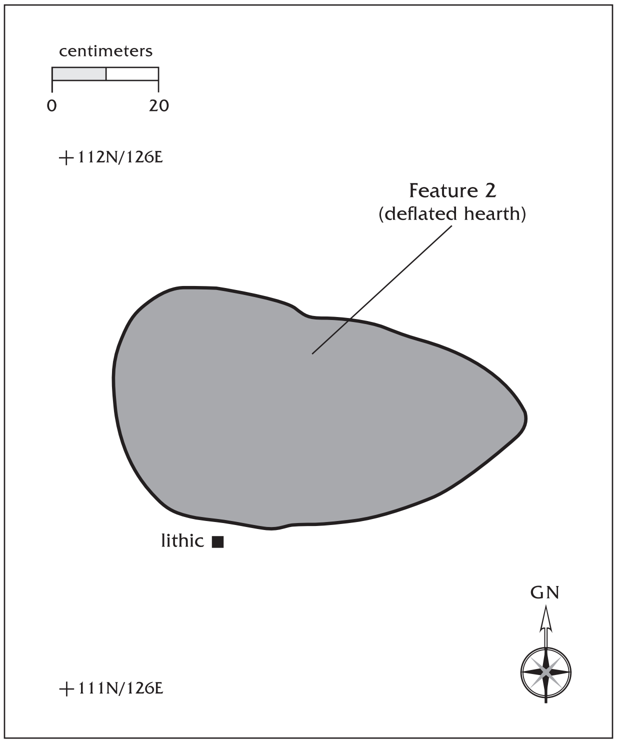


Figure 99. Plan and profile of Feature 2, LA 61287.

that LA 61287 was situated near fields or garden plots. Surface samples from other sites yielded maize pollen, indicating that the project area may have been farmed during Ancestral Pueblo times. Evidence of fieldhouses and farming features is rare, and pollen samples may be a better way to document Ancestral Pueblo land use in the piedmont.

Artifacts

Surface stripping and feature excavation yielded 43 artifacts. Forty-two chipped stone artifacts were debris from raw-material procurement and core reduction. Only local materials were present. One Santa Fe Black-on-white bowl rim sherd was retrieved from the vicinity of Feature 1 (see the discussion of ceramic artifacts in this report). The 43 artifacts recovered from the 87 units represent an artifact density of 0.5 artifacts per square meter, which is considered low.

Chipped stone. A total of 42 chipped stone artifacts weighing 2.71 kg were recovered from LA 61287, mainly chert core flakes and angular debris, with few cores and tools. These artifacts reflect limited raw-material procurement and core reduction.

A substantial proportion (54.9 percent) of these artifacts are Madera chert, which has been divided into three groups based on differences in color. A total of 29 of 33 artifacts that retain cortex have waterworn cortex. It is believed that these materials were obtained from local gravel deposits rather than an in-situ bedded source. Indeterminate types of cortex are retained by one piece each of silicified wood and undifferentiated chert debitage, and two pieces of nonred Madera chert.

The Cenozoic era Santa Fe group gravel, namely the Ancha formation, contains chert. These sedimentary deposits also contain metaquartzite cobbles, small amounts of silicified wood, and massive quartz. The Sangre de Cristo foothills contain Precambrian era granite and gneiss overlain by Paleozoic era Pennsylvanian deposits of sandstone, shale, and limestone. Within the Madera formation limestone are bedded nodules and veins of chert, which were quarried prehistorically (Lang 1993:6, 13; Lang 1995:5; Viklund 1994:1; Ambler and Viklund 1995:5). Madera chert also occurs as residual cobbles and pebbles in the later Santa Fe group gravels. Nonlocal materials such as obsidian are found in the axial gravels of the Rio Grande. However, the primary sources of this material are in the Jemez Mountains. A small amount of obsidian can also be found scattered across Caja del Rio Mesa (Kelley 1980:11–17).

Debitage. Debitage, including 26 core-reduction flakes and 10 pieces of angular debris, comprises 85.7 percent of the chipped stone assemblage (Table 25). No biface flakes, which are indicative of formal tool production, or tool maintenance debitage such as resharpening flakes were recovered. None of the debitage was heat treated or otherwise thermally altered. Flake attributes (amount of dorsal cortex, dorsal flake scars, platform type, portion, and mean whole measurements) suggest early- to middle-stage core reduction.

The most substantial proportion of core flakes (46.2 percent) retains 100 percent dorsal cortex. There is an equal proportion (26.9 percent) of core flakes retaining 10–50 percent dorsal cortex and noncortical core flakes. The noncortical to cortical core flake ratio is 1:1.7, indicating a prevalence of cortical core flakes. A substantial proportion (42.3

Table 25. Debitage artifact type by material type, LA 61287

Number Row % Column %	Chert	Madera Chert, Yellow/Red Mottled	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Chalcedony	Silicified Wood	Obsidian	Metaquartzite	Massive Quartz	Total
Angular debris	2	-	-	6	1	1	-	-	-	10
	20.0%	-	-	60.0%	10.0%	10.0%	-	-	-	100.0%
	18.2%	-	-	42.9%	100.0%	50.0%	-	-	-	23.8%
Core flake	7	1	8	7	-	1	-	2	-	26
	26.9%	3.8%	30.8%	26.9%	-	3.8%	-	7.7%	-	100.0%
	63.6%	100.0%	100.0%	50.0%	-	50.0%	-	66.7%	-	61.9%
Cobble tool	-	-	-	-	-	-	-	1	-	1
	-	-	-	-	-	-	-	100.0%	-	100.0%
	-	-	-	-	-	-	-	33.3%	-	2.4%
Multidirectional core	-	-	-	1	-	-	-	-	1	2
	-	-	-	50.0%	-	-	-	-	50.0%	100.0%
	-	-	-	7.1%	-	-	-	-	100.0%	4.8%
Tested pebble	2	-	-	-	-	-	-	-	-	2
	100.0%	-	-	-	-	-	-	-	-	100.0%
	18.2%	-	-	-	-	-	-	-	-	4.8%
Late-stage biface	-	-	-	-	-	-	1	-	-	1
	-	-	-	-	-	-	100.0%	-	-	100.0%
	-	-	-	-	-	-	100.0%	-	-	2.4%
Total	11	1	8	14	1	2	1	3	1	42
	26.2%	2.4%	19.0%	33.3%	2.4%	4.8%	2.4%	7.1%	2.4%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

percent) of flakes have one or two dorsal scars. Of the remaining flakes, 19.2 percent have two or three dorsal scars, and 7.7 percent have four scars.

A high proportion (42.3 percent) of flakes have cortical or single-facet platforms. One flake has a diagnostic fracture, indicating it was broken in manufacture. Collapsed (26.9 percent), crushed (3.8 percent), and absent platforms (23.1 percent) are also represented. These breakages may occur in all stages of reduction, especially when a flawed material is being reduced (Table 26).

Table 26. Debitage mean whole measurements, LA 61287

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Number	11	15	15	15	12
Mean	4.8	33.5	26.9	8.9	10.5
SD	2.3	22.9	12.4	4.1	12.3
Minimum	0.7	7	12	3	0.2
Maximum	8.4	99	63	17	42.5

The whole-to-fragmentary core flake ratio is 1:1.4, indicating fragmentary flakes are more frequent. Of the fragmentary flakes, lateral portions have the highest frequency, accounting for 30.8 percent of the total (26).

Cores. Two multidirectional cores and two tested pebbles comprise 9.6 percent of the lithic assemblage. The cores include FS 36, a medium-grained, mottled red Madera chert with five complete flake scars; and FS 12-2, a fine-grained, flawed massive quartz with four complete flake scars. Both retain 60 percent waterworn cortex, and neither appears exhausted. Maximum linear measurements for FS 36 are 98 mm long by 74 mm wide by 70 mm thick. It weighs 652.9 g. FS 12-2 measures 112 mm long by 109 mm wide by 64 mm thick and weighs 732.8 g. The presence of the tested pebbles points to at least limited procurement of raw material from an on-site gravel source. Each of the fine-grained chert tested pebbles has one complete flake scar. FS 28, a flawed material, retains 60 percent waterworn cortex; and FS 12-2 retains 80 percent. Because of their small size, it seems more likely that the pebbles were reduced using a bipolar rather than a freehand technique. FS 28 measures 40 mm long by 30 mm wide by 13 mm thick and weighs 18.1 g. FS 29 measures 36 mm long by 29 mm wide by 16 mm thick and weighs 24.1 g. The cores and the tested pebbles represent an expedient core-reduction strategy geared toward flake production.

Formal tool. FS 24 is an edge fragment of a late-stage biface manufactured from obsidian. The biface appears to be relatively uniform in bifacial and bimarginal retouch. The wear pattern, which includes rounding and step-fracturing, is consistent with longitudinal sawing (Chapman and Schutt 1977). The convex edge measures 41 mm and has an angle of 36 degrees. This artifact represents the only obsidian recovered from the site. The nonlocal nature of the material and the absence of debitage of this material suggest that it was not manufactured on-site and may reflect a curated technology. There is no evidence of hafting modification. The artifact measures 28 mm long by 14 mm wide by 5 mm thick and weighs 1.8 g.

Hand tools. FS 12-1 is a lateral portion of a medium-grained metaquartzite core flake with a culturally obscured distal termination. This artifact is fragmentary and represents only a portion of the original tool edge. This portion measures 41 mm. Unidirectional flake removal from the dorsal surface created this edge. Crushing is apparent on the slightly convex utilized edge, which has an angle of 65 degrees. This suggests use as a chopper. It measures 99 mm long by 72 mm wide by 32 mm thick and weighs 227.1 g.

FS 37 is a cobble tool modified by flaking. It has two utilized edges. One edge is sinuous, measures 111.6 mm, and has an angle of 65 degrees. The other is slightly convex, measures 108 mm, and has an angle of 74 degrees. Chopper use is indicated by the presence of step-fracturing and crushing along both utilized edges. This tool lacks hafting modification, but flattened areas opposite each utilized edge are ideal for palm placement during manual prehension. The chopper is made out of a medium-grained metaquartzite and retains 40 percent waterworn cortex. It measures 135 mm long by 87 mm wide by 64 mm thick and weighs 814.7 g.

Comparison of testing- and excavation-phase assemblages. In addition to the assemblage described above, the testing phase yielded 46 chipped stone artifacts (Wolfman et al. 1989:122–143). During the excavation phase, material type distribution was considerably expanded.

Types lacking from the testing-phase assemblage include Madera chert, chalcedony, obsidian, metaquartzite, and massive quartz. In the testing phase, Madera chert was not distinguished from other chert. In both assemblages, chert, including Madera chert, is the predominant type. With the exception of one obsidian biface recovered during the excavation phase, all materials are locally available.

The artifact type distribution was also considerably expanded during the excavation phase. Types lacking from the testing-phase assemblage include cobble tool, multidirectional core, tested pebble, and late-stage biface. One chert informal tool with unidirectional retouch and two chert undifferentiated cores were recovered during the testing phase. No informal tools were recovered during the excavation phase. In both assemblages, core-reduction flakes predominate. A total of 29 core flakes were recovered during the testing phase.

Between assemblages, there are minor differences in the core flake dorsal cortex distributions. In the testing-phase assemblage, there is a larger proportion of core flakes that retain 10–50 percent cortex (11.0 percent more), a slightly larger proportion lacks cortex (4.1 percent more), and a smaller proportion has 60–100 percent cortex (15.2 percent less). The noncortical to cortical core flake ratios for the testing (1:2.2) and excavation-phase assemblages (1:2.7) are comparable. Both reflect a preponderance of cortical core flakes, which are produced in the earlier stages of core reduction.

The mean length (40.0 mm), width (35.7 mm), thickness (12.7 mm), and weight (31.3 g) of whole core flakes in the testing-phase assemblage are consistently larger than the means for core flake whole measurements in the excavation-phase assemblage. These differences may reflect the recovery of more later-stage reduction debris in the excavation phase.

Site Summary

LA 61287 was a surface artifact scatter with features identified by test excavation and confirmed by excavation. Repeated occupations are indicated by the two thermal features and the dispersed, low-density artifact scatter. The pottery indicates a Coalition or Early Classic period occupation. The radiocarbon date suggests that an early occupation is possible, though adjustment of the date for old wood places it in the Late Developmental or Early Coalition period. The two thermal features are morphologically different and separated by 27 m, indicating they were left by different site occupants. While these two features suggest two occupations, the range of chipped stone artifacts and the dispersed distribution observed during testing indicate that more than two occupations may be represented. The different features and dispersed but relatively diverse artifact assemblage are typical of a site created by accretion or accumulation of materials left by small groups engaged in diurnal foraging. The hand tools and metate fragment indicate that processing was geared to reducing or rendering fibrous or coarse materials for transport, rather than immediate consumption. LA 61287 was a foraging camp used sporadically and occupied for short periods of time. It was situated to exploit the floral resources of Arroyo Gallinas and its major tributary drainages.

LA 61289

LA 61289 was originally test excavated by Wolfman et al. (1989:33–34). It was between centerline stations 656+00 and 658+50 on the lower slope of a broad piedmont ridge that divides the Arroyo Gallinas and Arroyo de los Frijoles drainage basins. This gentle, (6- to 10-percent), southeast- to southwest-facing slope is heavily dissected by deeply incised first- and second-order drainages. The site was at an elevation of 2,067 m (6,780 ft), where soils of the deep Pojoaque-Panky Rolling association cap westward-tilting outcrops of the Tesuque formation.

The site scatter and feature areas were west of the centerline and extended beyond the right-of-way. The northern site limit was relatively stable, and near-surface features were exposed in a deflated area of gravelly, shallow, A1 soil. At the southern site limit, a deep, well-entrenched arroyo meanders through thick colluvial deposits and intermittent exposures of the Tesuque formation. This arroyo is the main channel for a number of first-order channels, including the arroyo that cuts through LA 61286, 50 m to the west. Thermal features exposed in arroyo banks outside the right-of-way between LA 61289 and LA 61286 are deeply buried. Their stratigraphic position suggests that the drainage basin that incorporates Area 2 of LA 61286 and LA 61289 was once a large, gently sloped swale with intermittent sandstone breaks. This gentle, protected swale was highly suited to seasonal occupation, as indicated by the evidence of repeated occupations over a long span of the Archaic period.

Excavation revealed 1 to 2 m thick deposits of Pojoaque-Panky Rolling C1ca and C2ca soil. The C1ca stratum was a 30 to 70 cm thick, gravelly sandy clay loam. It was massive, slightly hard, friable when moist, and sticky and plastic when wet with fine tubular pores. It contained 25 percent igneous gravel and disseminations of lime and numerous calcium carbonate nodules (Folks 1975:43). The lower C2ca stratum is a 60 cm to 5 m thick, massive sandy clay loam, slightly sticky and plastic when wet, with fine and very fine tubular pores, 15 percent igneous gravel, disseminations of lime, and occasional calcium carbonate blotches (Folks 1975:43).

Erosion channel formation is aided by the sparse ground cover and the loose structure of the Pojoaque Rough Broken Land association. Vegetative cover is sparse to moderate, with grasses, prickly pear, narrowleaf yucca, and a sparse to moderately dense overstory of piñon and juniper.

Preexcavation Description

LA 61289 extended 35 m north-south by 50 m east-west across the slope (Fig. 100). There were two possible hearths that appeared deflated and consisted of stained soil and fractured cobbles. The debitage included 15 items and 2 cores. Material types consist of Tecolote chert, Pedernal chert, and other chert varieties. No utilized flakes were noted. One sherd of an unidentified corrugated ware was found (Wolfman et al. 1989:33–35).

Two features were identified by surface stains of charcoal-infused soil and associated fire-cracked rock. Feature 1 appeared to be 50 cm across and only 8 cm deep. Feature 2 was 60 cm long by 53 cm wide and 23 cm deep. Both features contained a mixed primary and secondary deposit with potential for paleobotanical and C-14 samples. No artifacts were recovered from the features.

The presence of cores and the wide range of lithic reduction stages represented suggests the use of locally available lithic materials for expedient flake manufacture. No wear was observed on these flakes, and their use cannot be determined. The hearths suggested use of the site as a temporary camp. A Coalition or Early Classic period occupation was suggested by corrugated pottery.

Excavation Methods

Reexamination of the site surface, erosion channel, and arroyo cuts within the right-of-way revealed

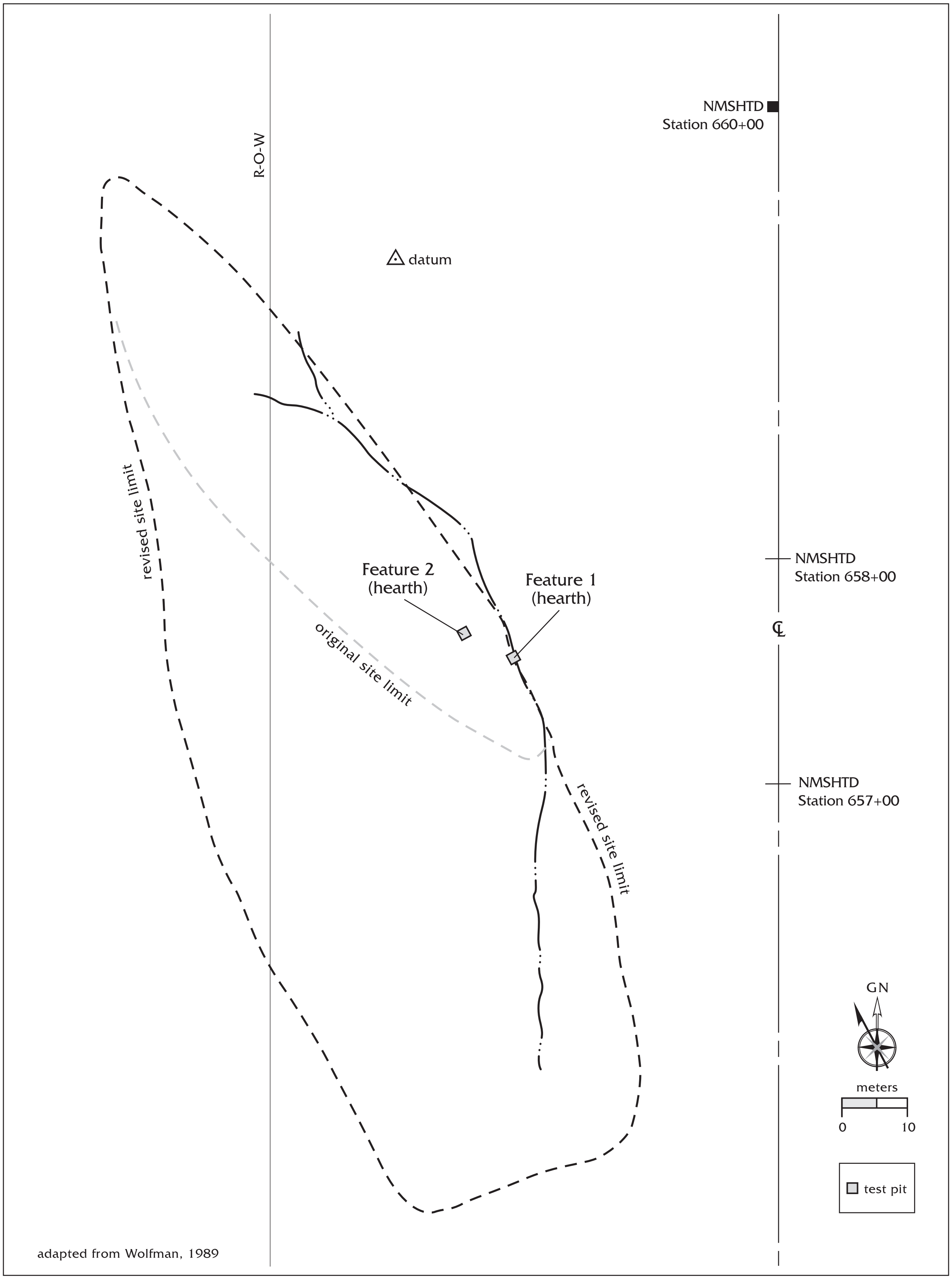


Figure 100. Old and revised site limits of LA 61289.

LA 61289 to be more extensive than determined during testing. Site limits were expanded to 75 m north-south by 30 m east-west, covering 2,250 sq m (Fig. 100). Excavation began in the Features 1 and 2 cluster at 115N/36E, southwest corner, which was also the focus of the testing phase (Fig. 100). As the excavation progressed and our search radius expanded, we identified one more area with buried cultural deposits exposed in the east wall of the arroyo that formed the southern site boundary (Fig. 101). This area, at 65N/38E, displayed an intermittent 28 m long charcoal-infused soil stain that extended to the west beyond the right-of-way limit. Depending on the condition and height of the arroyo bank, the stain was visible near the surface and as deep as 85 cm below the top of the arroyo bank. Cobble concentrations appeared to be collapsed hearth linings. These collapsed cobble features were associated with manos, metate fragments, and core-reduction debris. The exposed deposits represented a repeatedly occupied locale.

The 115N/36E area incorporated Features 1 and 2, which were identified during the test excavation. The features were relocated, and a 5 by 12 m area was surface-stripped, removing 8 to 15 cm of topsoil. Artifact density was very low, but the features were relatively intact. The features were excavated and recorded following standard project methods. Paleobotanical and C-14 samples were recovered from both features.

The main excavation area included the previously undocumented cultural deposit, exposed in the banks of an arroyo that drains what was the south site limit. Excavation focused on determining the horizontal and vertical extent and condition of the cultural deposit. The cultural deposit and features were exposed in gently sloped to vertical portions of the east arroyo bank. The site grid system was expanded into the 65N/38E area to include the newly found cultural deposit (Fig. 102). This allowed the piece-plotting of surface artifacts associated with the feature cluster, surface stripping of areas with exposed deposits, and deep excavation into the arroyo bank to expose the cultural deposit.

Excavation began in the 59–63N/36–41E area, where collapsed features were associated with artifacts and charcoal-infused soil. Where the cultural deposit was exposed on the bank, the surface artifacts were piece-plotted and collected. The topsoil was removed and screened through

Figure 101. Arroyo containing exposed middle and early Archaic cultural deposit and features, LA 61289.

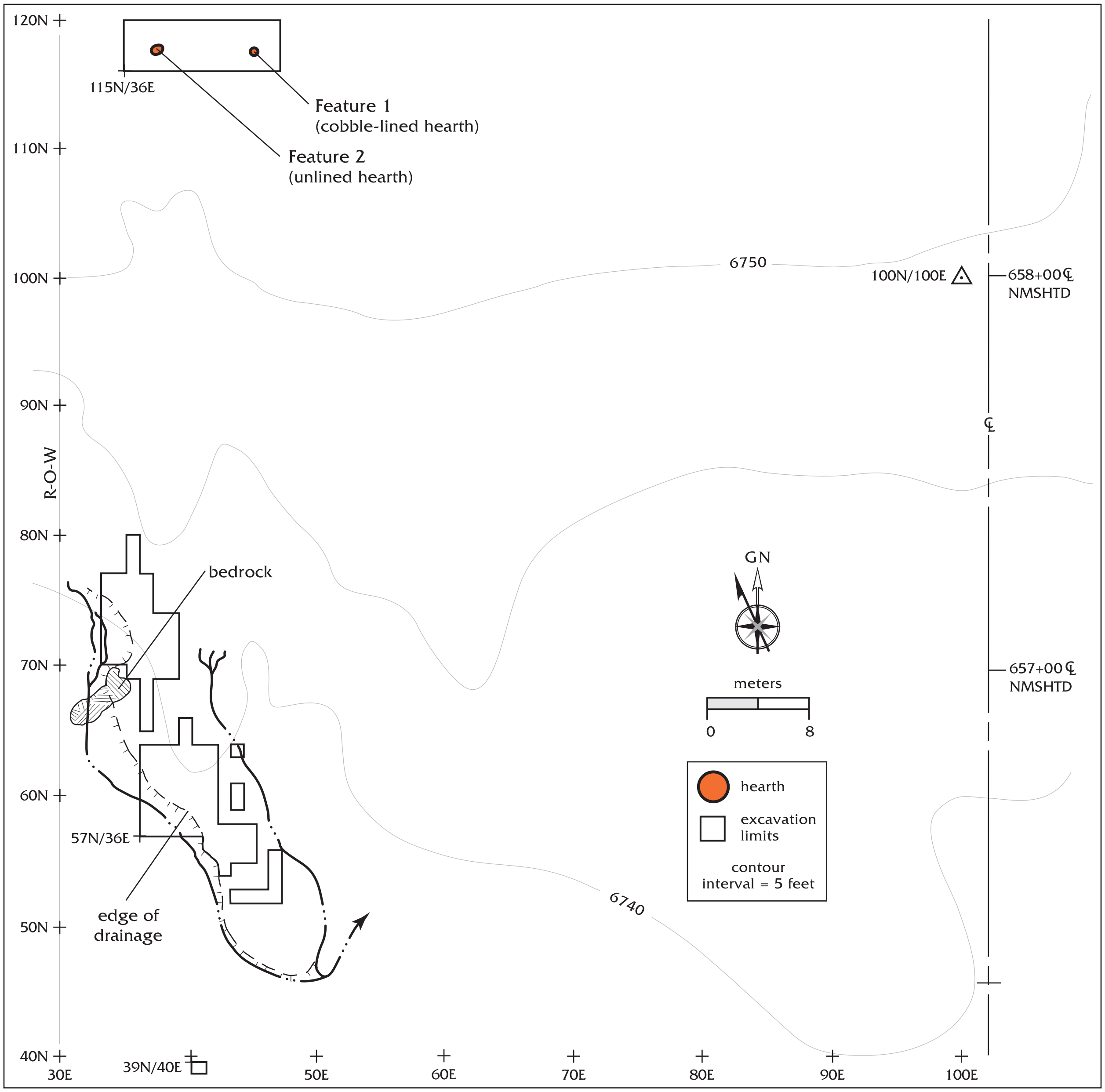


Figure 102. Excavation area, LA 61289.

1/8-inch screen. In the western grids, 36–38E, the cultural deposit had been removed by erosion, exposed on the surface or within 5 cm of the surface. In the eastern grids, 39–41E, the cultural deposit was buried from 10 to 100 cm below the modern ground surface by thick layers of low-energy, sandy loam colluvium (C1ca). This overburden was removed in 10 cm levels to the top of the cultural deposit and screened through 1/4-inch mesh. Once the top of the cultural deposit was exposed in the whole 5 by 6 m area, the features were excavated.

Feature excavation and documentation followed the standard project methods. Excavation revealed 13 features and evidence of reoccupation in the form of feature dismantling and the incorporation of metate fragments into roasting pit walls. Excavation also revealed intensive rodent burrowing and dens within and between features. This rodent intrusion had severely mixed the cultural deposit and truncated noncobble-lined feature walls. Most of the rodent disturbance was upslope, away from the arroyo edge and lower bank area.

While the 59–63N/36–41E area was under excavation, two more exploratory areas were established. A 7 by 4 m area at 70N/33E, southwest corner, was surface-stripped, revealing no surface cultural deposit. A 2 by 4 m area was excavated where cobbles were exposed at the intersection of the gentle slope and the bottom of the arroyo channel. Along the channel edge, 5 to 80 cm of low- and high-energy sandy loam and coarse sand were excavated in 10 and 20 cm levels to the top of the cobbles. At a depth of 80 cm, the presence of water-deposited sand meant that the arroyo had meandered, leaving a coarse sand that capped the occupation surface and enveloped the cobble-lined thermal features. Low artifact counts in this area may reflect the depositional environment more than the activities that were associated with the features.

Excavation around the cobbles revealed five intact cobble-lined roasting pits excavated into the scoured remnant of an old occupation surface. These pits were associated with a 5 to 15 cm thick cultural deposit that capped an earlier occupation. To more completely expose the cultural layer, a 2 by 4 m area to the east and upslope from the original 2 by 4 m area was excavated. The noncultural overburden was removed without screening to the top of the charcoal-infused cultural deposit. This cultural deposit was similar to the 59–63N/36–41E area deposit because it was heavily churned by rodent disturbance and the eddies from arroyo flow. The cultural deposit was removed in 10 cm levels and the soil screened through 1/8-inch mesh.

A 3 by 1 m trench, 77–79N/35E, southwest corner, was excavated at the northwest limit of the cultural deposit within the right-of-way. Forty to 60 cm of overburden was hand-excavated in 10 and 20 cm levels. No cultural materials or deposit were encountered, indicating the units were outside the dark, charcoal-infused stain that covered the area to the south.

At the southern extent of the stain, a L-shaped trench was excavated in 1 by 1 m units. The units were excavated in 10 cm levels to expose the cultural deposit. Very lightly stained charcoal-infused soil was encountered. However, the artifact counts were low, and no features were exposed. The light staining was interpreted as slope wash from the main occupation area, which was only 3 to 5 m upslope. The depth at which the cultural deposit occurred was used as a guide for the backhoe excavation that followed.

Excavation revealed that a deep, natural colluvial layer capped the cultural deposit east of the arroyo bank. This layer yielded few artifacts and no features during systematic excavation. To more fully expose the limit of the cultural deposit, the overburden was removed with mechanical equipment. Before the backhoe excavation, all the major exposed excavation walls were profiled. Pollen samples were collected from the major strata in the east wall of 60N/42E. Elevation profiles were mapped across the excavation area to document the topographic relationship between the modern and old ground surfaces. Figure 103 shows the main excavation area before backhoe excavation.

A backhoe was used to remove the colluvial overburden from the top of the cultural deposit. Figure 104 shows the extent of the backhoe work, the limits of hand-excavation, and feature locations. Within a 25 by 7 m area, 30 to 85 cm of overburden was removed to within 5 to 20 cm of the cultural deposit. The grid system and subdatums were reestablished. Excavation then focused on excavating the exposed features and determining the limits and condition of the cultural deposit.

Hand-excavation revealed Features 3, 21, 27, and 29 in the southern portion of the excavation area. Other excavation areas revealed a highly disturbed 5 to 10 cm thick cultural deposit that thinned to the east and disappeared at the erosion channel parallel to the east side of the excavation area. Because of erosion and rodent disturbance, the periphery of the cultural deposit had limited integrity. Consequently, excavation was halted without excavating 100 percent of the area exposed by the backhoe.

Nineteen auger holes were placed northeast of the backhoe excavation area. Within this area, sandy loam with charcoal flecks was encountered 85 to 120 cm below the modern ground surface. This depth corresponded well with the cultural deposit defined by the excavation. Based on the auger data, the cultural deposit was projected to the southwest corner of the 77N/40E unit, leaving a 4 by 3 m area that was not intensively investigated. Given the diffuse deposit observed in the auger holes and the increased rodent disturbance along the east perimeter of the

Figure 103. Main excavation area of LA 61289 before backhoe excavation, looking northwest.

deposit, data potential was considered to be low in that 12 sq m area.

Excavation of twelve 1 by 1 m units into the cultural deposit between and peripheral to the intensively examined areas also revealed limited data potential. The cultural deposit was discontinuous and appeared to have been subjected to channel erosion along and through the east perimeter. Few artifacts were recovered, and no features were exposed. Because of the low yield in the intervening and peripheral areas, no further work was conducted.

Finally, on the west side of the arroyo, exposed in an eroded remnant of the bank, a dense concentration of charcoal-infused soil was observed. The stain was surface-stripped in a 2 by 2 m area at 39N/40E, southwest corner, revealing two deflated thermal features (Features 28 and 30). The features were excavated through a thin mantle of sandy loam into the decomposing sandstone bedrock. Their stratigraphic position showed that bedrock was near the surface at the time of occupation and was incorporated into camp structure. This area was at the same level as the main excavation area features.

Excavation Results

The excavation of LA 61289 revealed a larger and more complex site than was defined by test excavation. The surface features that were partly excavated during testing were completely excavated. Examination of the larger area including the arroyo to the south of the Feature 1 and 2 cluster revealed an extensive and deeply buried Early and Middle Archaic deposit that included 29 features and associated artifacts representing at least four occupation episodes (Fig. 102). The site limits extended beyond the west right-of-way onto private property for an undetermined distance.

Six main strata were defined in the profiles of the excavation unit walls. Stratigraphic profiles are shown in Figure 105.

Stratum 1 was a 3 to 8 cm thick, dark brown (10YR 4/3), fine sandy loam, with a weak, subangular blocky structure, high organic content, 5 to 10 percent gravel, and an abrupt and smooth boundary. This was the topsoil that covered the excavation area.

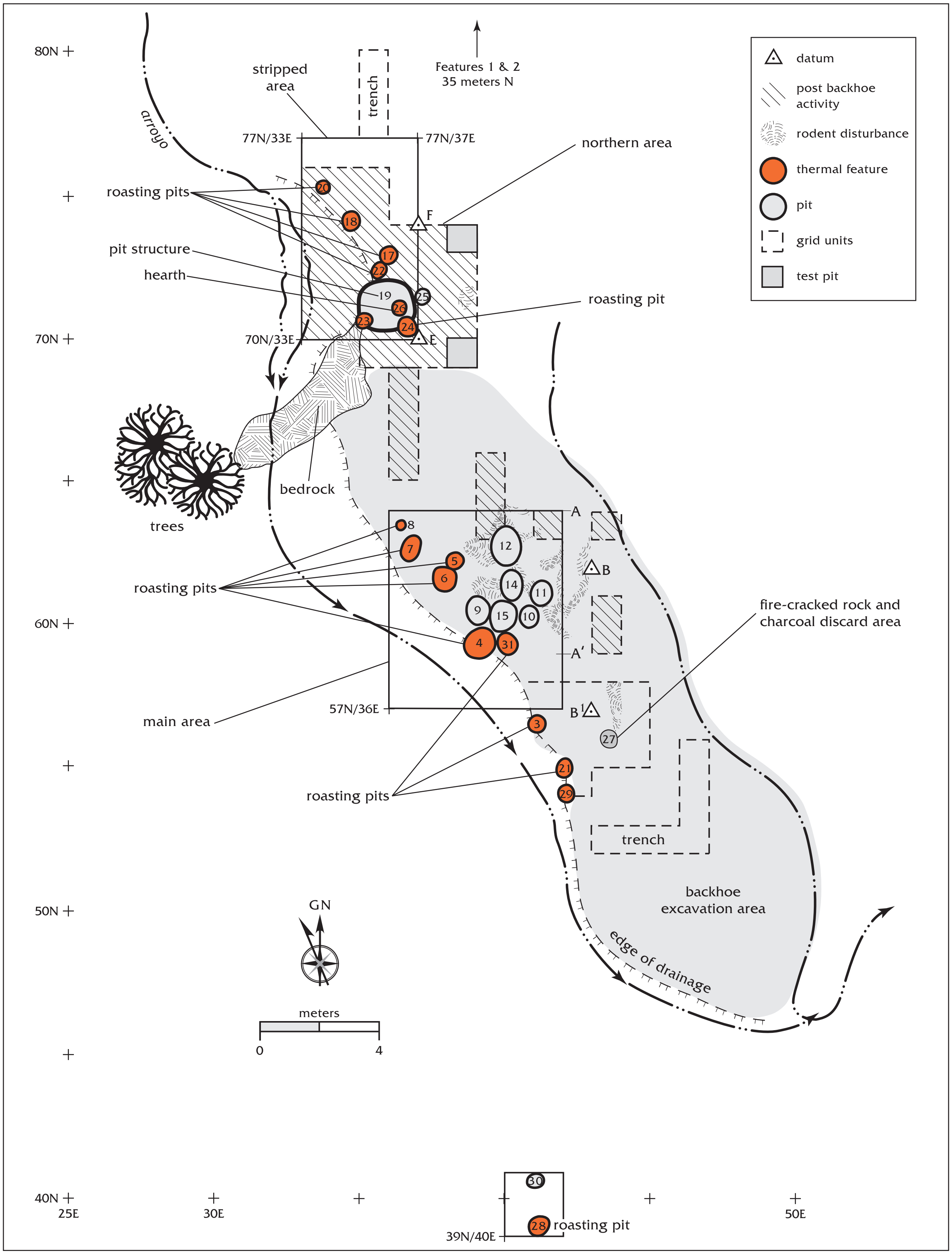


Figure 104. Main excavation area of LA 61289, showing featurevs and limits of hand and backhoe excavation.

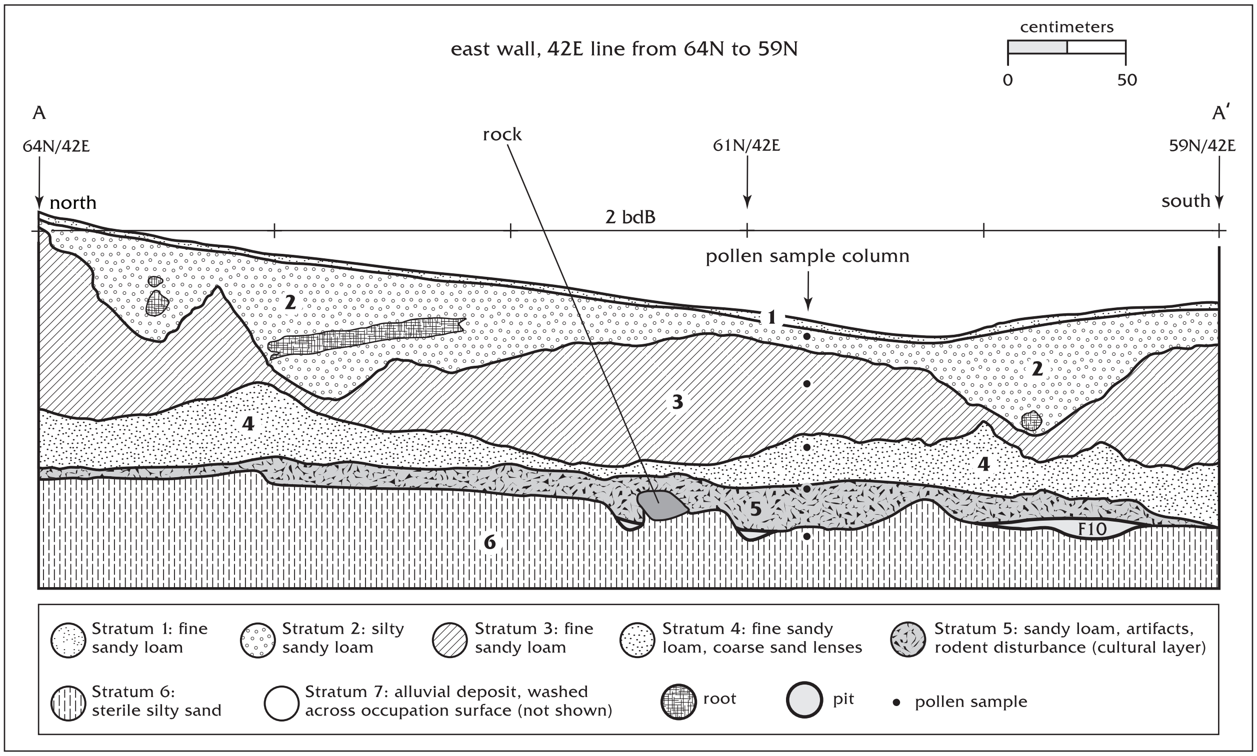


Figure 105. Representative stratigraphic profile, LA 61289 (59–64 N along the east wall of 42E).

Stratum 2 was 15 to 50 cm thick, brown (10YR 5/3), medium sandy loam, nonplastic when moist, weakly structured, heavily root intruded, with an abrupt and wavy boundary. This relatively recent deposit contained the Ancestral Pueblo features (Features 1 and 2) and a highly dispersed artifact distribution that may represent on a small scale the almost imperceptible Latest Archaic use of the area.

Stratum 3 was a 5 to 50 cm thick, light brownish gray (10YR 6/2), fine sandy loam, slightly plastic when wet, with moderately abundant carbonate filaments, 5 percent gravel, and a clear and wavy boundary. This stratum yielded a few chipped stone artifacts from a very ephemeral later occupation.

Stratum 4 was a 5 to 35 cm thick fine sandy loam with intermittent coarse sand lenses, a weak blocky structure, nonplastic when moist, sparse carbonate filaments, 1 to 5 percent gravel, and an abrupt and wavy boundary.

Stratum 5 was similar to Stratum 3, except it lacked the abundant carbonate filaments, and it was dark gray (10YR 5/1). Stratum 5 was 5 to 25 cm thick and thinned out to the east and at the south end of the excavation area. The cultural deposit was heavily rodent disturbed, but it contained fire-cracked rocks, discarded cobbles (possibly from stockpiling), chipped stone debris, and whole and fragmentary ground stone artifacts.

Stratum 6 was a brownish yellow (10YR 6/6) coarse sand with a weak, blocky structure and 5 to 10 percent pea-sized gravel.

Stratum 7 was the alluvial deposit that overflowed the arroyo channel and washed across the occupation surface. This stratum occurred along the east arroyo channel and primarily in the 70N area.

Strata 1 through 4 are naturally deposited strata that accumulated through creep and overland flow. Depositional buildup in this area resulted from a decrease in the slope angle as it joined the arroyo channel that drained the sandstone breaks and hillslopes to the north and east. Excavation area profiles exhibited wavy boundaries between strata, but no definite evidence of rill and channel formation. The hypothesis that the site area was geomorphologically stable for most of the period following site abandonment is supported by the absence of rills and channels. Stratum 6, with its coarse-grained, poorly cemented sand evidences the movement of water within the channel and the overflow of water onto the slope during heavy rainfall. This overflow did not occur at a high velocity or the cultural deposit would have been scoured and washed away. Instead, the channel or flow may have gently meandered, removing colluvial deposits, which were replaced and stabilized by creep and overland flow.

Stratum 5 was the cultural deposit that contained all features, cultural material, and other occupation evidence along the arroyo. Stratum 5 was easy to define but difficult to follow because of the severe rodent disturbance and mixing caused by water erosion, as in Stratum 6. Excavation exposed an occupation surface that spread across a gentle colluvial slope. This early slope experienced considerable aggradation consisting of successive layers of sandy loam. This colluvial deposit preserved the cultural deposit and cobble-lined features. Auger holes to the north of the occupation area show that the occupation surface gradually sloped up to Features 1 and 2 and that the capping colluvial deposit thinned to 20 cm thick only 10 m northeast of the main excavation area. The greater thickness of the colluvial deposit capping the Middle Archaic component indicates that a low, gently sloped expanse, perhaps adjacent to a spring bed or water source, was a favored base camp location. The elongated charcoal-stained cultural deposit east of the arroyo and linear feature distribution suggests an upslope activity and discard pattern that was directed away from a potential water source.

Temporal Components

Three components of different age were identified stratigraphically and confirmed by radiocarbon dating. These components represented occupations during the Early and Middle Archaic and Ancestral Pueblo periods. Depending on the location of each component on the slope, features and cultural materials were recovered from the surface to 1.0 m below the surface. The main excavation area yielded stratified cultural deposits of Early and Middle Archaic age. Hand and mechanical excavation exposed 31 thermal and unburned pit features (Table 27). The Early Archaic component had one large, unlined thermal feature, Feature 29. The Middle Archaic component included 28 features that have been placed in seven classes based on morphology, content, and inferred function. These classes are pit structure (Feature 19), unlined pit (Features 2, 9–12, 14–16, 23, 25, 28, and 30), cobble-lined hearth or roasting pit (Features 1, 3–7, 17, 18, 20–22, 24, and 31), slab and cobble-lined roasting pit (Feature 8), thermal feature with basal cobble-lining (Feature 26), fire-cracked rock concentration (Feature 27), and fire-cracked rock and charcoal discard area (Feature 27). Features 1 and 2 date to the Ancestral Pueblo period.

Early Archaic

The Early Archaic component was an occupation level distinguished by a 3 to 6 cm thick charcoal-infused stratum that appeared to be a discontinuous layer within Stratum 5, the main Middle Archaic deposit. This layer was observed in 53–55N/42–44E at 1.0 m below the modern ground surface. Excavation of a 2 m north-south by 1 m east-west area revealed a shallow thermal feature filled with charcoal-infused soil (Feature 29). This feature was 15 to 20 cm below the Middle Archaic horizon, which made up the majority of Stratum 5. Limited inferences can be made from this occupation level because a small area was investigated and it yielded minimal cultural materials.

Feature 29 was a large, basin-shaped, fire-cracked rock and charcoal concentration. It measured 90 cm in diameter and 14 cm deep (Figs. 106 and 107). The feature fill was a grayish brown to very dark gray (10YR 5/2–3/1) silty sandy loam. This layer was capped with coarse-grained yellowish brown (10YR5/6) sand that appeared to be an alluvial deposit. One obsidian biface fragment was recovered from the feature. Ethnobotanical analysis identified a relatively high number of charred *Chenopodium* and *Suaeda* seeds. *Suaeda* is commonly associated with seeps or other wet places.

One theory holds that the mid to lower slopes of the Santa Fe River tributary arroyos may have supported ephemeral seeps or springs that were habitually exploited by Archaic populations during seasonal rounds. LA 61289, with its sandstone outcrops and clustered feature distribution, could have been such an area and supported minor exploitation of *Suaeda*. Wood charcoal of piñon and juniper was present in

Table 27. Features, LA 61289

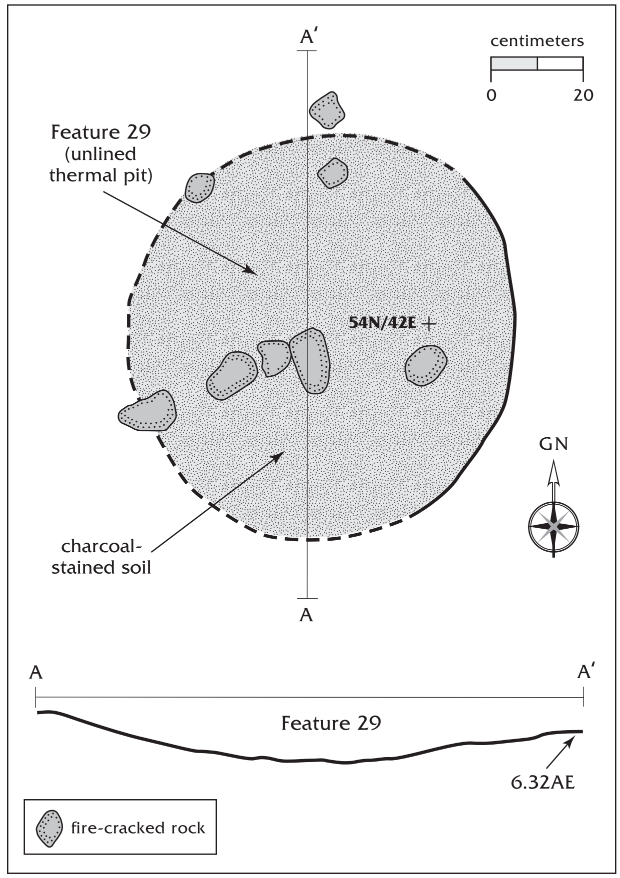
Feature No.	Type	Grid	Dimensions (cm)	Artifacts	Radiocarbon Age (B.P.)
1	Cobble-lined roasting pit	116-117N/43-44E	100 diameter by 40 deep		560±60
2	Unlined pit	117N/38E	80 by 78 by 26 deep		910±50
3	Cobble-lined roasting pit	57-58N/40E	60 diameter by 27 deep	lithics (2)	
4	Cobble-lined roasting pit	59-60N/38-39E	~50 diameter by 45 deep	lithic(1)	
5	Cobble-lined roasting pit	61N/37-38E	50 by 40 (partial) by 18 deep	lithic (1); mano (1)	
6	Cobble-lined roasting pit	61-61N/38-39E	90 by 70 by 34 deep	metates (2)	
7	Cobble-lined roasting pit	62-63N/ 36-37E	40 diameter by 15 deep	lithic (1)	
8	Cobble/slab-lined hearth	63N/37E	30 diameter by 15 deep		
9	Unlined pit	60N/38-39E	70 by 60 by 22 deep		
10	Unlined pit	59-60N/41-42E	74 by 60 by 18 deep		
11	Unlined pit	60-61N/41E	78 by 60 by 20 deep	lithics (5)	
12	Probable roasting pit	62-63N/39-40E	150 by 110 by 24 deep	lithics (6)	
14	Unlined pit	61N/39-40E	86 diameter by 28 deep	lithics (4)	
15	Unlined pit	60N/39-40E	62 by 52 by 26 deep		
16	Unlined pit	62-63N/38-39E	60 diameter by 13 deep		
17	Cobble-lined roasting pit	72-73N/35-36E	53 diameter by 40 deep	ground stone (1)	4540±40
18	Cobble-lined roasting pit	73-74N/34E	60 diameter by 32 deep		
19	Possible pit structure foundation	70-72N/34-36E	220 (est.) by 170 by 5 deep	lithics (5)	
20	Cobble-lined roasting pit	75-76N/33-34E	70 by 40 by 16 deep		
21	Cobble-lined roasting pit	55N/41-42E	54 diameter by 30 deep	manos (2)	
22	Cobble-lined roasting pit	71-72N/35E	56 diameter by 46 deep	lithic (2); mano (1)	4450±80
23	Unlined pit	70N/35E	50 by 33 by 13 deep		
24	Cobble-lined roasting pit	70N/36E	44 diameter by 44 deep	lithic (1); mano (1)	
25	Unlined pit	71N/37E	30 diameter by 4 deep		
26	Hearth within Feature 19	70-71N/36E	44 diameter by 22 deep		4650±100
27	Discard area	55-56N/43-44E	90 by 50 by 5 deep	lithics (6)	
28	Unlined pit	39-40N/41E	65 by 60 by 26 deep	mano (1)	
29	Unlined pit	53-54N/42E	90 diameter by 14 deep	lithics (3)	5450±200
30	Unlined pit	40N/40-41E	77 by 57 by 12 deep		
31	Collapsed cobble-lined hearth	58-59N/40E	40 by 30 by 10 deep	lithics (2)	

relatively equal proportions. Pollen data show no juniper and low piñon concentrations, indicating that conifer stands were used for fuel and clustered in a parkland setting. The interesting contrast between the pollen and wood charcoal data suggest a grassland/parkland environment that had a greater variety of plants than are present today. The virtual absence of conifer pollen in LA 61289 samples suggests that fuel sources were more distant 4,000 to 5,000 years ago.

Radiocarbon dating of wood charcoal recovered from Feature 29 yielded a calibrated two-sigma range of 4715 to 3800 BC, placing the use of this feature in the Early Archaic, before the main occupation by Middle Archaic populations. This date is supported by the lower stratigraphic placement of Feature 29.

Early Archaic components in the Northwest Santa Fe Relief project tend to be small and of limited extent. They are also commonly associated with Middle and Late Archaic occupations but are more deeply buried. The radiocarbon date suggests occupation in the middle of the Early Archaic span. The date range indicates Jay or Bajada phase occupation using the Oshara tradition framework. The lack of hunting implements or tool-making debris indicates that this occupation focused on foraging and plant gathering. The large and shallow feature form may have been best suited to parching or light roasting of fruits or nuts. The charred annual seeds indicate a late summer or fall occupation. These weedy plants may have been consumed or used as linings for the processing of other more substantial fruits or plant parts. So few Early Archaic components have been recognized in the Santa Fe area that each occurrence is important. Combined, the occupations suggest small-scale occupations by a few people geared to exploitation of plant resources in the piedmont hills and the tributary arroyo margins.

Figure 106. Plan and profile of Feature 29, LA 61289.



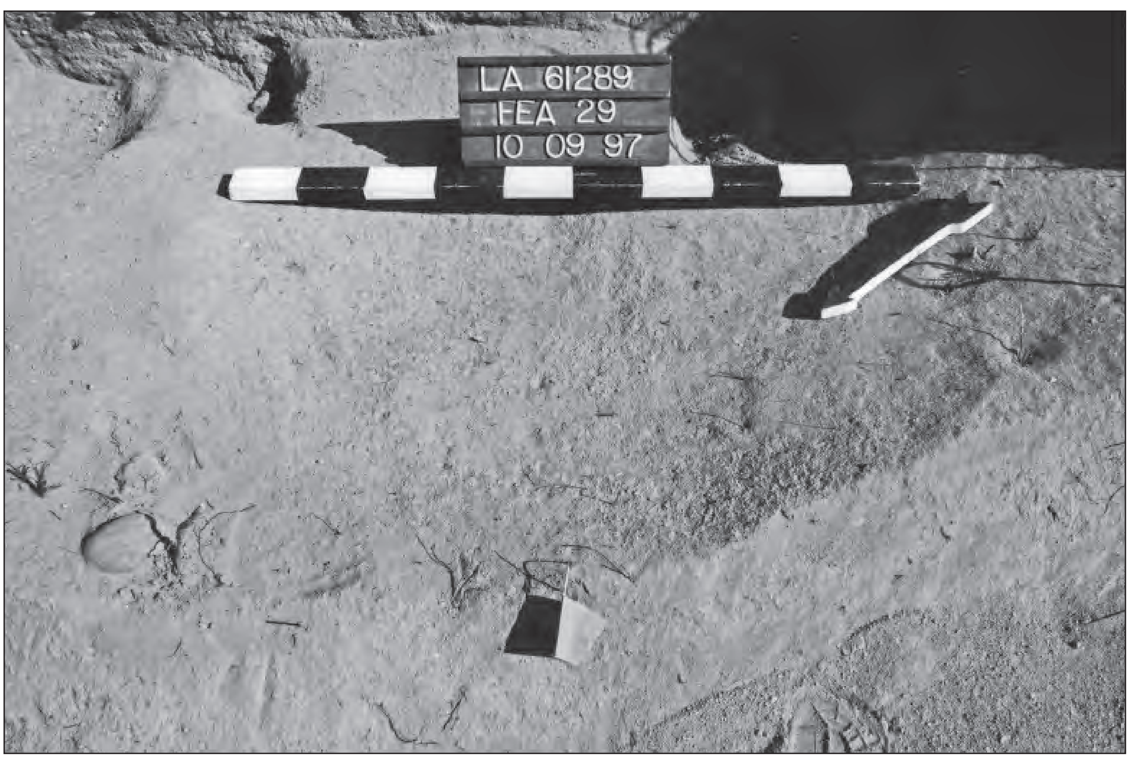


Figure 107. Feature 29, LA 61289.

Middle Archaic

Hand-excavation of 100 sq m within the main excavation area supplemented by an additional 60 sq m of backhoe excavation exposed a multicomponent Middle Archaic residential base camp and processing site that was occupied between 3363 to 3100 BC, two-sigma range (pooled estimate for four assays). All but Features 1, 2, and 29 probably date to the Middle Archaic period. Features included unique cobble-lined roasting ovens, unlined thermal features, and one pit-structure foundation. Spatial distribution of features and evidence of their dismantling and the reuse of discarded ground stone in feature construction is evidence that the 28 features were left from at least four occupation episodes within the estimated 260-year span. Stone artifacts were dominated by core-reduction debris from locally available raw materials and one-hand manos. See Badner and McBride (this report) for an analysis of pit features.

Pit-structure foundation. Feature 19, a possible pit-structure foundation or basin, was identified in the 70N area. This shallow circular depression measured 2.2 m long (east-west) and 1.7 m (north-south) by 10 cm deep (Figs. 108 and 109). This basin-shaped foundation was capped by a 50 cm thick layer of coarse-grained, poorly consolidated alluvial sand. The lower 15 cm of this layer attests to the initial reduction of the structure by arroyo flow and erosion. Actual wall heights could not be determined, but they were probably low and served as the base for a lean-to or wickiup-like superstructure. The presence of heavily charcoal-infused soil immediately below and mixed with the coarse alluvial sand was interpreted as evidence that the structure had burned. Unfortunately no superstructure elements were preserved, and their disintegration was surely accelerated by scouring and erosion during intermittent arroyo activity. No evidence of a prepared floor was observed. The floor level was defined by the vertical extent of the charcoal-infused fill.

Feature 26 was the only intramural feature that could be confidently associated with the structure occupation. This thermal feature may have functioned as a hearth. It was 44 cm in diameter and 16 to 22 cm deep. It was filled with charcoal-infused sandy loam mixed with charcoal flecks. No artifacts were recovered from within the feature.

Feature 26 yielded charcoal sufficient for radiocarbon dating. The sample yielded a calibrated two-sigma range of 3642-3098 BC. The pooled estimates for the four radiocarbon dates from this site indicated it was occupied in middle of this date range. This date range makes Feature 19 the oldest dated structure in the Santa Fe area and one of the oldest in the Northern Rio Grande. Feature 17, which was superimposed on the edge of Feature 19, has a similar, but later date range (cal. 3367–3098 BC two-sigma), indicating that Feature 17 was constructed 100 to 200 years after the abandonment of Feature 19.

Feature 19 was within a cluster of cobble-lined and unlined pit features (Fig. 108). Cobble-lined Features 17 and 22 are at the north perimeter, and Feature 24 is at the southeast perimeter of Feature 19. Their position suggests they were built on top of or next to the structure foundation after it was abandoned. The superpositioning of Feature 24 and proximity of Features 17 and 22 suggest that they postdate Feature 19. Feature 23, an unlined burned pit, is at the southwest perimeter of Feature 19. Placing a thermal feature at the perimeter of a brush structure would be impractical because of the extreme danger of fire. Some of the cobble-lined pits may be contemporaneous with Feature 19, but it is difficult to determine which ones. Feature 19 and some of the associated features may represent one component, but two other components may be represented in this area.

Unlined pits. Eleven unlined pits were uncovered during the excavation (Features 9–12, 14–16, 23, 25, 28, and 30; Figs. 110–119). These features had a mean length of 74 cm (30–150 cm). They had a mean width of 64 cm (30–110 cm), a mean depth of 19 cm (4–28 cm), and a mean area of 0.40 sq m (0.05 to 1.30 sq m). Obviously, the unlined pits exhibit a wide range of sizes that may reflect function, length of occupation, group size, or volume of resources that were processed. Feature outlines are split evenly between circular and oval. Feature profiles included four gentle basin, three with steep walls, and six with moderately steep basins. The fill within these features in most cases was a mixed primary and secondary deposit or secondary deposit. Considerable rodent burrowing and the possibility of feature dismantling reduced the

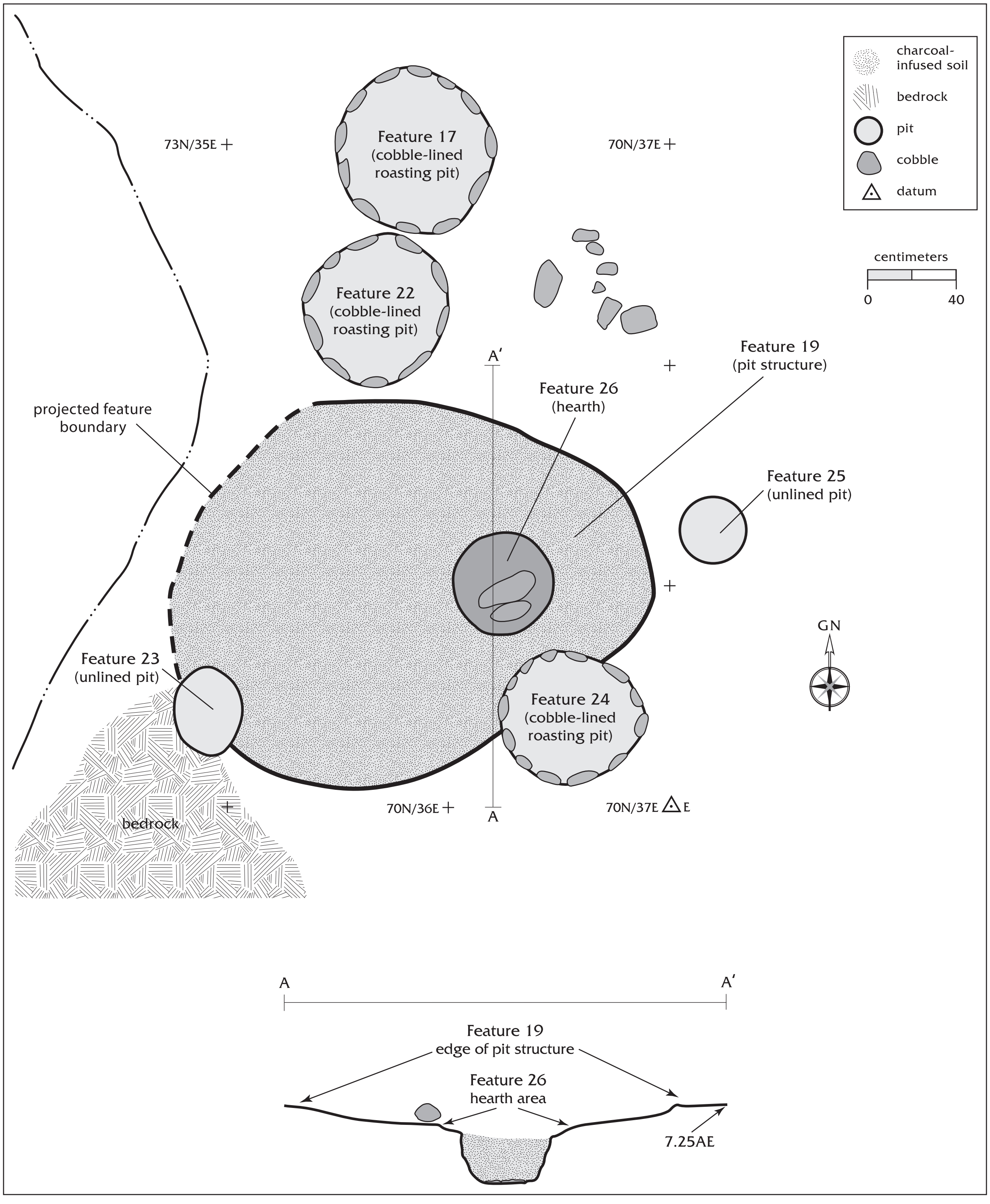


Figure 108. Plan and profile of Features 19 and 26, LA 61289.

Figure 109. Features 19 and 26, LA 61289.

integrity of the deposits. When feature walls and floors were examined, it became apparent that seven features were unburned, two had been burned, one was too disturbed by a channel cut to determine if it had been burned, and at least three showed signs of dismantling. Obviously, cobble-lined features that were dismantled would have left unlined pits with unburned walls and floor, since the native soil would have been protected by the cobble lining.

These pits were interspersed with cobble-lined roasting pits across the old occupation surface. Feature 25, an extramural unlined pit in the northern excavation area, may be associated with Feature 19. Feature 30 is spatially associated with Feature 28, which was a fire-cracked rock filled roasting pit. Potentially, these features were part of a facility used to make coals and heat rocks for stone boiling or basket parching.

Features 9, 10, 11, 12,14, and 15 clustered in the southern excavation area. They were associated with scattered fire-cracked rock and cobbles, a dark charcoal-infused level, and extensive evidence of animal burrowing. Determining feature limits versus rodent burrow limits and intrusions was difficult. However, it appears that this pit complex represents an occupation that preceded the construction of the intact cobble-lined hearths in the same excavation area but to the west. The abundant cobbles that are within or on the perimeter of the pits suggest that some of these unlined pits were dismantled cobble-lined pits and the rock was incorporated into the intact and later cobble-lined features. The unlined and cobble-lined pits have similar sizes and profiles, further supporting the observation that the some of the unlined pits were once lined.

Cobble-lined pits and cobble- and slab-lined pits. The 13 cobble-lined or cobble- and slab-lined roasting pits (Features 3–7, 17, 18, 20–22, 24, and 31) are unique among the Northwest Santa Fe Relief Route sites and among small sites north of the Santa Fe River (Figs. 120–138). These pits were lined from top to bottom with tightly packed tabular or split cobbles. In one case (Feature 8), friable slabs of Tesuque sandstone were used. The igneous and metamorphic cobbles ranged from 12–30 cm long by 10–23 cm wide by 3–10 cm thick. Attention to consistent cobble size and outline created a tightly lined oven or pit. Gaps between interior cobbles were rarely greater than 2 mm wide in any of the features. Feature profiles tended to be steep-walled, inverted cones. The greater diameter, at the top of the pit, was

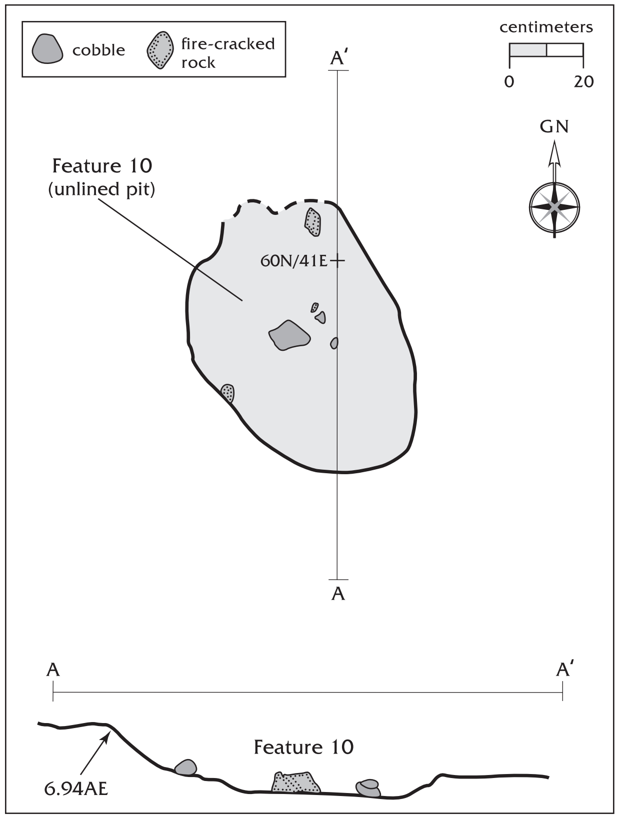


Figure 110. Plan and profile of Feature 10, LA 61289.

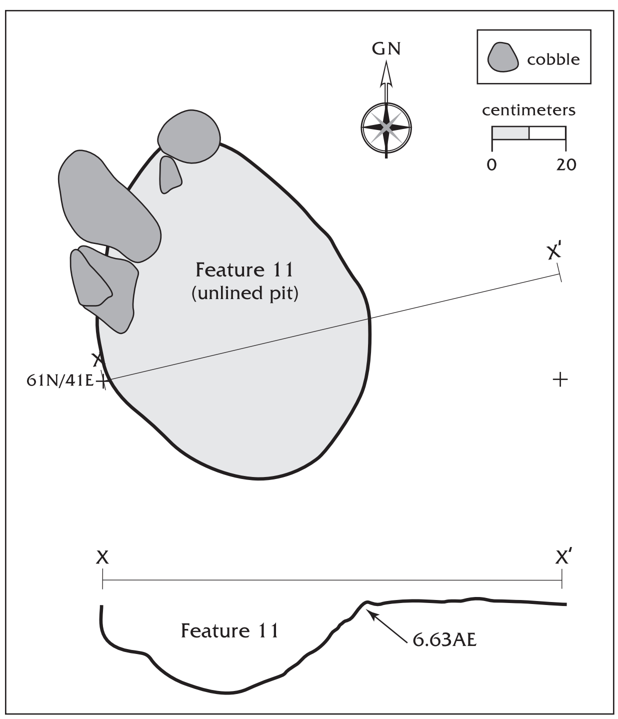


Figure 111. Plan and profile of Feature 11, LA 61289.

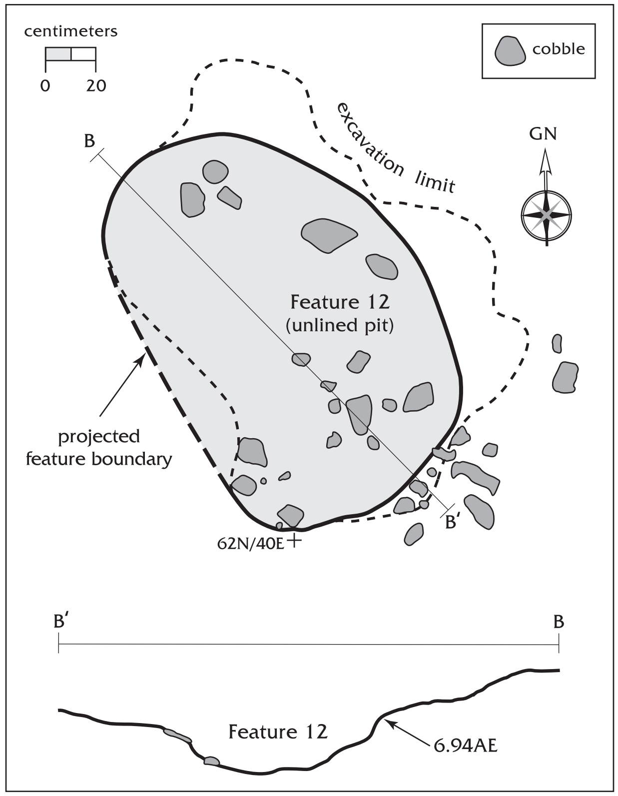


Figure 112. Plan and profile of Feature 12, LA 61289.

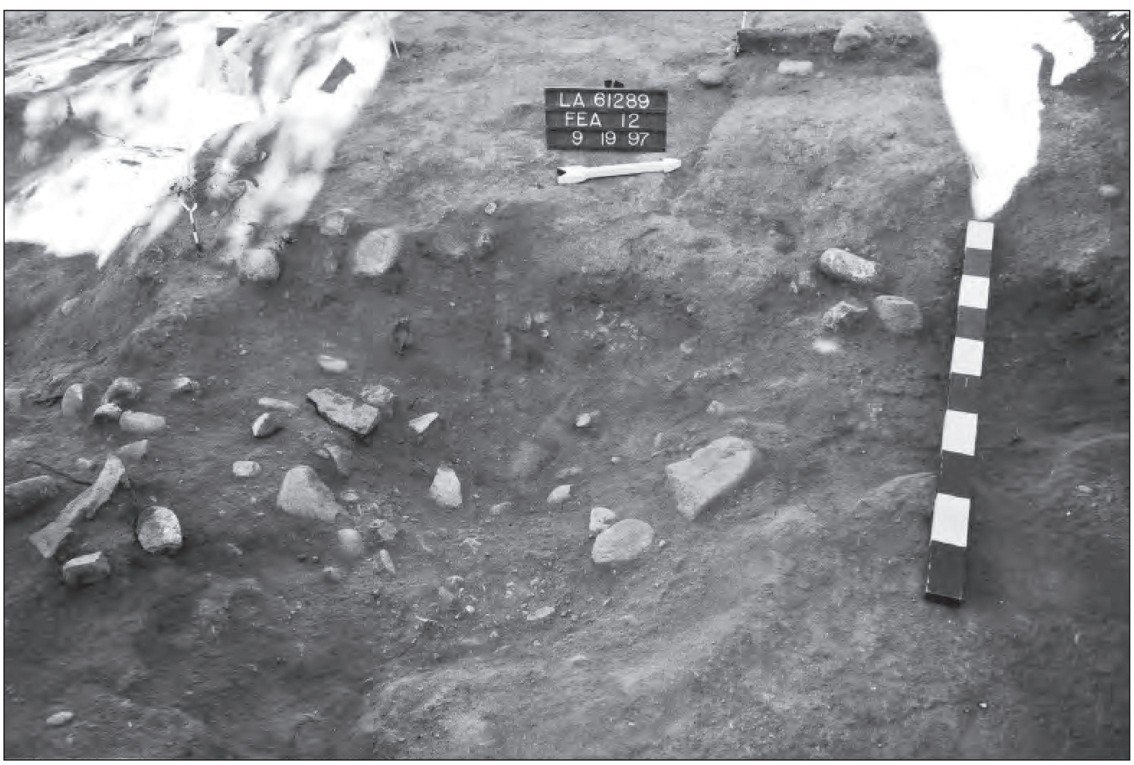


Figure 113. Feature 12, LA 61289.

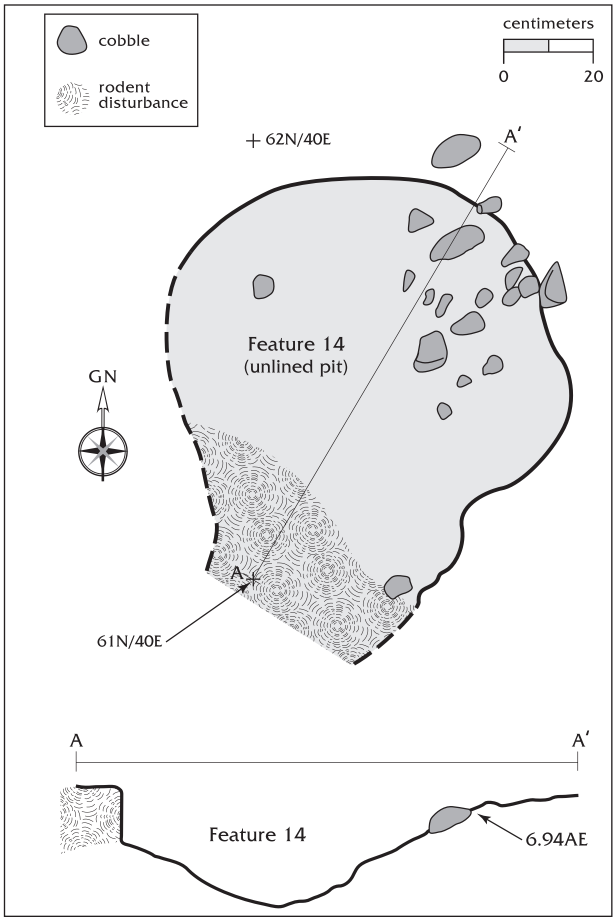


Figure 114. Plan and profile of Feature 14, LA 61289.

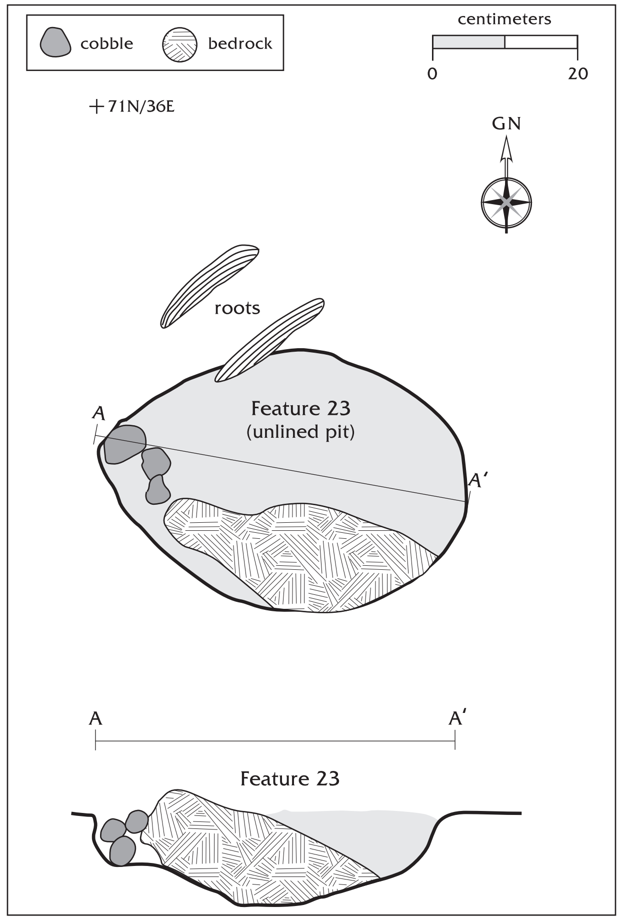


Figure 115. Plan and profile of Feature 23, LA 61289.

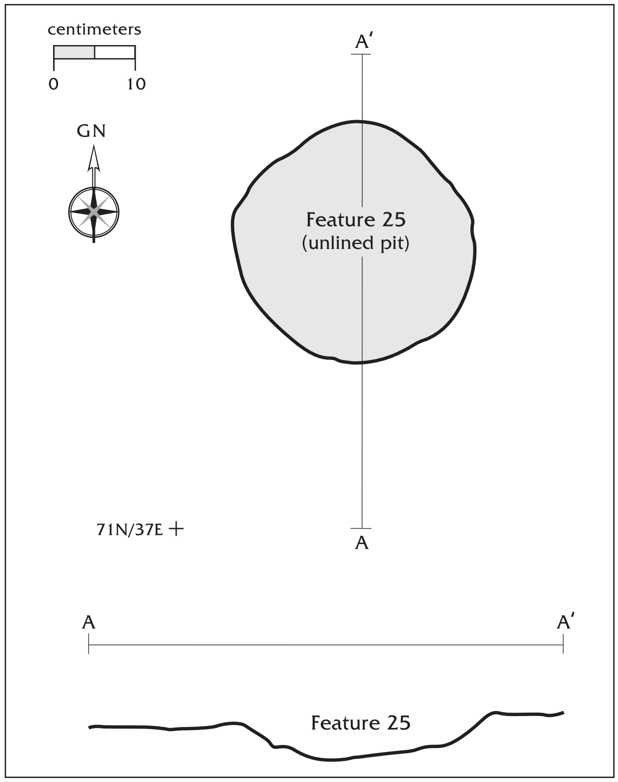


Figure 116. Plan and profile of Feature 25, LA 61289.

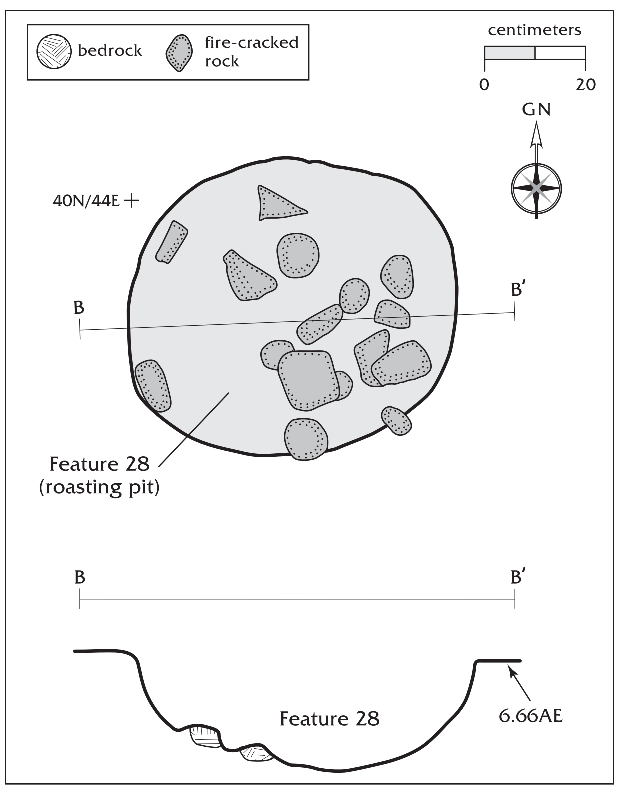


Figure 117. Plan and profile of Feature 28, LA 61289.

Figure 118. Features 28 and 30, LA 61289.

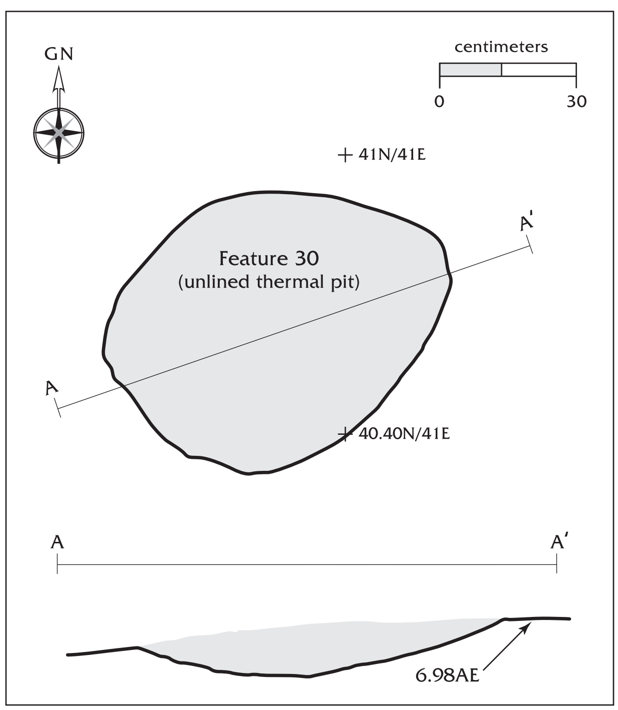


Figure 119. Plan and profile of Feature 30, LA 61289.

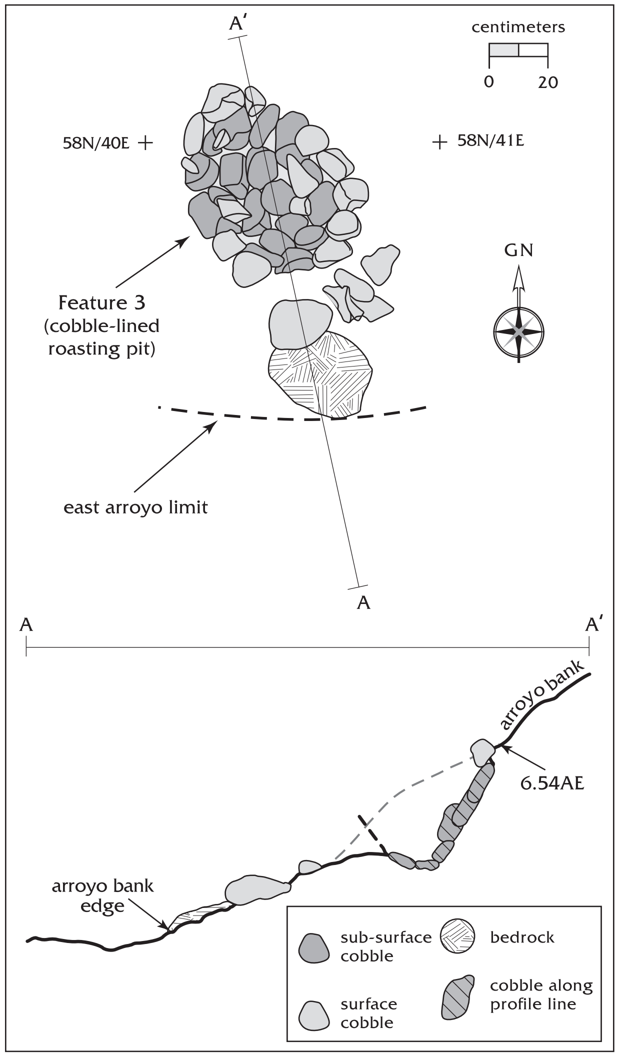


Figure 120. Plan and profile of Feature 3, LA 61289.

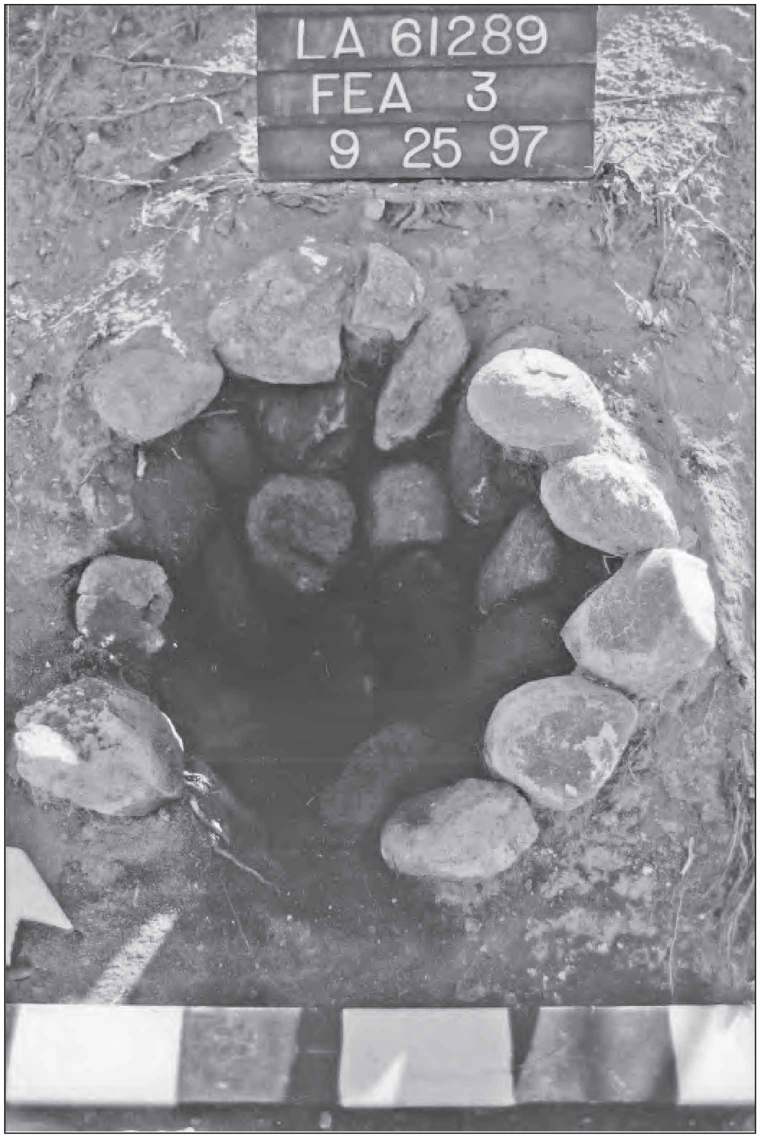


Figure 121. Feature 3, LA 61289.

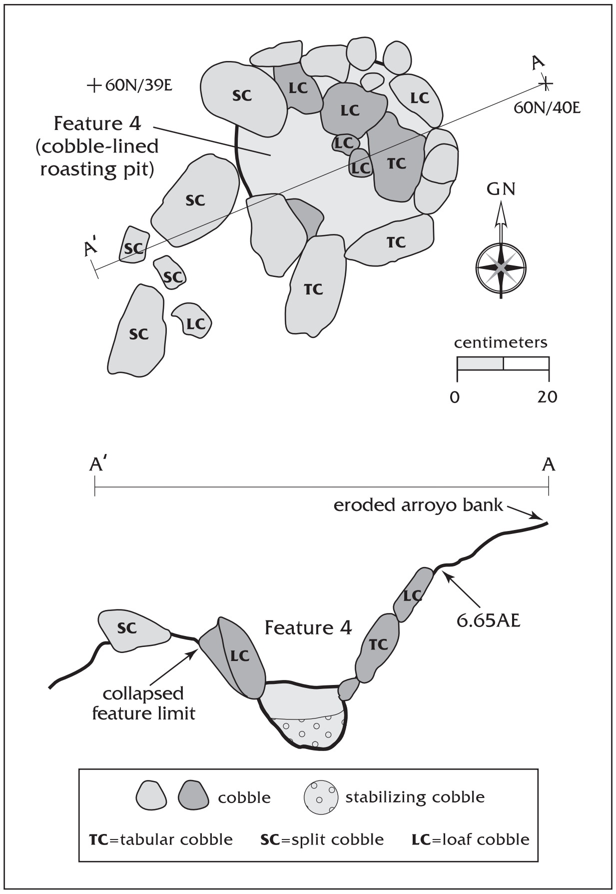


Figure 122. Plan and profile of Feature 4, LA 61289.

Figure 123. Feature 4, LA 61289.

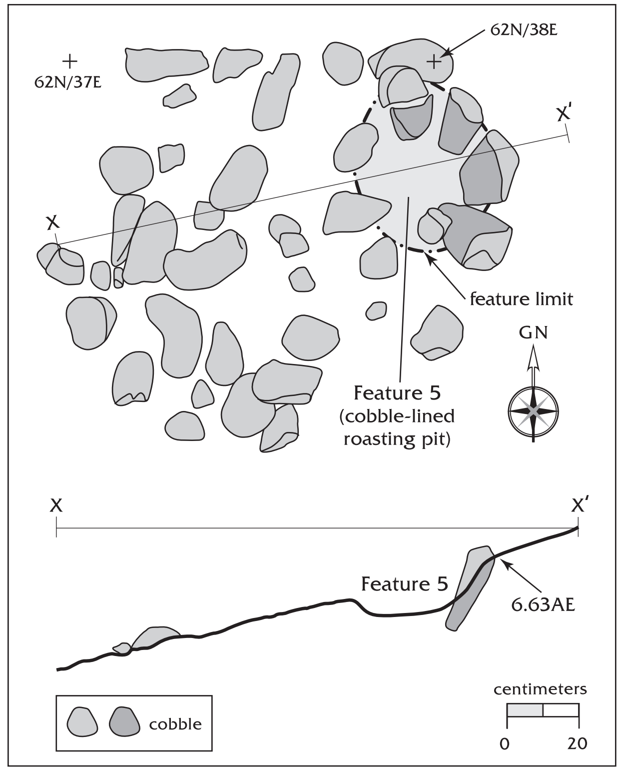


Figure 124. Plan and profile of Feature 5, LA 61289.

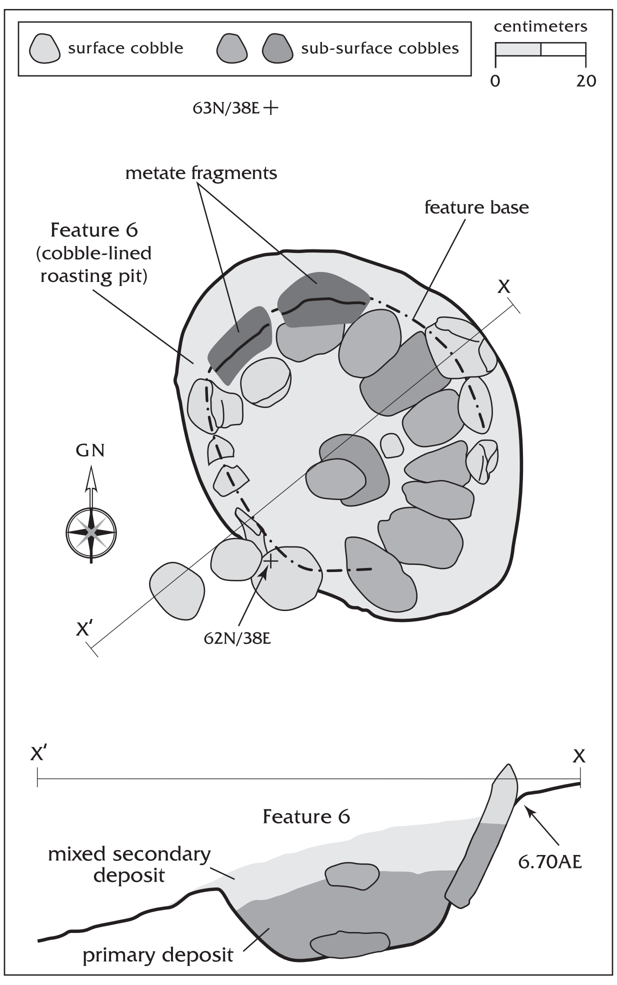


Figure 125. Plan and profile of Feature 6, LA 61289.

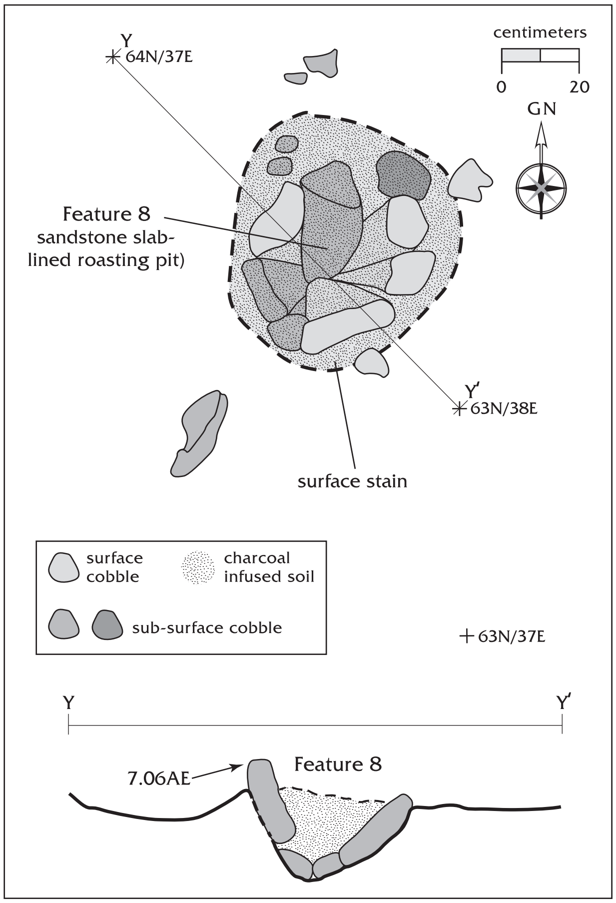


Figure 126. Plan and profile of Feature 8, LA 61289.

Figure 127. Feature 8, LA 61289.

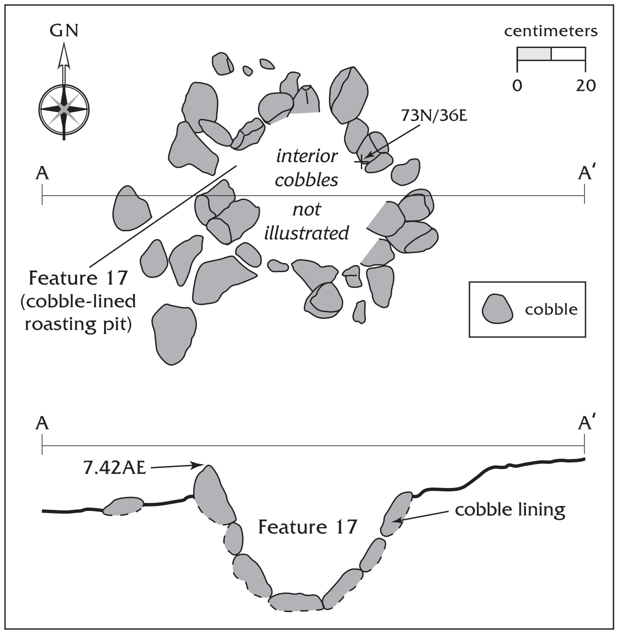


Figure 128. Plan and profile of Feature 17, LA 61289.

Figure 129. Feature 17, LA 61289.

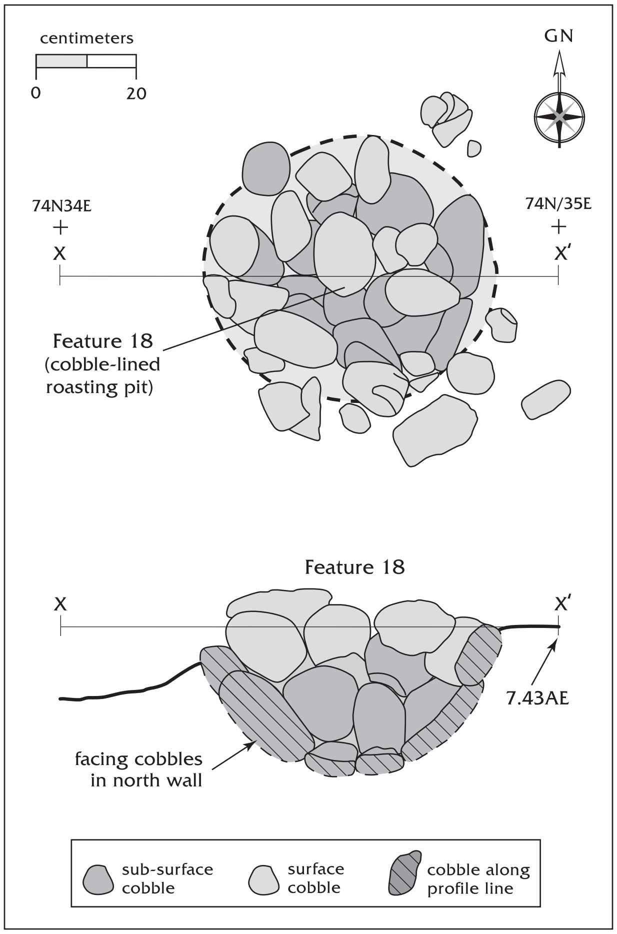
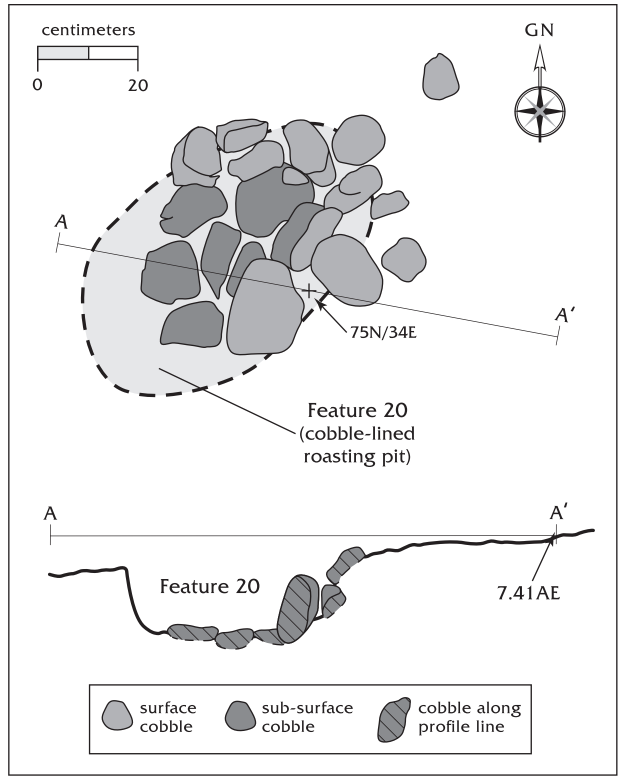


Figure 130. Plan and profile of Feature 18, LA 61289.

Figure 131. Feature 18, LA 61289.

Figure 132. Plan and profile of Feature 20, LA 61289.



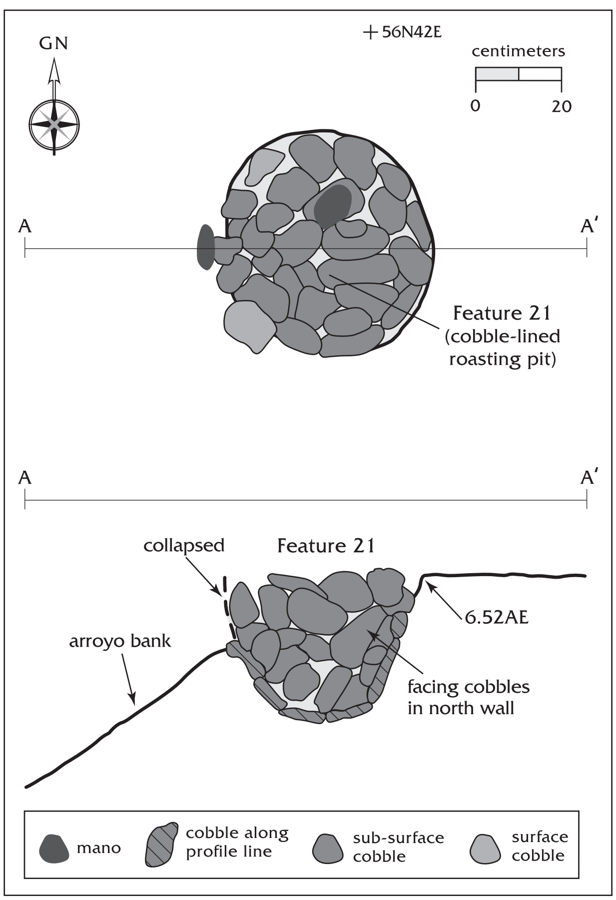


Figure 133. Plan and profile of Feature 21, LA 61289.

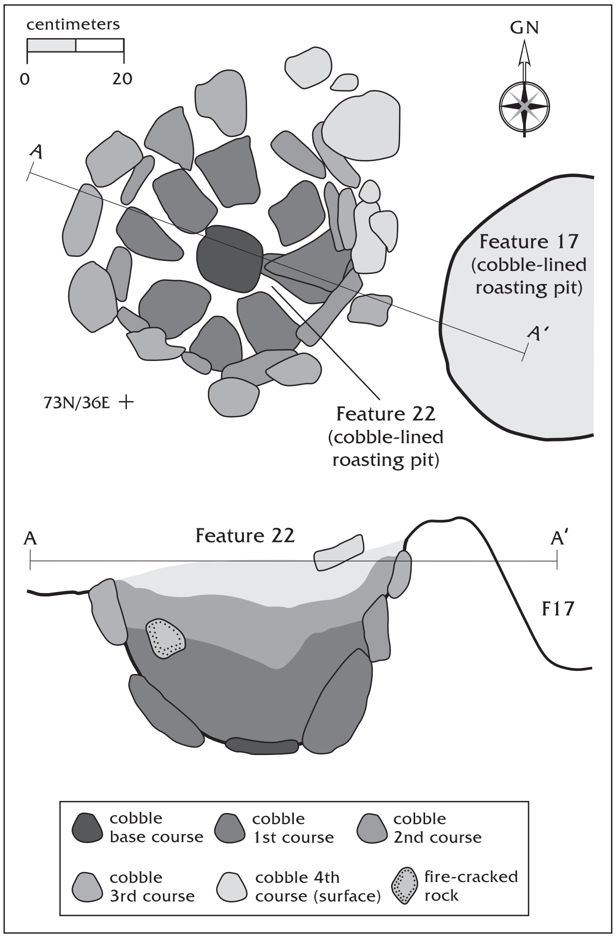


Figure 134. Plan and profile of Feature 22, LA 61289.

Figure 135. Features 17 and 22, LA 61289.

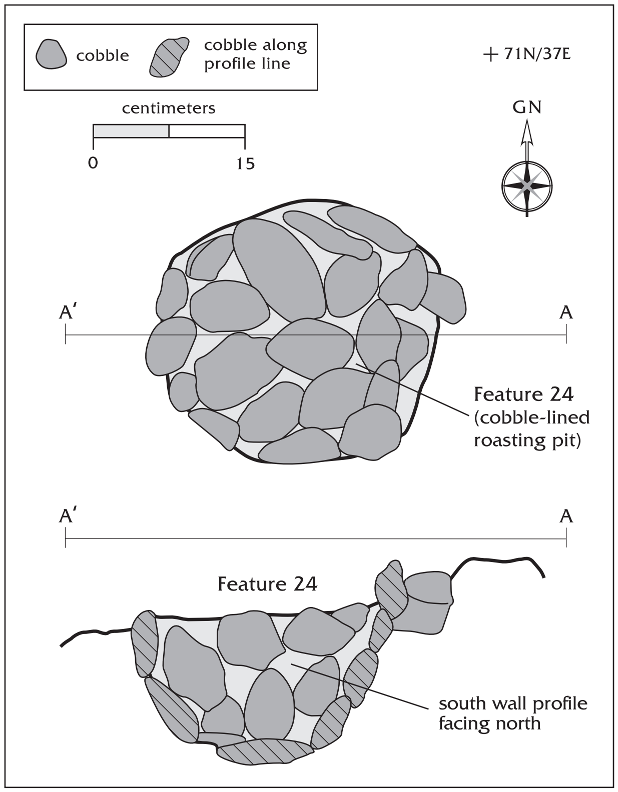


Figure 136. Plan and profile of Feature 24, LA 61289.

Figure 137. Feature 24, LA 61289.

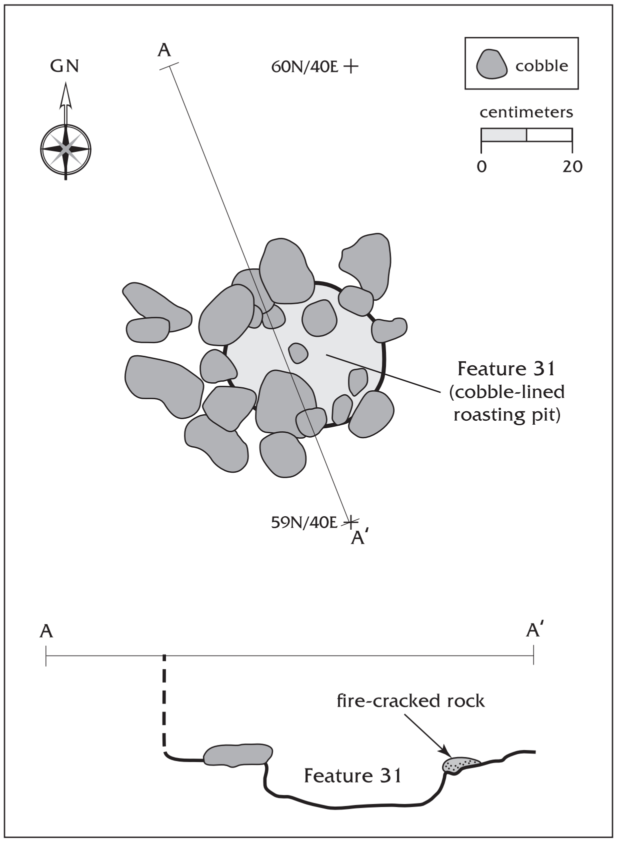


Figure 138. Plan and profile of Feature 31, LA 61289.

reduced by 200 to 400 percent at the bottom. The majority of the features had circular (10) or oval (3) outlines. Maximum diameters ranged from 30 to 100 cm, with a mean diameter of 60 cm. The basal diameter of the pits ranged from 8 to 24 cm, and they had a mean basal diameter of 15 cm. The mean pit depth was 30 cm (12–46 cm). All pits showed evidence of burning, and the most intact features contained a lower primary deposit remnant and an upper mixed primary/secondary deposit.

A low number of economic plant species were found in the cobble-lined features. Some of the features were very deflated, and a small portion of the mixed primary and secondary deposit remained. Identified species included *Chenopodium*, *Corispermum*, *Portulaca*, *Opuntia*, and *Echinocereus*. The latter two are some of the only cactus remains found in association with Middle Archaic features during this project, an indication that cactus was being used to some extent. Cactus thrives in disturbed areas and on the margins of intermittent arroyos or water channels, and cactus fruits are available in the late summer.

The majority of the cobble-lined features occur in a linear distribution along the east bank of the arroyo. The features in the 70N area were buried in a 5 to 50 cm thick layer of coarse sand, indicating that the arroyo had flowed over the occupation surface since abandonment. Therefore, the west portion of the activity area has been removed by erosion. This removal accentuates the linear distribution and its relation to the arroyo. Clearly, the features were placed in accordance with the drainage pattern or location, but the actual drainage location may have been 3 or 4 m to the west, providing a larger activity or camp space.

There appeared to be a pattern in the intervals between features. The distance between individual features along the northwest to southeast axis ranged from 1.50 to 3.4 m, and the majority of the features were spaced 1.5 to 2.3 m apart. Features that were oriented perpendicular to the drainage abut one another or were less than 1 m apart. The single features may have been associated with processing, or they may have been domestic features. The two main feature clusters with similar spatial configuration may represent contemporaneous multifamily camps or processing locations. The spatial regularities of the cobble-lined features suggests that they were contemporaneous and represent a single-occupation component, rather than multiple occupations of different age.

Similar features are rare in the Northern Rio Grande. These pits had steep, cobble-lined walls, a flat cobble base, and a roughly circular outline. They are morphologically similar to slab-lined thermal features at Basketmaker III sites on the Colorado Plateau, and they are very similar to slab-lined Middle Archaic features in southwestern Wyoming and northwestern Colorado (Smith and McNees 1999; Metcalf and Black 1991). Similar cobble-lined features were excavated in the Piedra Lumbre, but the features were not as deep, and they tended to be more basin shaped. At LA 61289, loosely consolidated soil and the probability of intensive use and reuse may have influenced the occupants to build sturdier forms.

It has been suggested that in southwestern Wyoming, deep ovens were used to bake tubers and roots (biscuitroot is common in the region). In the Santa Fe River basin, it is possible that such pits were used to process cactus pads (tunas) or yucca fruit from narrowleaf and broadleaf varieties (Smith and McNees 1999). Ethnographic studies of yucca and cactus processing suggest that open, basin-shaped pits were more commonly used, although pit baking was occasionally practiced by Apache women (Opler 1941:349–352).

Discard area. One discard area was identified in the southern excavation area and classified as a fire-cracked rock concentration. Feature 27 was east of Features 3 and 21, which were cobble-lined features. The cobbles were embedded and mixed with a heavily charcoal-infused deposit that was 5 cm thick (Figs. 139 and 140). The cobbles were stained and showed evidence of burning, but they were not fire cracked. The distribution of cobbles was unpatterned, and they were not within a basin or formally constructed feature. The associated stained soil also did not exhibit a regular outline and was not contained within a burned or formally prepared basin.

Knowledge of Middle Archaic occupation in the Santa Fe area was virtually nonexistent prior to Phase 2 excavations on the Northwest Santa Fe Relief Route. Only two components had been excavated, and both had been investigated within eight years before this project (Anschuetz 1998; Post 1996a:217–220). Shallow structures with intramural features that contained charred Indian ricegrass seeds and charred cactus suggested a late summer or early fall occupations between 2463 and 2287 BC at LA 113958 (Anschuetz 1998:40). Sited in the piedmont above the Arroyo Trampas, LA 122958 had evidence of superimposed occupations. Features were unlined thermal pits that exhibited a wide range of dimensions. LA 86139 was sited in the piedmont above the Arroyo Calabasas. It was a hunting and gathering camp with fewer features, but more evidence of tool manufacture (Post 1996a). LA 86139 was not chronometrically dated. By comparison, neither site is similar to the LA 61289 Middle Archaic component, except for the presence of shallow pit-structure foundations and evidence of reoccupation at LA 113958.

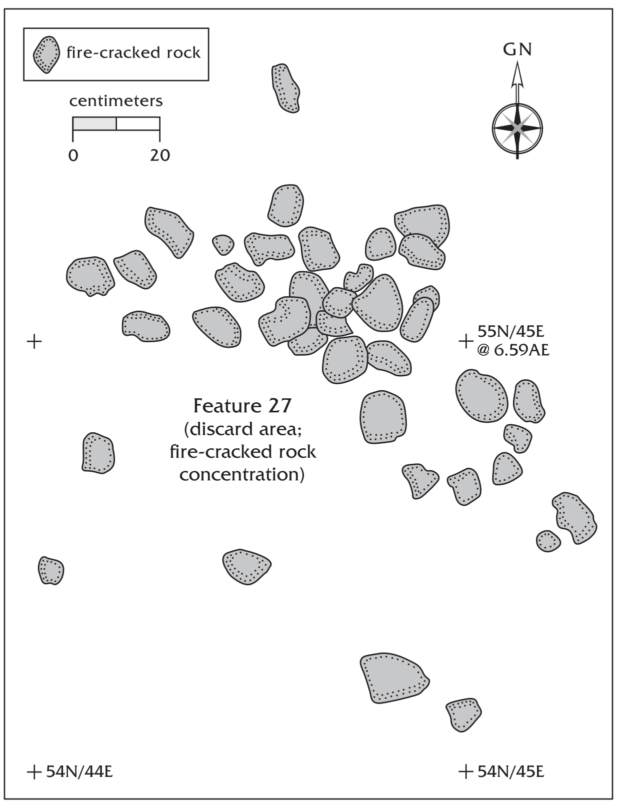


Figure 139. Plan of Feature 27, LA 61289.

With its cluster of cobble-lined roasting features, LA 61289 had a relatively formal site structure that was not apparent in the limited excavation of LA 113958. The shallow pit-structure foundation at LA 61289 (Feature 19) with an intramural hearth (Feature 26) yielded the earliest radiocarbon date for the component (cal. 3642–3098 BC two-sigma range [Beta-132608]). The early radiocarbon date is consistent with the superimposition of cobble-lined roasting ovens on the edge and immediately outside the pit-structure foundation, indicating that they postdate the structure. The temporal association of other features with the pit-structure foundation is unreliable. Excavation revealed no associated features south or west of the structure. The unlined and dismantled feature cluster in the 59N area may represent early features associated with the pit-structure foundation. Feature 12 is especially interesting because it was much larger than the other features, suggesting extensive processing, such as might accompany a longer occupation.

The cobble-lined ovens represent a second occupation that was geared to processing of specific resources using distinctive thermal facilities. Even though the charred macrobotanical evidence is sparse, the presence of cactus is intriguing. Greater quantities of ground stone implements combined with a poor representation of hunting-tool production and use indicate that the cobble-lined ovens were used for a restricted range of activities. The spatial distribution of the

Figure 140. Feature 27, LA 61289.

roasting ovens suggests at least three discrete occupation areas (Figs. 103 and 141). Radiocarbon dating focused on Features 17 and 22, which were joined, emphasizing the specialized function. Feature 17 wood charcoal (*Quercus*) yielded a cal. 3367–3098 BC two-sigma range, and Feature 22 wood charcoal (*Juniperus*) yielded a cal. 3349–2919 BC two-sigma range. These are dates are from the same statistical sample and appear to indicate contemporaneous use. Unfortunately, other features yielded insufficient charcoal for dating. Whether the cobble-lined ovens represent one episode in which members formed commensal groups or the return of one group to the same site within a relatively short span (25–50 years) cannot be determined. The spatial arrangement suggests three separate processing areas established at the same time. The spatial pattern of dual roasting ovens surrounding by individual ovens is repeated in the 59N and 70N areas. These two areas are separated by 6 m, and no intervening features were found during excavation. The third possible processing area is only 4 m south of the 59N area and appeared to be an extension of the 59N area rather than a separate unit. However, all three areas do have discard zones east of the feature cluster. Feature 27, associated with the southernmost processing area, is the most formal. The discard areas associated with the 59N and 70N areas were more disturbed by rodent burrowing and erosion channels.

The unique construction of the cobble-lined ovens, their apparent clustering, and the lack of similar features at the three other Middle Archaic components investigated during this project and at LA 113958 strongly suggests one episode or occupations at short intervals targeting a specific suite of resources. Even though macrobotanical remains cannot provide conclusive support for this interpretation, the specificity of these features and site structure, which was not matched in later occupations, suggests use by an Archaic population that was very familiar with the floral resources of mountain flank piedmont zones. In any case, floral resources were available in abundance for a short span during the late fourth millennium BC. This floral abundance apparently was not duplicated or the populations that had the technology to exploit it did not return to the Santa Fe River piedmont area. Without considerable more excavation in the Northern Rio Grande of Middle Archaic sites in similar piedmont settings, it is impossible to say for sure. However, other explanations do not readily arise. The similarity in construction of these features to slab-lined features in northern woodland settings suggests that northern Archaic populations had extended their annual range into the Santa Fe

Figure 141. Distribution of cobble-lined features, LA 61289. Right to left, Features 20, 18, and 17 and 22.

area around 3000 BC. The lack of similar features from later periods or from other areas suggests this territorial expansion was retracted and may not have been duplicated, at least not for the same economic reasons.

Ancestral Pueblo

The Ancestral Pueblo component, identified in the testing phase, was examined in a 60 sq m excavation area (115N/35E, southwest corner). Excavation exposed two thermal features and an associated low-frequency artifact scatter. Features 1 and 2 were radiocarbon-dated to temporally discrete occupations in the twelfth and fourteenth centuries AD. The features were spaced 5 m apart and were separated from the Early and Middle Archaic occupation area by 50 m (Fig. 142).

Feature 1 was a cobble-lined thermal feature similar in construction and size to the Middle Archaic cobble-lined features. Relatively straight-walled with a basin-shaped bottom, this feature was slightly different from the earlier features, which were more cone shaped and had a more restricted bottom (Figs. 143 and 144). The feature fill was darkly charcoal-stained sandy loam (10YR 3/1) mixed with fire-cracked rock. The Middle Archaic features did not contain fire-cracked rock, indicating that even though the features looked similar, they may have been used in different ways. Charcoal recovered from Feature 1 was submitted for radiocarbon dating and produced a cal. A.D. 1299–1439 two-sigma range (Beta-143396). According to the radiocarbon date, Feature 1 is over 4,500 years younger than the Middle Archaic features. There were a few charred *Chenopodium* seeds, which occur during all periods. Wood charcoal was mostly juniper, with much less piñon. No artifacts were recovered within the feature and no other evidence that might relate to feature function.

Feature 2 is different from Feature 1 in that it was unlined. It is similar in that it has relatively straight walls and a basin-shaped bottom (Fig. 145). The fill was a dark (10YR 3/1) charcoal-stained sandy loam. There was no associated fire-cracked rock or artifacts in the feature. No economic plant species were identified during analysis. In contrast to Feature 1, the wood charcoal was primarily piñon, with only a trace of juniper. Radiocarbon dating of wood charcoal yielded a cal. A.D. 1022–1221 two-sigma range

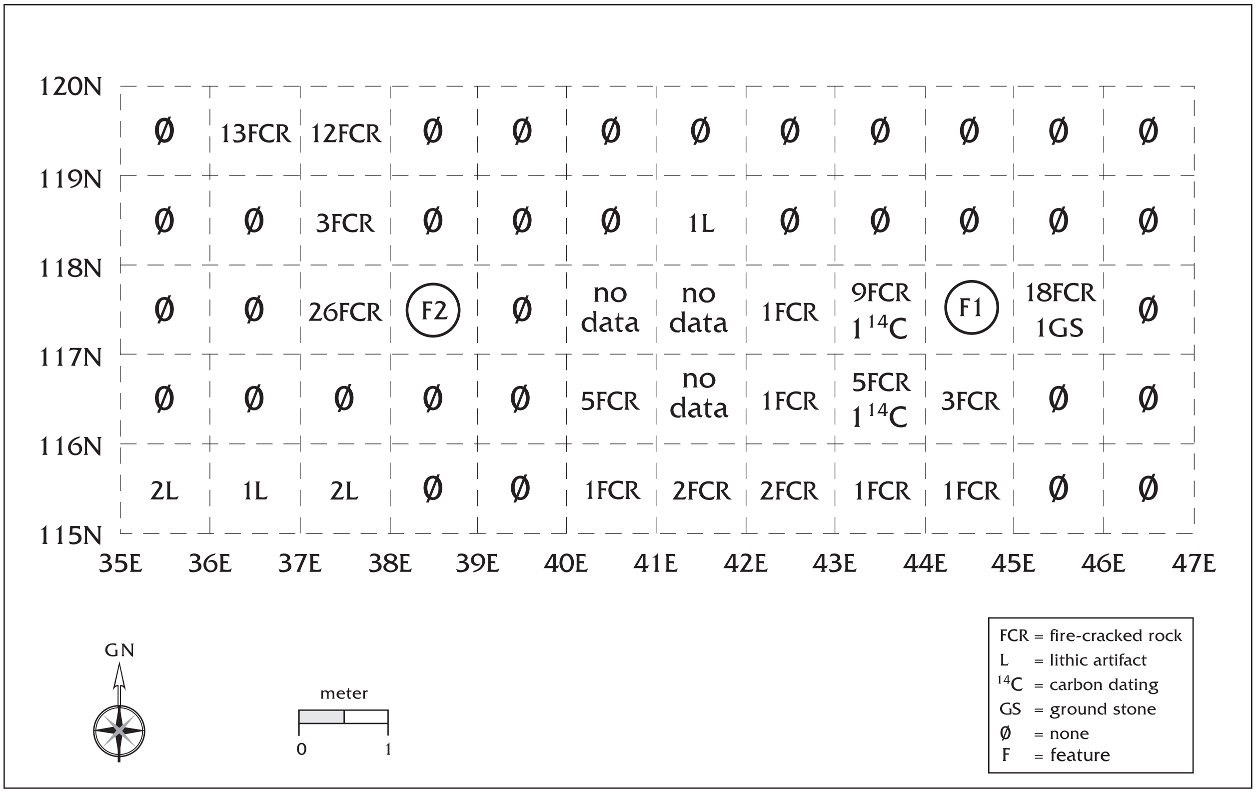


Figure 142. Artifact distribution, Features 1 and 2, LA 61289.

(Beta-132611). The date range suggests that Feature 2 is older than Feature 1. The difference in wood species may reflect changing ecological conditions following the height of the Santa Fe River village occupations between A.D. 1300 and 1350.

The Ancestral Pueblo component reflects repeated use of the piñon-juniper piedmont slopes and tributary environs by local populations. The low frequency of associated artifacts is typical for this later period. The statistically distinct dates for the radiocarbon samples indicates that two occupations are represented, one from the Late Developmental or very early Coalition period (Feature 2), and one from the Early Classic period (Feature 1). The former may derive from the Late Developmental period settlement at LA 114 along the Santa Fe River, 2 km from LA 61289. Little is known of Late Developmental period foraging patterns in the Santa Fe Piedmont. The nearest Coalition or Classic period settlements are 2.1 to 2.8 km from LA 61289, well within the daily foraging range of the villages. Foraging during this period as defined by the distribution of pottery is widespread on the piedmont. The cobble-lined construction of Feature 1 is unusual, however. No other similar features have been reported in the piedmont from this period. The similarity between the Middle Archaic features and Feature 1 is impossible to explain. The continued investigation of small sites dating to the Coalition/Classic period may bring new light to the use of cobble-lined features at Ancestral Pueblo sides.

Artifacts

A total of 379 chipped stone and 26 ground stone artifacts, 1 Santa Fe Black-on-white bowl sherd, and 1 animal bone were recovered from all components. Ninety-six of the artifacts, including 74 chipped stone and 22 ground stone artifacts, were piece-plotted. The overwhelming pattern is of a low recovery rate for chipped and ground stone artifacts.

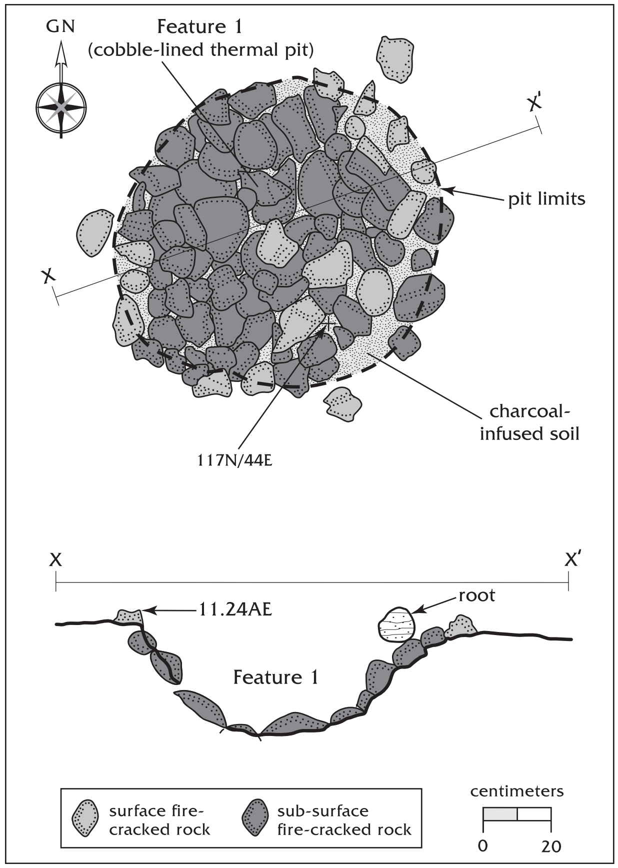


Figure 143. Plan and profile of Feature 1, LA 61289.

Figure 144. Feature 1, LA 61289.

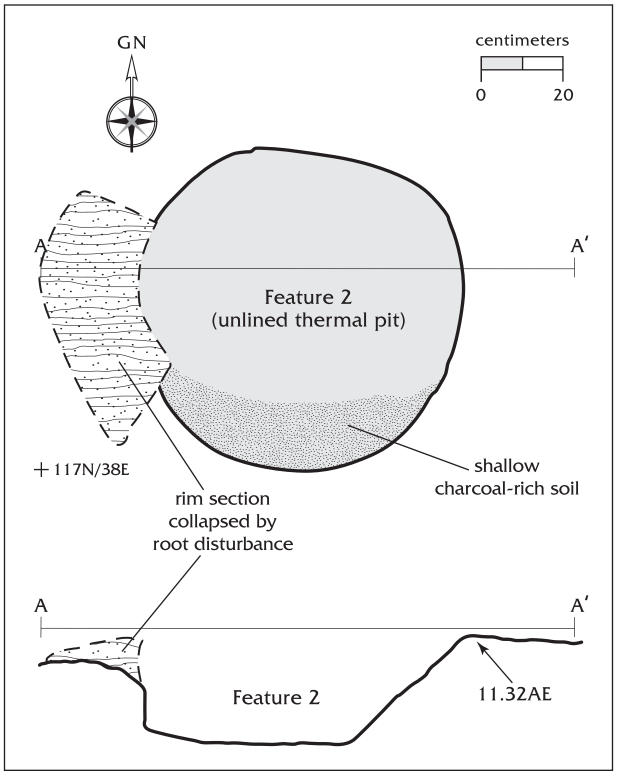


Figure 145. Plan and profile of Feature 2, LA 61289.

Chipped Stone

A total of 379 chipped stone artifacts weighing 7.91 kg were recovered from LA 61289. This total consists mainly of debitage, with few cores and tools. Nonutilized debitage weighs a total of 5.52 kg, accounting for 69.7 percent of the total assemblage weight. The assemblage reflects core reduction, very limited tool production or maintenance, and a variety of tool use.

The majority of the artifacts are Madera chert (79 percent). A total of 165 out of 167 Madera chert artifacts that retain cortex have waterworn cortex. We believe that these artifacts were obtained from local gravel deposits rather than an in-situ bedded source. Out of a total of 305 Madera chert artifacts, 110 contain flaws. These flaws mainly take the form of cracks or incipient fracture planes.

The Cenozoic era Santa Fe group gravel, namely the Ancha formation, contains chert. These sedimentary deposits also contain metaquartzite cobbles and small amounts of silicified wood. The Sangre de Cristo foothills contain Precambrian era granite and gneiss overlain by Paleozoic era Pennsylvanian deposits of sandstone, shale, and limestone. Within Madera-formation limestone are bedded nodules and veins of chert, which were quarried prehistorically (Lang 1993:6, 13; Lang 1995:5; Viklund 1994:1; Ambler and Viklund 1995:5). Madera chert occurs as residual cobbles and pebbles in the later Santa Fe group gravel. Nonlocal materials, such as obsidian and Pedernal chert, are found in the axial gravel of the Rio Grande. However, the primary sources of these materials lie in the Jemez Mountains. A small amount of obsidian can also be found scattered across Caja del Rio Mesa (Kelley 1980:11–17).

Middle Archaic Chipped Stone

Debitage. Debitage, including 240 core-reduction flakes, 123 pieces of angular debris, 3 biface flakes, and 2 hammerstone flakes, accounts for 97.1 percent of the Middle Archaic assemblage (Table 28).

Material types were lumped into two material classes. Chalcedony, Pedernal chert, and silicified wood were included with the chert. Orthoquartzite was included with metaquartzite to comprise the quartzite material class. The small sample size of the quartzite material class may render skewed distributions, so interpretation regarding this class is tentative. The following discussion is geared toward clarifying core-reduction sequences and discerning if there are significant differences between the chert and quartzite material classes.

The high percentage of quartzite core flakes lacking dorsal cortex (66.7 percent) points to middle- or late-stage reduction (Table 29). Substantial proportions of chert (15.8 percent) and quartzite (22.2 percent) with 60–100 percent dorsal cortex reflect early-stage reduction. The majority of chert core flakes (84.3 percent) have less than 50 percent dorsal cortex, indicating middle- to late-stage reduction. The noncortical to cortical core flake ratio is 1:0.8. The majority of core flakes (81.3 percent) display 0–2 dorsal scars, indicating early- to middle-stage reduction (Table 30). A substantial proportion of chert core flakes (18.5 percent) exhibit 3–5 dorsal scars, indicating middle- to late-stage reduction. One chert core flake exhibits six or more dorsal scars, indicating late-stage reduction.

All quartzite angular debris lacks cortex

Table 28. Debitage artifact type by material type, Middle Archaic component, LA 61289

Number Row % Column %	Chert	Madera Chert, Yellow/Red Mottled	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Chalcedony	Pedernal Chert	Silicified Wood	Obsidian	Metaquartzite	Orthoquartzite	Total
Indeterminate fragment	-	-	1	-	-	-	-	-	-	-	1
	-	-	100.0%	-	-	-	-	-	-	-	100.0%
	-	-	0.4%	-	-	-	-	-	-	-	0.3%
Angular debris	11	2	73	29	-	1	-	1	6	-	123
	8.9%	1.6%	59.3%	23.6%	-	0.81%	-	0.8%	4.9%	-	100.0%
	26.2%	20.0%	32.4%	43.3%	-	33.3%	-	50.0%	25.0%	-	32.5%
Core flake	28	8	142	36	4	2	1	-	18	1	240
	11.7%	3.3%	59.2%	15.0%	1.7%	0.8%	0.4%	-	7.5%	0.4%	100.0%
	66.7%	80.0%	63.1%	53.7%	100.0%	66.7%	100.0%	-	75.0%	100.0%	63.3%
Biface flake	-	-	1	1	-	-	-	1	-	-	3
	-	-	33.3%	33.3%	-	-	-	33.3%	-	-	100.0%
	-	-	0.4%	1.5%	-	-	-	50.0%	-	-	0.8%
Hammerstone flake	-	-	1	1	-	-	-	-	-	-	2
	-	-	50.0%	50.0%	-	-	-	-	-	-	100.0%
	-	-	0.4%	1.5%	-	-	-	-	-	-	0.5%
Unidirectional core	-	-	1	-	-	-	-	-	-	-	1
	-	-	100.0%	-	-	-	-	-	-	-	100.0%
	-	-	0.4%	-	-	-	-	-	-	-	0.3%
Multidirectional core	-	-	5	-	-	-	-	-	-	-	5
	-	-	100.0%	-	-	-	-	-	-	-	100.0%
	-	-	2.2%	-	-	-	-	-	-	-	1.3%
Tested cobble	1	-	-	-	-	-	-	-	-	-	1
	100.0%	-	-	-	-	-	-	-	-	-	100.0%
	2.4%	-	-	-	-	-	-	-	-	-	0.3%
Tested pebble	2	-	1	-	-	-	-	-	-	-	3
	66.7%	-	33.3%	-	-	-	-	-	-	-	100.0%
	4.8%	-	0.4%	-	-	-	-	-	-	-	0.8%
Total	42	10	225	67	4	3	1	2	24	1	379
	11.1%	2.6%	59.4%	17.7%	1.1%	0.8%	0.3%	0.5%	6.3%	0.3%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 29. Core flake dorsal cortex by material class, Middle Archaic component, LA 61289

Number Row % Column %	Local Chert	All Quartzite	Total
Noncortical	122	12	134
	91.0%	9.0%	100.0%
	55.0%	66.7%	55.8%
10-50%	65	2	67
	97.0%	3.0%	100.0%
	29.3%	11.1%	27.9%
60-100%	35	4	39
	89.7%	10.3%	100.0%
	15.8%	22.2%	16.3%
Total	222	18	240
	92.5%	7.5%	100.0%
	100.0%	100.0%	100.0%

Table 30. Core flake dorsal scars by material class, Middle Archaic component, LA 61289

Number Row % Column %	All Chert	All Quartzite	Total
0-2	178	17	195
	91.3%	8.7%	100.0%
	80.2%	94.4%	81.3%
3-5	41	1	42
	97.6%	2.4%	100.0%
	18.5%	5.6%	17.5%
6 or more	1	-	1
	100.0%	-	100.0%
	0.5%	-	0.4%
Indeterminate	2	-	2
	100.0%	-	100.0%
	0.9%	-	0.8%
Total	222	18	240
	92.5%	7.5%	100.0%
	100.0%	100.0%	100.0%

(Table 31). This points to later-stage reduction. The chert angular chert debris cortex distribution suggests a prevalence of middle- to late-stage reduction with little early-stage reduction. The single piece of obsidian angular debris, which is not included in the table, lacks cortex.

Table 31. Angular debris cortex by material class, Middle Archaic component, LA 61289

Number Row % Column %	All Chert	All Quartzite	Total
Noncortical	53	7	60
	88.3%	11.7%	100.0%
	46.1%	100.0%	49.2%
10-50%	56	-	56
	100.0%	-	100.0%
	48.7%	-	45.9%
60-100%	6	-	6
	100.0%	-	100.0%
	5.2%	-	4.9%
Total	115	7	122
	94.3%	5.7%	100.0%
	100.0%	100.0%	100.0%

The majority of core flakes (67.5 percent) have cortical or single-facet platforms reflecting early- to middle-stage reduction (Table 32). A small proportion of chert core flakes (3.6 percent) exhibit multifaceted platforms, reflecting middle- to late-stage core reduction. Quartzite core flakes lack platform types, indicating the later stages of reduction.

The whole-to-fragmentary core flake ratio is 1:2.1, indicating a predominance of fragmentary core flakes (Table 33). The most frequent portions are lateral (43.0 percent) and proximal (15.6 percent). Generally, flake breakage increases in the later stages of reduction as flakes get thinner; however, other postreduction cultural and natural processes such as trampling or solifluction, must also be considered (Moore 1996:247). The high frequency of core flake breakage (67.9 percent) may indicate the later stages of reduction. Yet, comparable proportions of distal and proximal portions can indicate postreduction breakage, whereas a prevalence of distal portions points to breakage during reduction (Moore 1996:254). There are equal proportions of quartzite core flake distal and proximal portions (11.1 percent), which can indicate postreduction breakage. Material flaws should also be taken into account when examining flake breakage distributions. A substantial proportion of core flakes (23.7 percent) are flawed. One quartzite core flake manifests flaws. Breakage along an incipient fracture plane or other flaw can contribute to the representation of all fragmentary portions and can occur in all stages of reduction, although it seems less likely that a flawed material would be intensely reduced if a more suitable raw material were easily obtainable.

A cursory examination of Table 34 shows that there are differences in mean statistics between chert and quartzite core flakes. No whole measurements were gleaned from the nonlocal materials, which consist of two fragmentary

Table 32. Core flake platform type by material class, Middle Archaic component, LA 61289

Number Row % Column %	All Chert	All Quartzite	Total
Single-facet and cortical platforms	146	16	162
	90.1%	9.9%	100.0%
	65.8%	88.9%	67.5%
Multifacted, abraded, and retouched platforms	8	-	8
	100.0%	-	100.0%
	3.6%	-	3.3%
Absent, collapsed, crushed, and broken-in-manufacture platforms	68	2	70
	97.1%	2.9%	100.0%
	30.6%	11.1%	29.2%
Total	222	18	240
	92.5%	7.5%	100.0%
	100.0%	100.0%	100.0%

Table 33. Core flake portion by material class, Middle Archaic component, LA 61289

Number Row % Column %	All Chert	All Quartzite	Total
Whole	71	6	77
	92.2%	7.8%	100.0%
	32.0%	33.3%	32.1%
Proximal	36	2	38
	94.7%	5.3%	100.0%
	16.2%	11.1%	15.8%
Medial	11	-	11
	100.0%	-	100.0%
	5.0%	-	4.6%
Distal	10	2	12
	83.3%	16.7%	100.0%
	4.5%	11.1%	5.0%
Lateral	94	8	102
	92.2%	7.8%	100.0%
	42.3%	44.4%	42.5%
Total	222	18	240
	92.5%	7.5%	100.0%
	100.0%	100.0%	100.0%

Table 34. Core flake mean whole measurements by material class, Middle Archaic component, LA 61289

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
All Chert					
Number	154	121	107	107	71
Mean	8.3	34.4	32.2	10.1	16.1
SD	4.4	16.2	14.1	6.6	26
Minimum	0.9	8	8	2	0.3
Maximum	22.6	88	67	33	149.2
All Quartzite					
Number	16	10	8	8	6
Mean	12	44.3	43.1	17.4	58.5
SD	7.9	20.8	18.4	11.6	70.2
Minimum	4.1	13	20	4	1.2
Maximum	34.4	72	77	36	180.2
All Materials					
Number	170	131	115	115	77
Mean	8.7	35.1	33	10.6	19.4
SD	4.9	16.7	14.6	7.2	32.8
Minimum	0.9	8	8	2	0.3
Maximum	34.4	88	77	36	180.2

Pedernal chert core flakes. The larger dimensions for quartzite suggest that it was less intensely reduced, although size is not always a good indicator of reduction stage and may be related to parent raw-material size. In this case, the empirical data pertaining to debitage attributes indicate that there is little difference in reduction stage between the chert and quartzite material classes. The recovered debitage represents an emphasis on middle-stage core reduction but includes early-stage reduction debris as well as limited late-stage reduction debris, mainly of the chert material class, as indicated by platform type and dorsal scar distributions.

The remaining debitage reflects very limited tool production or maintenance. Three biface flakes were recovered. One is an edge bite, and another is an outrepassé, both of which are described in the formal tool section because they contain substantial portions of biface edge. Both most often occur during soft-hammer percussion (Whittaker 1994:19, 163, 190). The remaining biface flake is a fine-grained red or mottled red Madera chert with a crushed platform and a hinge termination. It measures 27 mm long by 26 mm wide by 5 mm thick and weighs 3.1 g.

Additional evidence of tool maintenance is present in the form of two hammerstone flakes. These flakes exhibit battering wear along dorsal ridges resulting from the rejuvenation of a hammerstone (OAS 1994:12).

Five pieces of debitage appear thermally altered. Crazing is displayed by two pieces of nonred Madera chert angular debris. In addition, one exhibits potlids, and the other exhibits a color change. An undifferentiated chert core flake displays ventral potlids. A red or mottled red Madera chert core flakes show crazing. With the lack of luster variation, it is difficult to determine if these artifacts are the products of heat treatment.

Informal tools. Excavation yielded 11 pieces of utilized/retouched debitage, classified as informal tools (Table 35). These include whole and fragmentary portions of Madera chert and undifferentiated chert core flakes and angular debris.

The majority of artifacts (8) have one utilized/retouched edge. Three (FS 66, FS 176, and FS 260-70) have two utilized/retouched edges. On core flakes, which are the most frequent (10) utilized/retouched morphological type, edge location is most commonly lateral (8), followed by distal (5). Since angular debris cannot be oriented by definition, edge location cannot be determined. The majority of edge outline forms are convex or slightly convex (9).

The majority of edges (8) display unidirectional wear scars. Two of these edges also display discontinuous crescentic scars. Crescentic scars are produced during unidirectional and bidirectional movements and may be related to the angle at which the tool contacts the worked surface (Chapman and Schutt 1977:90). Four edges display bidirectional wear scars. Bidirectional scars suggest use in a longitudinal motion such as cutting, slicing, or sawing, whereas unidirectional scars suggest use in a transverse motion such as scraping, whittling, or planing (Chapman and Schutt 1977:86–92; Odell and Odell-Vereecken 1980:98–99). Two core flakes (FS 251-51 and FS 265-74) exhibit retouch scars but lack wear scars. Some use-wear analysts using high-power magnification (100–200 power) to examine experimental stone tools caution against the reliability of interpretations based solely on scarring. Patterned scarring can also be caused by natural processes such as solifluction or cryoturbation, as well as trampling. In experimental context, bidirectional and unidirectional scarring have been produced by transverse and longitudinal motions (Keeley 1980:30–36; Vaughan 1985:10–12, 19–24).

The majority of edge angles (10) measure over 40 degrees. The remaining four edges measure 40 degrees or less. Post, citing experiments by Schutt (1981), suggests that tools with edge angles of 40 degrees or less are better suited for cutting, while tools with edge angles above 40 degrees are better suited for scraping. Furthermore, he suggests that tools with edge angles measuring over 60 degrees could accommodate more heavy-duty or intensive use (Post 1996a:418). Three edges have angles measuring over 60 degrees. All three display unidirectional retouch and/or wear.

Formal tools. FS 115-2 is a fine-grained, mottled gray-brown Madera chert edge-bite flake. An edge-bite flake is a biface flake, typically produced during soft hammer percussion, in which the crack initiates too far in from the intended marginal platform and removes a portion of biface edge (Whittaker 1994:190). Due to its fragmentary condition, the facial scarring pattern cannot

Table 35. Utilized/retouched debitage, Middle Archaic component, LA 61289

FS No.	Material Type	Morphology	Portion	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Utilized Edge Location	Wear Pattern	Utilized Edge Outline	Utilized Edge Length (mm)	Utilized Edge Angle (degrees)
58	Madera chert, red and mottled red	core flake	whole	42	39	12	20.4	distal	unidirectional wear, discontinuous crescentic scars	convex	39	35
60-7	Madera chert, nonred	core flake	lateral	48	53	17	35.6	distal	bidirectional wear	slightly concave	26	26
66	Madera chert, red and mottled red	core flake	proximal	40	47	7	11.3	lateral	unidirectional retouch and wear, discontinuous crescentic scars	convex	24	40
	mottled red							distal	unidirectional retouch and wear	straight	11	45
145-11	Madera chert, red and mottled red	angular debris	indeterminate	57	42	24	59.2	indeterminate	unidirectional retouch and wear	concave	18	75
	mottled red											
176	Madera chert, red and mottled red	core flake	whole	31	47	10	12	distal	bidirectional wear	slightly convex	50	48
								lateral	bidirectional wear	slightly convex	21	40
251-51	Madera chert, red and mottled red	core flake	whole	62	48	20	57.8	lateral	bidirectional retouch	convex	55	45
258-65	Madera chert, red and mottled red	core flake	whole	33	42	11	12.8	distal	unidirectional retouch and wear	convex	20	65
260-70	chert	core flake	whole	63	34	15	30.5	lateral	unidirectional wear	slightly concave	44	42
								lateral	unidirectional retouch and wear	slightly convex	40	55
265-74	Madera chert, red and mottled red	core flake	lateral	92	116	39	444.9	lateral	unidirectional retouch	convex	80	61
273-81	Madera chert, red and mottled red	core flake	lateral	47	33	20	24.8	lateral	unidirectional retouch and wear	sinuous	42	56
	mottled red											
282-96	Madera chert, red and mottled red	core flake	lateral	41	17	8	6.7	lateral	bidirectional wear	slightly convex	38	45
	mottled red											

be ascertained. The marginal scarring pattern consists of continuous, bimarginal scalar scars and discontinuous step-fracturing. This artifact measures 12 mm long by 9 mm wide by 5 mm thick and weighs 0.4 g.

FS 203-1 is the distal portion of an obsidian overshoot or outrepassé flake. Outrepassé flakes, which typically occur during soft hammer percussion, are produced when the crack of a flake continues to the end of a biface and bends, removing a portion of the opposing biface edge (Whittaker 1994:19, 163). This type of flake is diagnostic of a biface production failure and has also been termed reverse fracture (Johnson 1979:25). In this case, the flake removed a flared, barblike projection, which constitutes its distal termination. The fragmentary condition of the biface edge included with this flake prevents its facial scarring pattern from being determined. The marginal scarring pattern includes continuous scalar scarring. The artifact measures 11 mm long by 7 mm wide by 3 mm thick and weighs 0.1 g.

Hand tools. FS 72-1 is a red Madera chert core-chopper. At least seven flakes were removed from multiple platforms in manufacturing an edge, which displays step-fracturing and crushing. This wear pattern and its edge angle of 66 degrees are consistent with chopper use. The edge perimeter is sinuous and measures 72 mm. The tool retains 70 percent waterworn cortex. The cortex opposes the utilized edge, providing a natural backing (Chapman and Schutt 1977:92). The artifact measures 79 mm long by 55 mm wide by 44 mm thick and weighs 167.6 g.

FS 80-1 is a mottled red-pink Madera chert core-hammerstone. It displays at least 14 flakes removed from multiple platforms. The core tool exhibits three discrete locations of battering wear in the form of crushing and step-fracturing. All worn areas are at the intersection of three or more flake scar ridges. They measure 23 mm, 22 mm, and 13 mm, with edge angles of 52 degrees, 89 degrees, and 92 degrees, respectively. The artifact measures 59 mm long by 52 mm wide by 43 mm thick and weighs 110.8 g.

FS 149-67 is a large fragment of a red Madera chert chopper. It shows a slightly concave, crushed, and step-fractured edge. The edge measures 24 mm, with an angle of 72 degrees. The artifact retains 50 percent waterworn cortex. It measures 74 mm long by 59 mm wide by 28 mm thick and weighs 92.5 g.

Cores. Four cores, three tested pebbles, one tested cobble, and two pieces of angular debris with evidence of further reduction were recovered during excavation of the Middle Archaic component (Table 36). All materials are fine or medium grained. Half of the material is flawed, mainly by cracks. All tested pebbles and the tested cobble retain 50–90 percent waterworn cortex. All cores and angular debris retain 20–50 percent waterworn cortex. One multidirectional core (FS 281) shows thermal alteration in the form of crazing. The tested pebbles and cobble reflect the testing of local gravel for suitable lithic raw material. None of the cores appear exhausted. Coupled with core material type and cortex retention, this points to the expedient reduction of locally obtained materials.

Comparison of testing- and excavation-phase assemblages. In addition to the assemblages described above, the testing phase yielded 17 chipped stone artifacts (Wolfman et al. 1989:122–143). The following discussion addresses

Table 36. Cores, Middle Archaic component, LA 61289

FS No.	Morphology	Material Type	Flake Scars	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
43	Angular debris	Madera chert, red and mottled red	8	68	47	27	84.7
58	Tested pebble	Madera chert, red and mottled red	1	52	27	24	33
75	Tested pebble	Chert	3	48	40	11	31.3
77	Tested pebble	Chert	2	40	35	17	22.1
80	Multidirectional core	Madera chert, red and mottled red	8	61	51	30	83.2
96	Angular debris	Madera chert, red and mottled red	8	77	63	35	111.4
145	Tested cobble	Chert	1	102	80	34	284
256	Unidirectional core	Madera chert, red and mottled red	8	77	55	55	216.3
274	Multidirectional core	Madera chert, red and mottled red	>15	75	68	53	240.8
281	Multidirectional core	Madera chert, red and mottled red	indeterminate	63	50	37	161.1

assemblage-level and artifact-level attributes, such as material type, artifact type, core flake dorsal cortex, and core flake dimensions, for comparative purposes. These attributes are limited to those considered in the testing phase. The testing-phase assemblage is compared to the excavation-phase assemblage of the Middle Archaic component.

Greater diversity is exhibited in the artifact and material type distributions of the excavation-phase assemblage. This assemblage shows evidence of limited biface production in the form of three biface flakes of different materials. Other artifact types that are absent from the testing-phase assemblage include hammerstone flakes, unidirectional and multidirectional cores (the testing includes two undifferentiated cores), and tested cobbles and pebbles. These artifacts suggest that tool maintenance and raw-material procurement took place on-site. In both assemblages, core flakes are the predominant artifact type. A total of 11 core flakes were recovered during the testing phase. Materials lacking from the testing-phase assemblage include nonlocal Pedernal chert and obsidian as well as locally available chalcedony, silicified wood, metaquartzite, and orthoquartzite. In the testing-phase assemblage, Madera chert was lumped in with the chert. In both assemblages, chert, including Madera chert, is the predominant material type. In fact, in the testing-phase assemblage, all core flakes are chert.

Since, in the excavation-phase assemblage, core flake dorsal cortex distributions and mean whole dimensions were tabulated by material class, the testing-phase core flakes can be contrasted with the chert core flakes of the excavation phase.

In respect to the core flake dorsal cortex distributions, the assemblages differ considerably. The testing-phase core flakes retain 60–100 percent dorsal cortex (49.3 percent more), 10–50 percent dorsal cortex (12.3 percent less), and a much smaller proportion that lacks dorsal cortex (37.0 percent less). The noncortical to cortical core flake ratios are 1:10.0 and 1:1.2 for the testing-and excavation-phase assemblages, respectively. In the testing-phase assemblage, cortical core flakes are slightly more than eight times more frequent relative to noncortical core flakes.

In the testing-phase assemblage, the mean length (38.0 mm), width (43.3 mm), thickness (18.8 mm), and weight (47.0 g) of whole core flakes are consistently larger than the mean whole measurements calculated for the excavation-phase chert core flakes. The testing-phase width (6.7 mm greater) and weight (16.1 percent greater) standard deviations are considerably larger than those of the excavation-phase assemblage. The length and thickness standard deviations are comparable. No difference exceeds 3 mm.

Differences are obvious in all the attributes examined. The greater diversity of the excavation-phase artifact and material type distributions is not unexpected since, presumably, recovery intensifies during this phase. The difference in the noncortical to cortical core flake ratios suggests that a smaller proportion of early- to middle-stage core-reduction debris was recovered in the excavation phase. This notion appears to be supported by the mean size differences. Although, the small sample size of the testing-phase core flakes must be considered in evaluating this notion.

Ancestral Pueblo Debitage

The Ancestral Pueblo component yielded six artifacts, including four core flakes and two pieces of angular debris (Table 37). Of the angular debris, FS 7-1 retains 50 percent cortex, while FS

Table 37. Debitage, Ancestral Pueblo component, LA 61289

FS No.	Morphology	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
2	Core flake	24.1	44	85	24	73.5
6	Core flake	2.7	29	22	7	5
7	Angular debris		42	22	12	8
7	Angular debris		37	16	8	4.7
11	Core flake	5.9	58	38	14	24.9
18	Core flake	9.4	34	38	10	10.5

7-2 retains 40 percent. Two core flakes (FS 2 and FS 6) lack dorsal cortex, while two (FS 11 and FS 18) retain 20 and 90 percent dorsal cortex, respectively. FS 2 and FS 18 each have one dorsal scar, while FS 6 and FS 11 each have two dorsal scars. With the exception of FS 2, which has a cortical platform, all core flakes have single-facet platforms. With the exception of FS 18, which is whole, all core flakes are lateral fragments.

Ground Stone

LA 61289 yielded seven whole one-hand manos, one mano end fragment, two basin metate fragments, and one indeterminate fragment (Table 38).

Manos. All manos and the mano end fragment are of flattened cobbles of medium-grained metaquartzite. The fragment is heat fractured and reddened. Its use surface is convex, but its plan view outline form cannot be ascertained. All whole manos are oval in plan, with the exception of FS 75-1, which is circular and biconvex in cross section. Three manos (FS 94-56, FS 275-84, and FS 236-31) exhibit ground surface sharpening. One (FS 233-17) has a yellow limonitelike mineral adhesion on its ground surface, direct evidence of pigment processing. Two manos (FS 75-1 and FS 236-3) appear heat fractured. Three manos show use as a hammerstone along the edge of the short axis. All one-hand manos/hammerstones and two additional one-hand manos show some degree of investment in tool production, which implies the anticipation of intense use. Wear patterns on three manos consist of consistently oriented, linear, furrow striations, indicating use in a reciprocal motion. One mano (FS 275-84) exhibits less than complete dimensions, and one mano (FS 75-1) was recorded with less than complete weight. FS 275-84 was recorded with less than complete thickness and weight measurements. Mean length (7) equals 107.9 mm, with a standard deviation of 11.8 mm. Mean width (7) equals 91.1 mm, with a standard deviation of 6.3 mm. Mean thickness (6) equals 51.7 mm, with a standard deviation of 4.5 mm. Mean weight (5) equals 1039.3 g, with a standard deviation of 170.5 g.

Metates. A shallow basin metate end fragment (FS 45-35) is of a very thin slab of a medium-grained metamorphic material. A shallow basin metate corner fragment (FS 45-36) is of a large flattened cobble of coarse-grained metaquartzite. Plan view outline forms cannot be determined because of the artifacts' fragmentary conditions, but both have concave ground surfaces. FS 45-36 shows evidence of ground surface sharpening and appears heat fractured.

Indeterminate ground stone fragment. The fragmentary condition of this artifact precludes determinations of preform morphology, production input, shaping, and plan view outline form. The internal fragment is a fine-grained igneous material. The artifact has a slightly concave ground surface.

Site Summary

Excavation of LA 61289 revealed a more complicated site than was identified during the test excavation. Radiocarbon assays identified five temporal components spanning over 5,000 years. The Early and Middle Archaic components, represented by 29 features, were not found during the test excavation. The two features that were identified during testing, Features 1 and 2, were more substantial than was expected and appear to represent two discrete Ancestral Pueblo occupations during the Coalition and Classic periods.

The earliest component was at the south end of the main excavation area. The two large, basin-shaped features had few associated artifacts, fire-cracked rock, or other occupation debris. Radiocarbon-dated to the fifth millennium BC, the occupation was short and small-scale. It may have focused on a patch of plant resources that occurred along or near an ephemeral or seasonal water source. Pollen data suggest that the surrounding environment was dominated by sage and grassland, while the charcoal data indicate that piñon and juniper were available for fuel. Low artifact frequency is typical of Early Archaic components in the Santa Fe area (Anschuetz 1997; Post 2000b).

The second occupation occurred nearly 1,000 years later with the construction and occupation of a small-scale, probably brush-covered structure. The house pit foundation, which is one of the earliest found in the Santa Fe area, had sufficient floor space to house one or two people. It had a small offset intramural hearth, but no

Table 38. Ground stone, Middle Archaic component, LA 61289

FS No.	Function	Material Type	Production Input	Shaping	Number of Use Surfaces	Primary Wear	Secondary Wear	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
94-56	one-hand mano	metaquartzite	none	none	1	polishing	pecking	110	81	55	753.9
275-84	one-hand mano	metaquartzite	slightly modified	pecking	1	grinding	pitting	118	91	24	316.2
232-16	one-hand mano	metaquartzite	none	none	1	grinding	none	103	100	44	683.8
233-17	one-hand mano	metaquartzite	mostly modified	pecking	2	polishing	furrow striations, linear, parallel to short axis	119	95	54	888.7
75-1	one-hand mano/ hammerstone	metaquartzite	slightly modified	grinding	2	grinding	furrow striations, linear, parallel to long axis	91	90	49	502.9
236-31	one-hand mano/ hammerstone	metaquartzite	mostly modified	pecking	2	grinding	pecking	119	95	56	1039.3
269-82	one-hand mano/ hammerstone	metaquartzite	mostly modified	pecking	2	grinding	furrow striations, linear, parallel to short axis	95	86	52	611.1
263-1	mano fragment	metaquartzite	none	none	1	grinding	none	74	83	44	194.5
45-35	basin metate fragment	metamorphic	none	none	1	grinding	none	210	176	37	2750
45-36	basin metate fragment	metaquartzite	none	none	1	grinding	pecking	246	205	68	4700
279-89	indeterminate fragment	igneous	indeterminate	indetermina	1	grinding	none	82	68	34	305.2

other intramural features. Artifacts and refuse directly associated with this Middle Archaic period occupation could not be separated from the later Middle Archaic period overlay. The structure foundation and intramural hearth apparently reflect a change from an ephemeral and brief foraging occupation to longer residential occupation. The site was situated near water in a low, southwest-oriented setting, which suggests a fall or early winter occupation. Without associated material culture items, further speculation about the range of activities and length of occupation is not possible. However, the residential occupation suggests a favored location within the annual movement of a small-scale and dispersed hunter-gatherer population.

The third occupation also occurred during the Middle Archaic period, but 200 to 250 years after the structure was abandoned. The site structure pattern of multiple features of similar morphology and size, combined with evidence of dismantling of features and reuse of discarded ground stone fragments in feature construction, suggests that the same group used the site during a 70- to 100-year period. The predominant feature type, cobble-lined roasting ovens or thermal features, had not been previously identified in the Santa Fe area and were not found in a review of Archaic site literature of the Northern Rio Grande. However, similar features are more common in the intermountain areas of Colorado and Wyoming (Smith and McNees 1999; Metcalf and Black 1991). In southwestern Wyoming, similar sandstone slab-lined features co-occurred with house pit foundations and other features, but they were not contemporaneous, as in the LA 61289 occupation sequence (Smith and McNees 1999:133). Ethnographic literature and mechanical analysis of Wyoming features suggested that they were associated with the acquisition and thermal processing of biscuitroot (Smith and McNees 1999). Site reoccupation and long-term use of slab-lined thermal features was indicated by the dismantling and remodeling of the Wyoming features, as at LA 61289. Unlike LA 61289, the southwestern Wyoming slab-lined pit locales were used over a period of 2,000 years, leading investigators to suggest they were part of "a stable, structured, long-term land-use pattern that involved the periodic use of locations and locales on the landscapes over periods of centuries and millennia" (Smith and McNees 1999:129). Since only one site with similar baking features had been found in the Santa Fe area, it is difficult to assess broader significance of this interesting and potentially unique technological adaptation. At LA 61289, these features were used for less than 100 years, suggesting a temporary climatic and environmental change conducive to the growth of roots, tubers, and succulents. The superpositioning of the pit-structure foundation and the cobble-lined pits indicate the occupation focus at LA 61289 changed through time, consistent with movement of a hunter-gatherer group within an annual or lifetime territory (Binford 1982; Hudspeth 1997; Sassaman 1998).

The latest components were represented by the two thermal features (Features 1 and 2), upslope from the Archaic component. These features, identified during testing, revealed relatively intact roasting pits or thermal features that were morphologically different from one another and spatially and stratigraphically associated, but not contemporary. Radiocarbon dates from each suggest that Feature 1 was used during the Coalition period, and it is more likely that Feature 2 was used during the Classic period. The low artifact frequency indicates an occupation of limited length and small-scale or activity-specific processing. Ethnobotanical analysis provided no insight into the different feature functions. Isolated features in the piñon-juniper piedmont are consistent with diurnal foraging, a land-use and subsistence pattern that has been well documented through excavations in the Las Campanas area to the west and during the test excavations for the Northwest Santa Fe Relief Route.

LA 61290

LA 61290 was between centerline stations 697+50 and 701+00 on the south- and southeast-facing slopes of a broad ridge that separates Arroyo de Gallinas from an unnamed drainage to the north. This gentle to moderately steep slope is dissected by a south- and southeast-draining arroyo that heads within the site limit. The upper slopes are covered with shallow sandy loam colluvium and a dense cobble deposit that overlays a thick, highly carbonate, silty loam that is more than 50,000 years old. The lower slope areas exhibit deflated topsoil but deep, low-energy colluvium. The site occurred on both sides of the right-of-way, and the east limit extended beyond the right-of-way. LA 61290 was not included in the testing program because the permission of the landowner could not be obtained. The site was recommended for data recovery based on the survey data, and by the time data recovery began, NMDOT had acquired the land.

Preexcavation Description

LA 61290 was originally recorded as a dispersed sherd and lithic artifact scatter associated with seven thermal features and two possible cobble grid gardens. The features and artifacts were distributed over a 180 m northwest-southeast by 100 m northeast-southwest area. The agricultural fields were bordered by large cobbles and small boulders. One field appeared to have internal subdivisions. The seven hearths appeared to contain datable remains (Wolfman et al. 1989:35–36).

The lithic artifact assemblage, numbering between 100 and 250 artifacts, was comprised of locally available materials such as red chert, pink-white chalcedony, black quartzite, and brown quartzite. Lithic artifacts include cores, core flakes, and angular debris. One basalt biface and several utilized flakes were observed during the initial survey. A cluster of indented corrugated jar sherds was associated with a feature, suggesting a Coalition or Early Classic period (AD. 1200 to 1350) occupation.

Because the lithic artifact assemblage has not been inventoried, it is not possible to evaluate the full range of activities that occurred at the site. However, the potential agricultural features suggest farming.

Excavation Methods

Reexamination of LA 61290 resulted in the expansion of the site limits 37 m to the southeast. (Fig. 146). Five of the seven thermal features identified during the inventory were relocated. It was determined that the possible grid gardens were cobble deposits, not cultural features. This reassessment was based on excavation of similar clusters at LA 67960 (this project) and LA 98861 (Las Campanas project [Post 1996a]). At LA 61290 the possible grid gardens resembled naturally occurring, eroded cobble deposits that occur throughout the middle and upslope areas of the piedmont hills. Timothy Maxwell, the principal investigator and a researcher of the cobble gardens found along the middle Rio Chama and the Rio Ojo Caliente of north-central New Mexico, concurred with this assessment.

The main arroyo draining the site becomes deeply dissected at the south site boundary, where we found a 35 m long, 10 to 20 cm thick charcoal-infused soil stain like the deposits excavated at LA 61286 and LA 61289, and observed outside the right-of-way at LA 61299. This charcoal-infused stain extended 15 m beyond the east right-of-way limit. Five eroded roasting pits or deflated hearths in arroyo cuts and exposed on the surface were found in addition to the five features identified during the 1988 inventory. Only two artifact clusters worthy of excavation were found. Therefore, the work focused mainly on excavating features and adjacent activity space, and determining the nature and extent of the buried deposit at the southeast site limit.

A site datum was established at 100N/100E on the upper slope at centerline station 700+00. Excavation areas were established, incorporating nine surface features and two artifact clusters (Fig. 147; Table 39). The excavation areas were stripped, removing a 5 to 15 cm mantle of sandy loam with abundant cobbles and gravel. The soil was screened through 1/4-inch mesh, and a tally

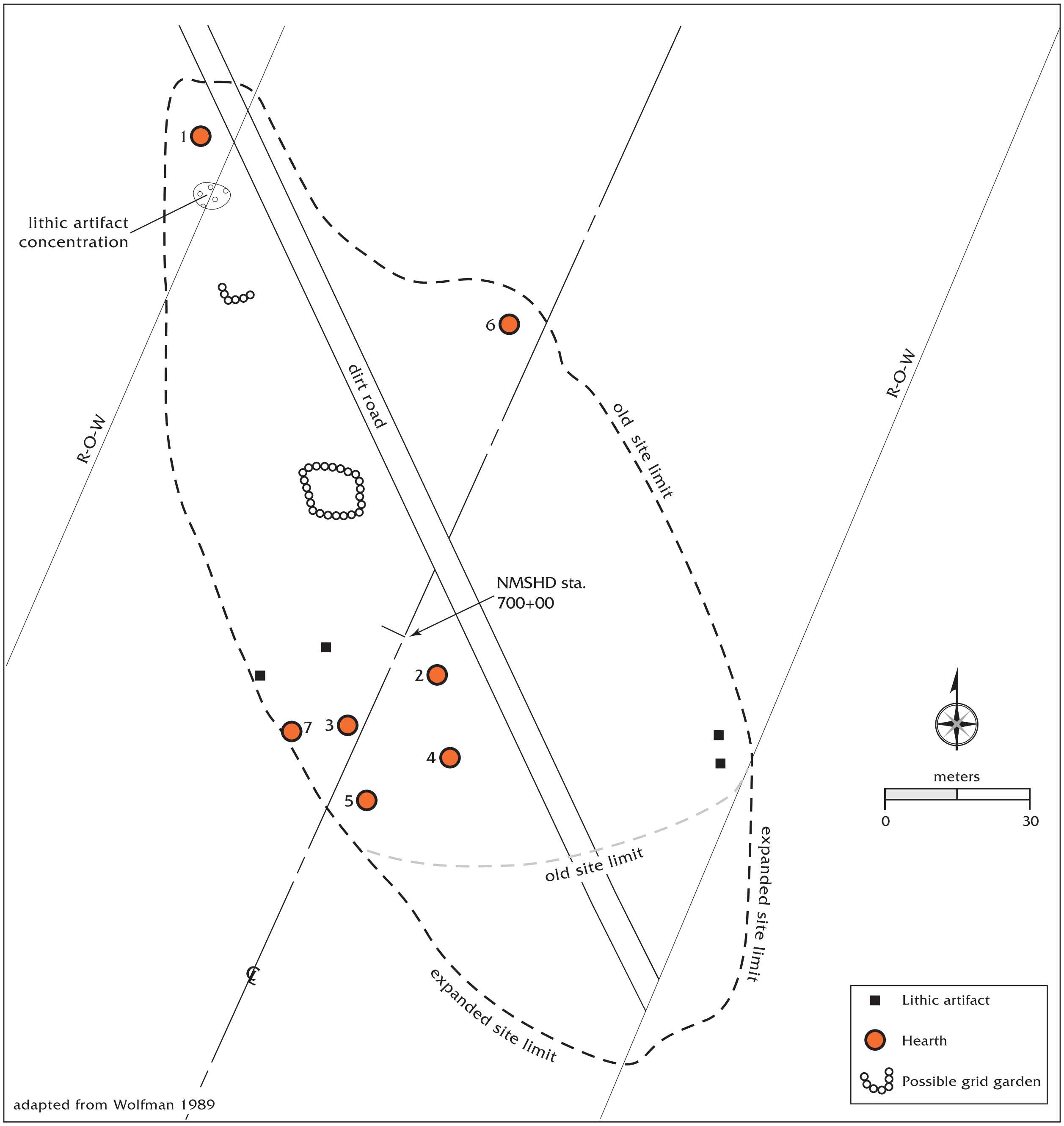


Figure 146. Expanded site limit, testing phase, LA 61290.

of artifacts and fire-cracked rock was maintained and used as a guide for expanding each surface-stripped area.

Within Area 2 and the Area 6 artifact cluster, two grids were excavated into the carbonate-rich silty loam. The units had yielded the highest artifact count during the surface strip. These subsurface units yielded no evidence of a cultural deposit, and excavation was halted. In the other areas, artifact counts were so low that no subsurface excavation was considered necessary.

The deeply buried deposit (Areas 10 and 11) visible in the west bank of the main arroyo required a different strategy than that used for the surface features. First, surface deposits were examined within two areas, 51N/139E and 35N/131E. Excavation in 35N/131E (Area 9) exposed two deflated thermal features (Features 8 and 9) and the near-surface, carbonate-rich silty loam. The near-surface occurrence of this deposit

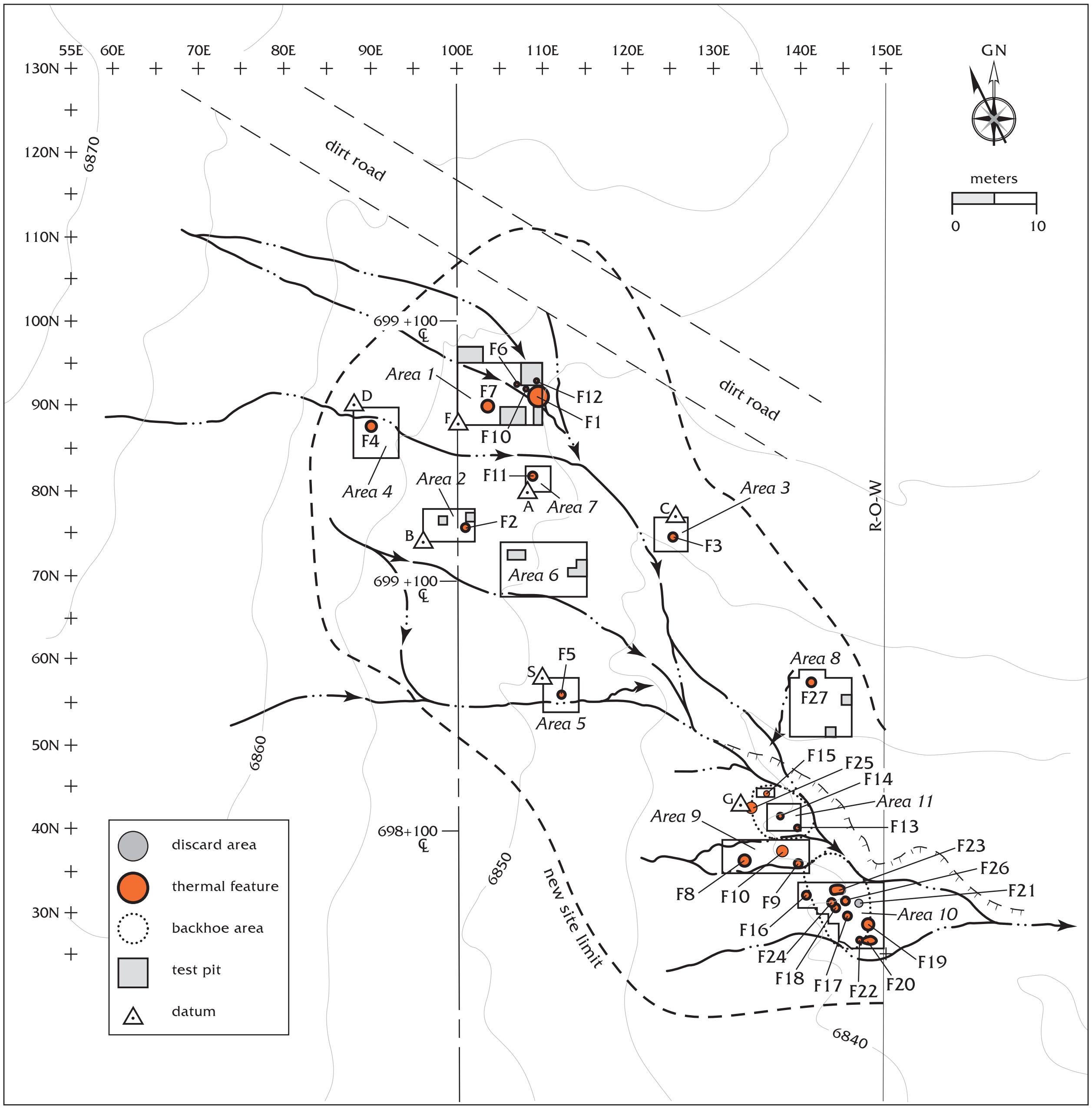


Figure 147. Excavation area, LA 61290.

indicated the shallow depth of the cultural deposit in upslope settings. Surface stripping in the 51N/139E (Area 8) area exposed no cultural deposits that could be associated with the deeply buried cultural deposit. One surface feature (Feature 27) was encountered and excavated.

After we determined that the surface deposits had limited data potential, subsurface trenches were excavated into the buried cultural deposit where it was exposed in the arroyo bank. These exploratory trenches included a 3 by 1 m unit (26–28N/148E, Area 10), a 2 by 1 m unit (42–43N/136E, Area 11), and a 1 by 3 m unit (42N/136–139E, Area 11). The trench profiles exhibited nine stratigraphic layers. The primary cultural deposit (Stratum 2) was 12 to 82 cm below the surface and 10 to 15 cm thick. Few artifacts and fire-cracked rock were recovered from cultural layer, and numerous rodent burrows suggested it was disturbed. However, the extent and intensity of the charcoal-infused stain required additional investigation.

Table 39. Excavation areas, LA 61290 (excluding areas 10 and 11)

Excavation Area	Dimensions (m, north to south)	No. of Units	Setting	Feature Nos.
Area 1 (88N/100E)	9 x 11	71	Upper slope, south-facing, eroded and deflated, cut by two erosion channels.	1, 6, 7, 10, and 12
Area 2 (74N/96E)	4 x 6	24	On a gentle south-facing, undissected, but deflated portion of the upper slope.	2
Area 3 (73N/123E)	3 x 3	9	On the east slope of the main arroyo that cuts through the site.	3
Area 4 (84N/88E)	6 x 5	30	On a gentle, southeast-facing part of the upper slope, dissected by a shallow erosion channel.	4
Area 5 (54N/110E)	4 x 4	16	On a gentle, southeast-facing part of the middle slope, dissected by a shallow erosion channel.	5
Area 9 (35N/131E)	4 x 10	40	On a gentle, southeast-facing part of the lower slope, dissected by a shallow erosion channel that empties into the main arroyo and separates the two main Archaic occupation areas.	8 and 9
Area 7 (80N/108E)	2 x 3	6	On a gentle, south-facing portion of the middle slope, undissected but deflated.	11
Area 8 (51N/139E)	7 x 7	49	On the east bank of the main arroyo that cuts through the site and deeply dissected in the lower slope area.	27
Area 6 (68N/105E)	6 x 8	48	On a gentle, southeast-facing portion of the middle slope, undissected but deflated.	none

The depth of the cultural deposit was determined with hand-excavated units. This information was used to guide the mechanical equipment that removed the noncultural overburden. Before the overburden was removed, elevations were transit-recorded along the grid lines, providing the basis for horizontal control and documenting the extent of the removal. A Bobcat with a smooth front bucket was used to remove the noncultural alluvium covering the cultural deposit (Figs. 148 and 149). Juniper and piñon trees were removed from the excavation area. Overburden removal encompassed the limits of the cultural deposit as defined in the arroyo bank. A 140 sq m area was bladed in 10 to 20 cm levels, exposing a previously undocumented thermal feature (Feature 25) in the upper 10 cm of colluvium above the cultural layer. The overburden was removed to the top of or within 10 cm of the cultural deposit (CH horizon).

The occupation area was hand-excavated in natural levels, and the CH horizon was removed in one or two 10 cm levels. The excavation area was naturally divided into two areas by the arroyo and a side drainage. Both areas were excavated in the same manner but yielded different results. All cultural fill was screened through 1/4-inch mesh. The cultural deposit was removed, and heavily rodent-intruded thermal features were exposed in association with a diffuse scatter of chipped and ground stone artifacts. Twenty-four artifacts and one animal bone were piece-plotted on or near the old occupation surface. Hand-excavation of 62 sq m in Area 11 and 20 sq m in Area 10 was completed, constituting 60 percent of the area excavated by the Bobcat, which also included drainages that were not further examined. The excavations exposed the main portion of the cultural deposit. Excavation was halted when the charcoal-infused CH horizon was absent or had been removed. Auger tests in the south area revealed that the vertical limit of the cultural deposit had been reached. The initial exploratory units in the north area were excavated through the cultural deposit, confirming the absence of a deeper or earlier deposit.

All features at LA 61290 were excavated as described for LA 61286. One notable exception

Figure 148. Areas 10 and 11, LA 61290, before Bobcat excavation, looking southwest.

Figure 149. Areas 10 and 11, LA 61290, after Bobcat excavation, looking south.

was Feature 1, which yielded an abundant cache of charred piñon nut shells in association with a partial indented corrugated jar. All fill from the piñon-nut-bearing stratum was collected for dry-screening.

Excavation halted after all of the CH horizon exposed in the Bobcat-excavated zone had been excavated. The high frequency and density of features strongly indicated that the main portion of the cultural deposit had been exhaustively examined. Final mapping entailed elevation cross sections across the excavation area. These elevation data document differences between modern and ancient topography.

Excavation Results

The excavation of LA 61290 verified the presence of features identified during the inventory. It was determined that the possible cobble grid gardens were natural, and no further examination was conducted. A thorough search of the area focused on identifying inventory-documented features. Five of those features were found, but not two others. Beside the original five features, an artifact concentration, five additional surface features, and an extensive buried cultural deposit were found. Excavation exposed 26 thermal features or pits and an isolated burned log. Fifteen features were from surface or near-surface contexts, and 11 features were defined within the CH horizon (Middle Archaic). These features may represent as many as 13 components from Middle and Late Archaic, Ancestral Pueblo, and historic periods. Occupation concentrated on the south-facing, protected slope of the broad ridge that separates the Arroyo Gallinas drainage system from drainages to the north.

Stratigraphy

Nine strata were recorded and can be grouped into four major horizons (Fig. 150).

The A horizon was a 5 to 20 cm thick, brown (10YR 4–5/4 and 10YR 4/6), coarse sandy loam with weak, coarse, subangular blocky structure, colloidal staining, abundant fine roots, a clear and smooth boundary, few carbonate filaments, and 1 to 5 percent gravel.

The B horizon was brown (10YR 3–5/4) and coarse with a weak to moderate, medium to coarse blocky structure, diffuse boundaries, common carbon filaments in the seams and on the bottom of rocks, and 5 to 10 percent gravel.

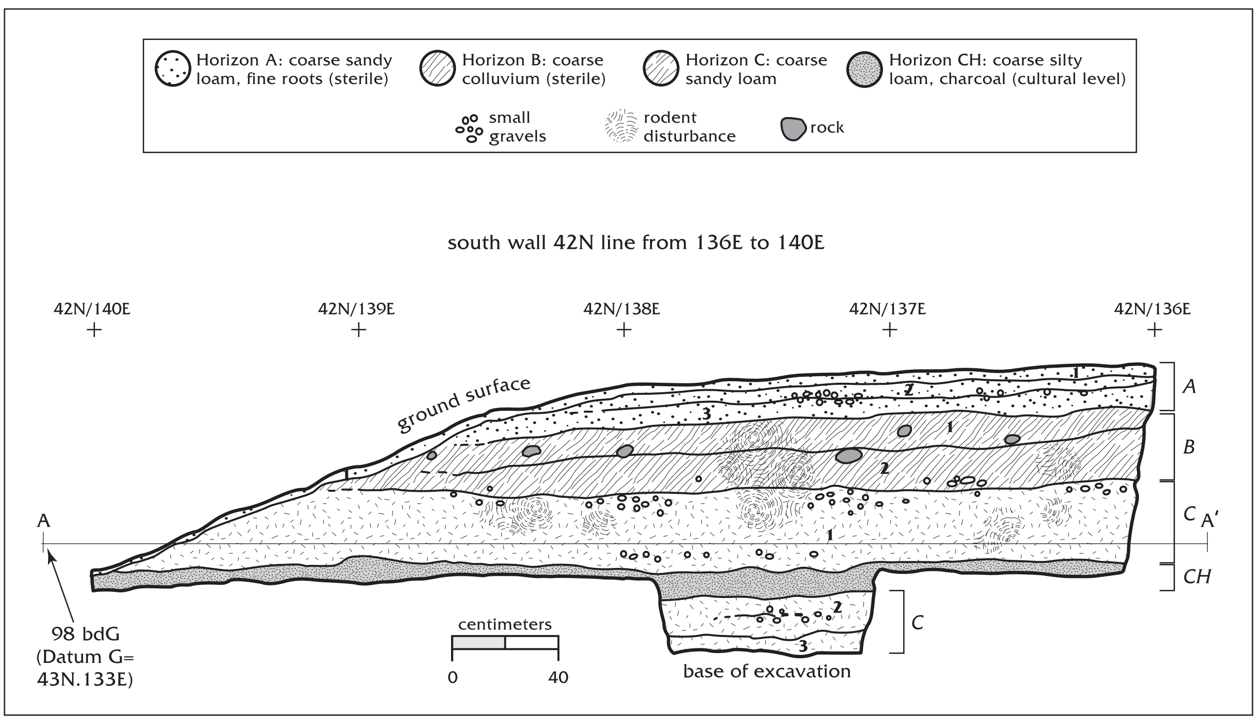


Figure 150. Representative stratigraphic profile from Area 11 excavation, LA 61290.

The CH horizon (the cultural deposit) was a gray brown (10YR 4/2), charcoal-infused, weak, single-grained, subangular to blocky, coarse silty loam with fine, disseminated carbonated filaments, few fine roots, an abrupt and wavy boundary, and 7 percent gravel.

Horizon C was a reddish brown (7.5YR 5/4), coarse, sandy loam with a weak to moderate, subangular to blocky structure; colloidal staining; disseminated, sparse carbonate filaments; a few fine roots; and 10 percent gravel.

The CH horizon was the cultural deposit in the southeast portion of the site. The other strata were natural strata that had been deposited during a long-term, stable pattern of low-energy slope wash or transport. The low-energy deposition suggests that former topography was gentler than the modern landscape. This gently sloped, deep colluvial deposit was selected for the earliest occupations. Early occupations occurred during a long episode of gradual or steady slope deposit. Farther upslope, less stable and less protected settings were chosen for many of the exposed thermal features dating to the Ancestral Pueblo and later periods.

Excavation Areas and Features

Eleven excavation areas were established within LA 61290 (Fig. 147; Table 39). These excavation areas focused on features and two artifact concentrations (Table 40). The following discussion is organized by excavation area from earliest to latest components, followed by features of unknown age.

Area 11. Area 11 (40N/136E) was a 4 by 4 m area capped by 20 to 130 cm of colluvium (Fig. 151). Exploratory trenches excavated through the overburden yielded no cultural material or evidence of a shallower or intervening cultural deposit. Therefore, the overburden was mechanically removed to within 10 cm of the CH horizon. Systematic excavation revealed two stratigraphic components that were lightly stained by charcoal-infused sandy loam. The occupation

Table 40. Features, LA 61290

Feature No.	Type	Grid	Dimensions (cm)	Artifacts	Radiocarbon Age (B.P.)
1	Roasting pit	90-91N/109-110E	123 by 110 by 32 deep	ceramics (20)	
2	Undifferentiated burned pit	75-76N/99-100E	83 by 65 by 22 deep		
3	Undifferentiated burned pit	74N/124E	17 diameter by 19 deep	lithics (2)	
4	Roasting pit	86-87N/89-90E	150 by 87 by 18 deep	animal bone	twentieth century
5	Fire-cracked rock filled roasting pit	55-56N/112-113E	144 by 100 by 12 deep		
6	Fire-cracked rock filled roasting pit	92-93N/106E	85 by 80 by 12 deep	lithic (1)	820±60
7	Undifferentiated burned pit	89-90N/ 103E	57 by 40 by 5 deep		
8	Undifferentiated burned pit	36N/133-134E	108 by 100 by 8 deep		
9	Undifferentiated burned pit	37-38N/137-138E	~90 by ~90 by 9 deep	lithic (1)	
10	Cobble-lined hearth	91N/108-109E	62 by 39 by 24 deep		
11	Undifferentiated burned pit	81N/108-109E	38 by 32 by 6 deep		
12	Burned log	91N/110E	36 by 28 by 8cm deep		
13	Undifferentiated burned pit	39N/139-140E	64 by 42 by 20 deep		3830±40
14	Unburned pit	41-42N/138-139E	60 diameter by 10 deep		
15	Deflated cobble-lined hearth	44N/135-136E	60 diameter by 6 deep	mano (1)	3730±40
16	Deflated, undifferentiated burned pit	32N/140-141E	74 by 69 by 4 deep		
17	Undifferentiated burned pit	29N/143-144E	50 by 50 by 12 deep		
18	Undifferentiated burned pit	31-32N/144E	80 by 40 by 18 deep	lithic (1)	3570±70
19	Undifferentiated burned pit	27-28N/147E	78 by 54 by 7 deep		
20	Undifferentiated burned pit	26N/146-147E	110 by 52 by 13 deep		3660±70
21	Activity discard area	31N/146E	64 by 44 by 5 deep	lithic (1); metate/comal (1)	
22	Undifferentiated burned pit	26N/146E	50 by 42 by 9 deep		
23	Roasting pit	33-N/144-145E	72 by 52 by 45 deep		3870±70
24	Undifferentiated burned pit	31-32N/144E	60 by 50 20 deep	lithics (2)	
25	Roasting pit	42N/134-135E	76 by ~64 by 19 deep	lithic (1)	
26	Undifferentiated unburned pit	32N/144-145E	87 by 56 by 12 deep	lithics (2); animal bone (4)	
27	Fire-cracked rock filled roasting pit	57N/141E	74 by 72 by 16 deep	lithic (1); mano (1)	

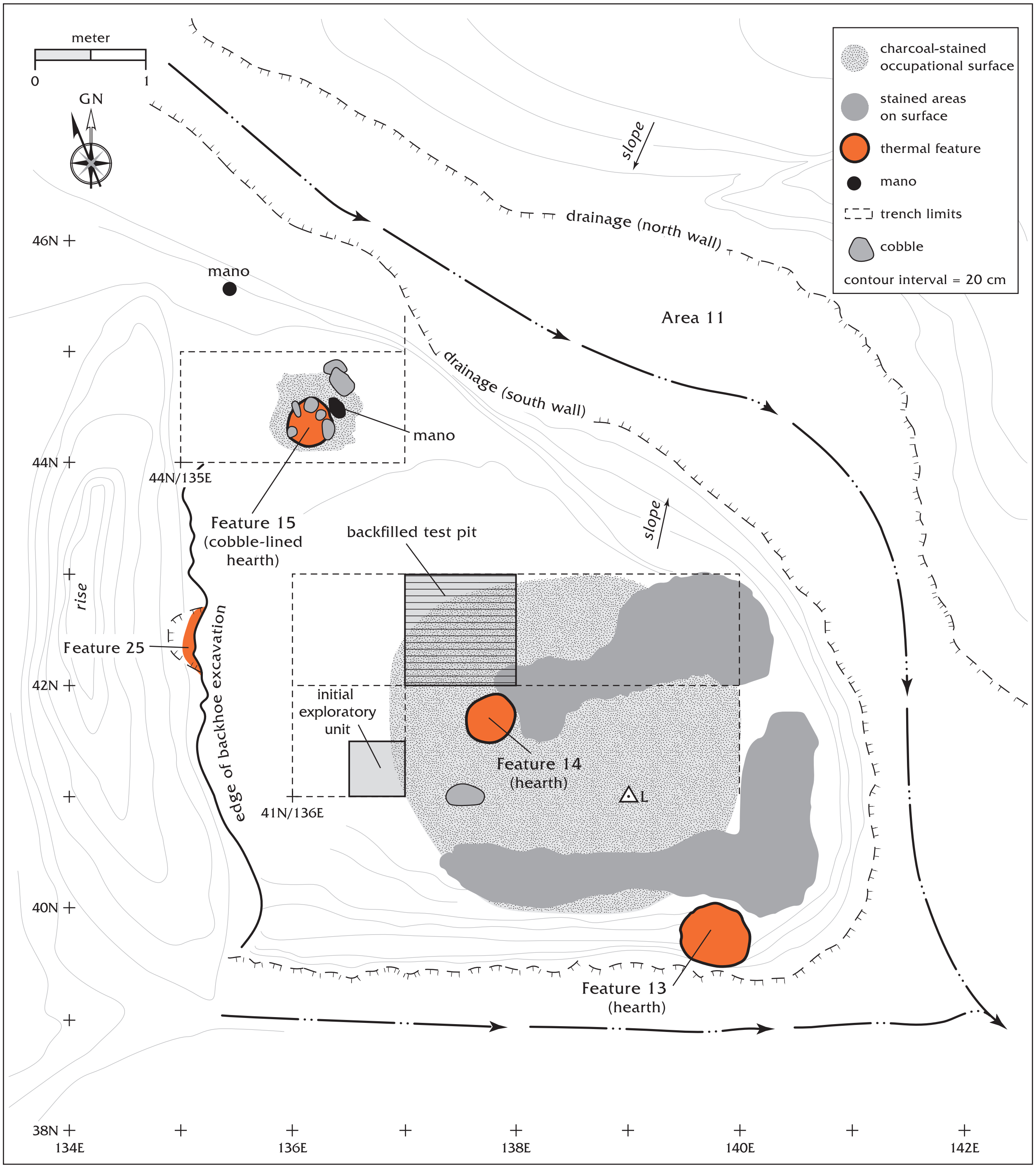


Figure 151. Plan of excavation, Area 11, LA 61290.

surfaces on this gentle old slope contained the remains of three pit features. Differences in feature elevations indicated that multiple occupations were represented by Features 14, 13, and 15. Features 13 and 15 were below the Feature 14 occupation level. The upper occupation level is only known by the presence of the feature and a diffuse stain of charcoal-infused soil. This surface accumulated on top of a lower occupation level, but only a 3 m diameter portion of the activity area remained. The soil accumulation indicates the passage of an unknown length of time between occupations. The low artifact counts associated with the surface reflect some scouring by sheet wash and creep.

Feature 14 was a circular, undifferentiated burned pit with one associated lithic artifact (Fig. 152). The fill, a light brown sand, was slightly plastic. There was no fire-cracked rock and only very dispersed charcoal. This pit was lightly burned and associated with a thin smear of charcoal. The slightly higher stratigraphic position of Feature 14 indicates that it postdates Features 13 and 15. The limited nature of the cultural deposit indicates that it remains from a short-lived excavation.

Another lightly stained, ephemeral occupation surface associated with two thermal features (Features 13 and 15) was 10 cm below the Feature 14 component. The features were on a gentle slope. Two manos and two chipped stone artifacts were recovered. Radiocarbon dating indicates that Features 13 (2457–2143 BC) and 15 (2281–1981 BC) are not contemporaneous, and their use may have been separated by as much as 150 years. This occupation surface was well scoured, and besides the features, little other evidence of use remained.

Feature 13 was an undifferentiated burned pit that was truncated by the arroyo. This steep-walled pit was partly filled with black (10YR 3/1) fine sandy loam (Fig. 153). The dark color indicates that substantial charcoal remained in the feature after its final use. The charcoal was diffused into the redeposited sandy loam that washed into the

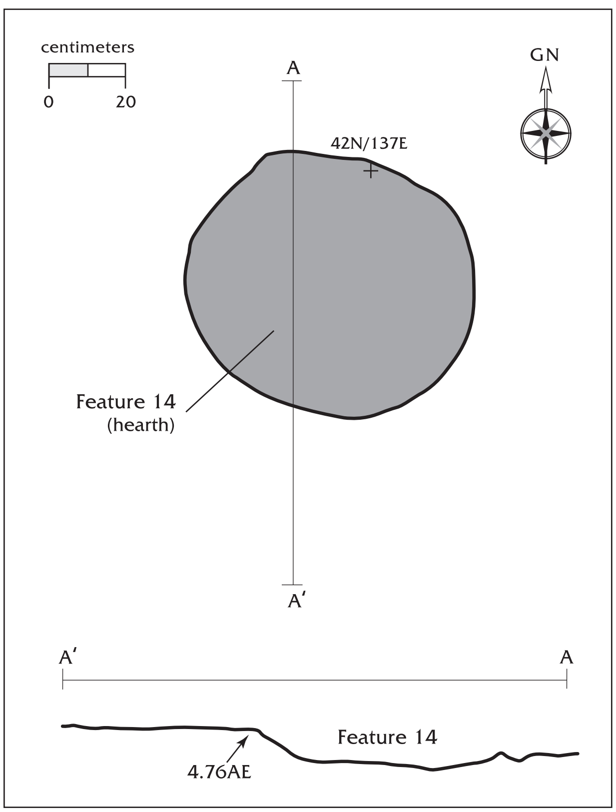


Figure 152. Plan and profile of Feature 14, Area 11, LA 61290.

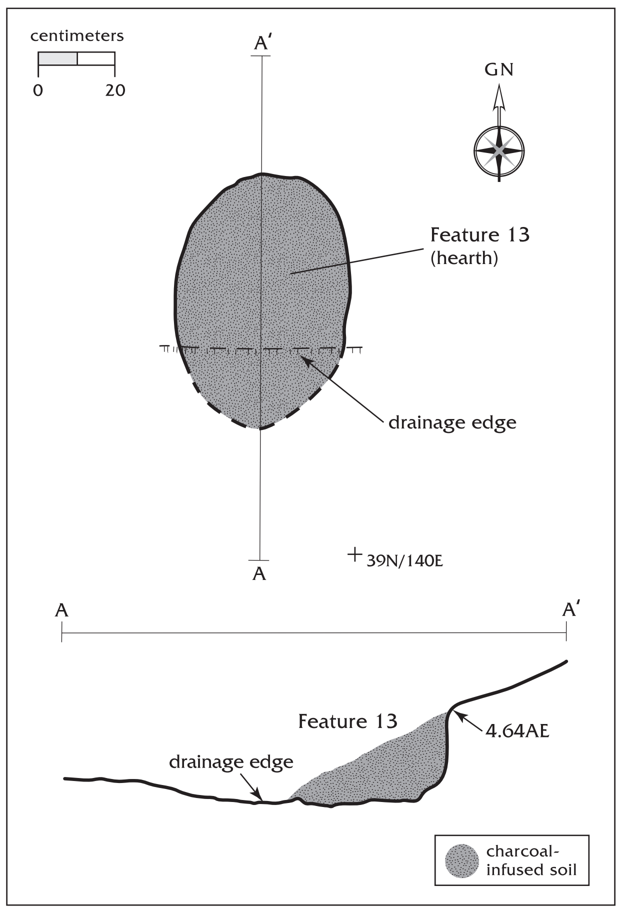


Figure 153. Plan and profile of Feature 13, Area 11, LA 61290.

open pit. The few charred seeds reveal nothing about the feature function. Radiocarbon samples recovered from the upper feature fill was dated to cal. 2457–2143 BC two-sigma range (Beta-132613). This date range suggests occupation during the late Middle Archaic.

Feature 15 was the deflated, collapsed, and eroded remains of a cobble-lined hearth (Fig. 154). It was upslope from Feature 13, approximately 35 cm higher in elevation, but dug into the same colluvial surface. The feature fill was a brown (10YR 5/3) sandy loam that was lightly charcoal infused, except for the lowest 1–2 cm of deposit, which was a highly charcoal-infused dark gray brown (10YR 4/2). A radiocarbon sample consisting of juniper wood charcoal dated to cal. 2281–1981 BC two-sigma range (Beta-143400). No ethnobotanical remains were recovered from the feature.

Five chipped stone artifacts were recovered from Area 11: three core flakes, one piece of angular debris, and an early-stage biface. All artifacts were made from locally available Madera chert. Little can be deduced from them about site activities and subsistence strategies.

Like Area 10, Area 11 dates to the late Middle Archaic period. The scoured colluvial surfaces retained little evidence of occupation other than the three features. The impression is that Area 11 was a lightly used, reoccupied late Middle Archaic camp where the main activities were plant gathering and processing. Limited ethnobotanical remains preclude detailed assessment of feature function, activity focus, or season of occupation.

Area 10. Area 10 (26N/140E) is a downslope extension of the Area 11 late Middle Archaic occupation surface. Areas 10 and 11 combine to form a remnant colluvial slope that has been covered by up to 130 cm of sandy loam overburden. The cultural deposit was identified as a 10–20 cm thick gray charcoal-infused lens with charcoal flecks visible in the erosion channel profile.

Excavation of two exploratory units in 28–29N/148E revealed 80 cm of overburden on top of the cultural layer with no intervening cultural deposits. The absence of intervening cultural deposits cleared the way for mechanical removal of the overburden to within 10 cm of the charcoal-stained cultural layer. Hand-excavation of the remaining overburden and the cultural deposit progressed in 10 cm arbitrary levels. If the stratum

Figure 154. Feature 15, Area 11, LA 61290.

thickness was within 1 or 2 cm of a 10 cm level, it was removed as one level.

Hand-excavation exposed an 8 by 9 m area that was an intensively used Middle Archaic period base camp (Figs. 155 and 156). Nine thermal features and one discard/activity area were excavated into the C horizon and capped by the 10 to 15 cm thick CH horizon. The occupation surface was positioned within an elongated south-southeast-facing swale. Elevations within the excavation area ranged from 4.82 to 4.04 from 34N/140E to 26N/148E, a diagonal distance of 11 m. Estimated slope was 5 to 7 percent, which is greater than might be expected for Middle Archaic camps. LA 61286 and LA 61289 excavations showed a slope of less than 5 percent, and slopes of 2 to 5 percent were prevalent. The swale was bounded on all but the south-southeast by low ridge slopes, which would have provided protection from wind and increased solar exposure. For this reason, this ideally suited cool-weather locale would have taken advantage of lower and more southern solar trajectories.

Excavation revealed an extensively charcoal-stained area and associated and peripheral features and artifacts. The limits of the most intensely stained area formed an irregular outline covering a 4 by 3 m area (Fig. 155). The CH horizon was 3 to 15 cm thick in this area, but it was difficult to follow, and there were no prepared interior surfaces that could be called a floor or boundaries that could be construed walls. However, the extent of the stain and the fact that it had limits suggests that it was the heavily deflated and bioturbated remains of a shallow structure foundation. Because it could not confidently be called a structure during excavation, the area was not assigned a feature number and was not treated as a structure. It is also possible that this area is the burned remains of a ramada or open-walled shelter. This is partly suggested by three thermal features (Features 18, 24, and 26) and a discard area (Feature 23) that occurred within the stained area. Features 16, 17, 19, 20, 22, and 23 were peripheral to the possible sheltered activity area.

Eight thermal features and a discard area were identified (Table 40 and Figs. 157–168).

The discard area, Feature 21, consisted of a cluster of cobbles and a slab metate made from schist. Feature 21 was at the perimeter of the main feature cluster (Figs. 164 and 165).

All thermal features, regardless of possible intramural or extramural context, were unlined and basin-shaped burned pits except for Feature 23, which was a deep roasting pit, similar to features excavated in Area 2 of LA 61286. These oval to circular, basin-shaped pits range from 0.50 to 1.10 m long and 0.40 to 0.69 m wide by 0.04 to 0.48 m deep.

The pits fall into three categories based on depth and area. Four pits—Features 16, 19, 20, and 26—are less than 0.15 m deep and have areas of more than 0.30 sq m. They can be characterized as shallow, open pits. Four undifferentiated pits, not particularly large or shallow, were 10 to 20 cm deep but had areas of less than 0.30 sq m. One deep pit, Feature 23, was 0.48 m deep and had an area of 0.30 sq m. It had burned *Opuntia* remains.

These pit classes were not segregated, paired, or equally distributed across Area 10, suggesting that they were built and used during repeated occupations. The second pit class may have been less specialized in function than the others. The open, shallow, and medium-sized deep pit may have been more functionally specific and geared toward plant processing (see Badner and McBride, this report). Regardless of morphology, all pits lacked fire-cracked rock, and they were lightly to moderately burned. Typically, they were filled with primary and secondary mixed deposits. The most common economic plant remains were *Chenopodium*, *Portulaca*, and cheno-ams. Feature 23, with *Opuntia* remains, was the deepest pit and had steep walls. In size and cross section, it was similar to the cobble-lined pits at LA 61289, but Feature 23 had no cobble lining.

The activity space encompassing the features contained fire-cracked rock concentrations and dispersed scatters, two metate fragments, a comal/metate, three mano fragments, a core chopper, a scraper, two tool flakes, a core, nine pieces of core-reduction debris, and a deer bone. Within the 10–15 cm thick CH horizon, 20 more pieces of core-reduction debris were recovered. This artifact frequency is low, and in general there is a lack of evidence of hunting-tool manufacture or butchering. The deer bone was heavily corroded and decomposed, indicating that smaller and less robust bone may not preserve well in the deep sandy loam. This in part may account for the low animal bone frequencies from this and other sites

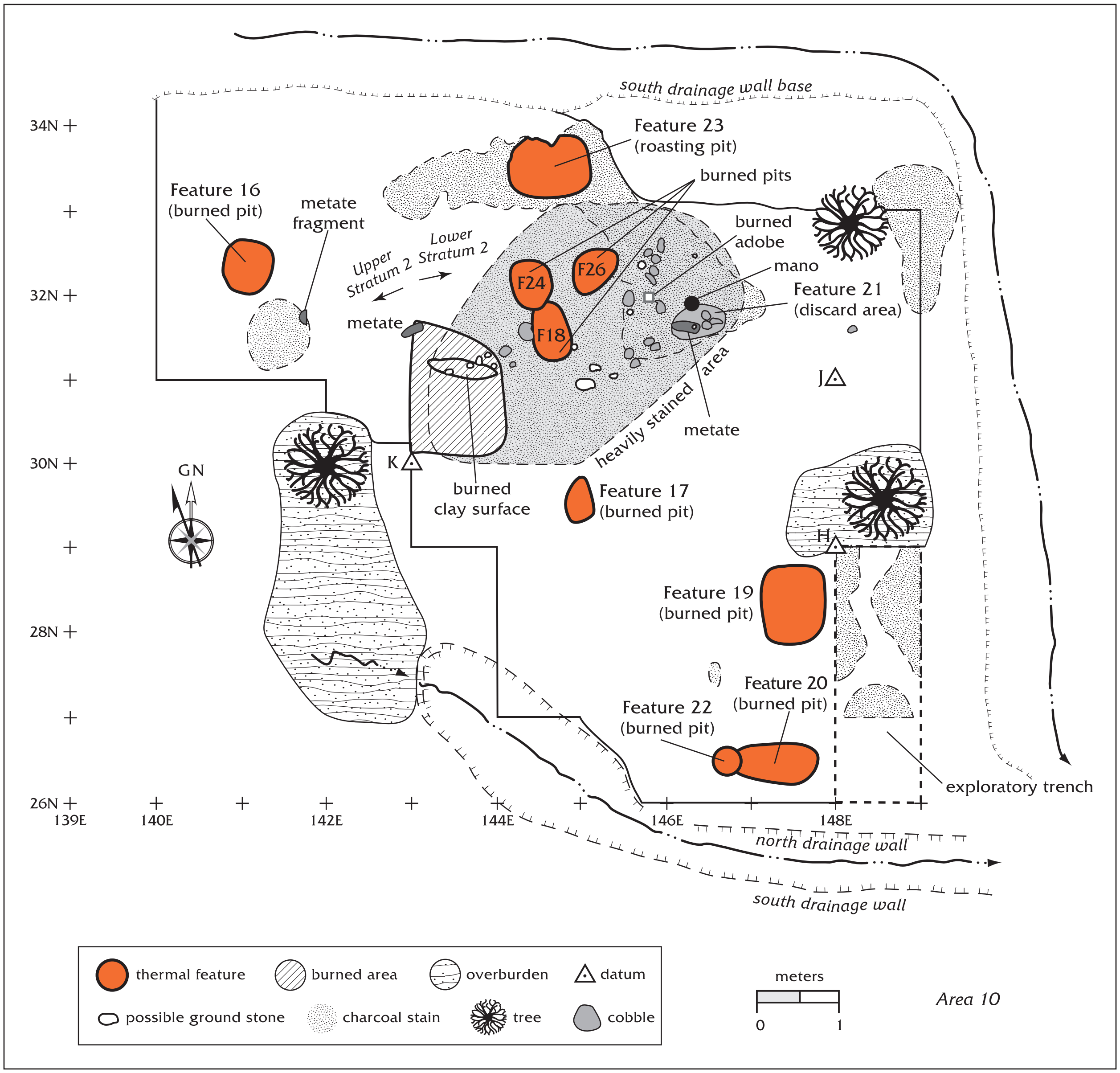


Figure 155. Plan of excavation, Area 10, LA 61290.

Figure 156. Area 10, LA 61290.

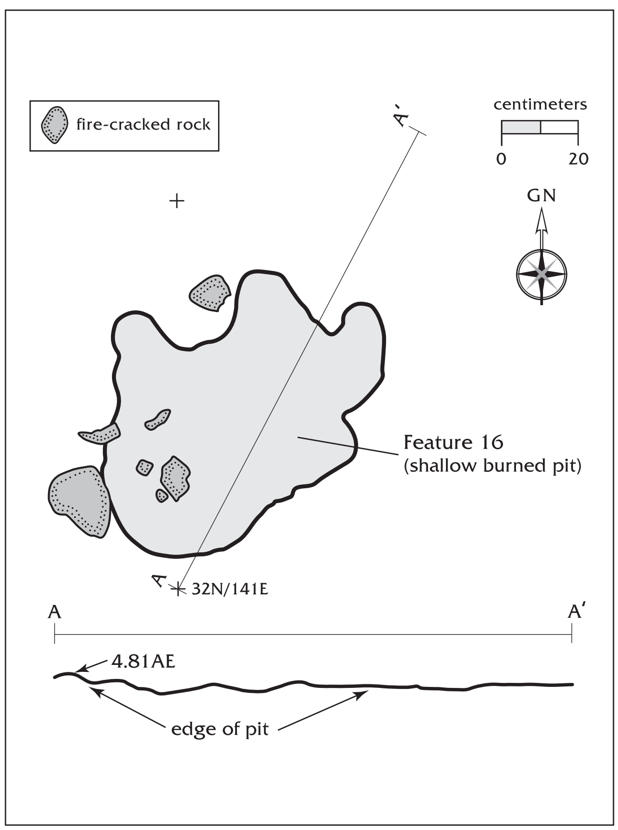


Figure 157. Plan and profile of Feature 16, Area 10, LA 61290.

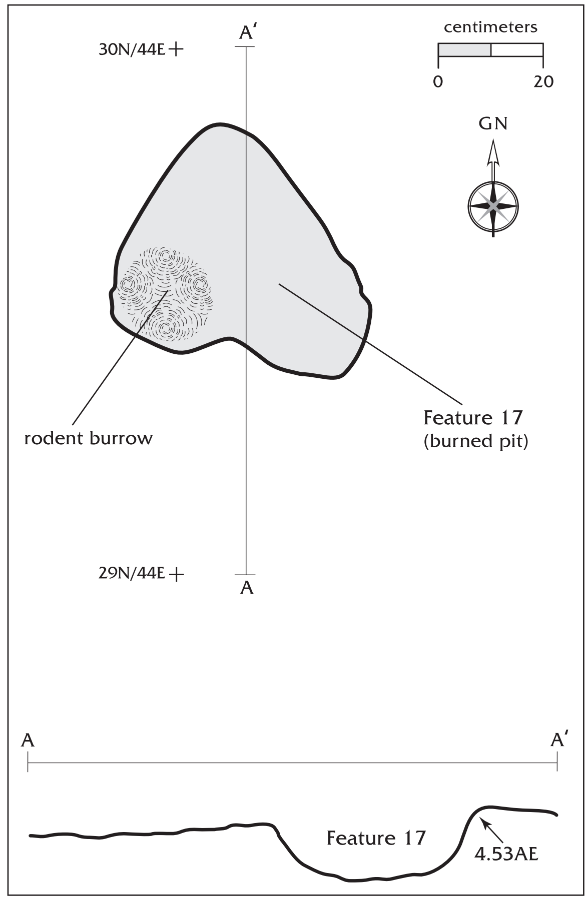


Figure 158. Plan and profile of Feature 17, Area 10, LA 61290.

Figure 159. Feature 17, Area 10, LA 61290.

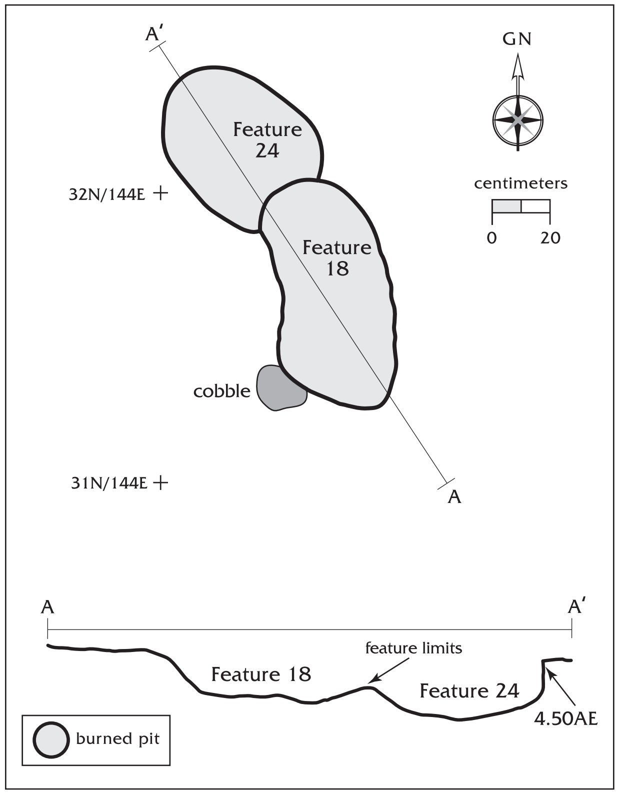


Figure 160. Plan and profile of Features 18 and 24, Area 10, LA 61290.

Figure 161. Features 18 and 24, Area 10, LA 61290.

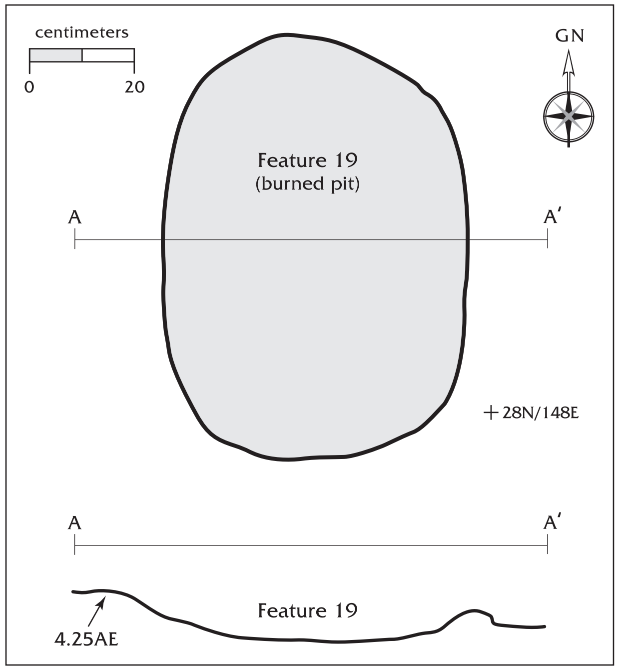


Figure 162. Plan and profile of Feature 19, Area 10, LA 61290.

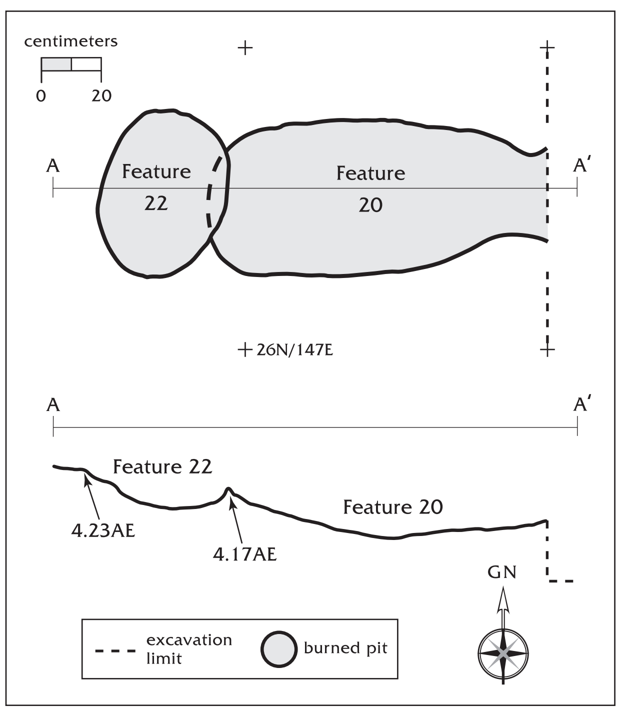


Figure 163. Plan and profile of Features 20 and 22, Area 10, LA 61290.

Figure 164. Discard area, Feature 21, Area 10, LA 61290.

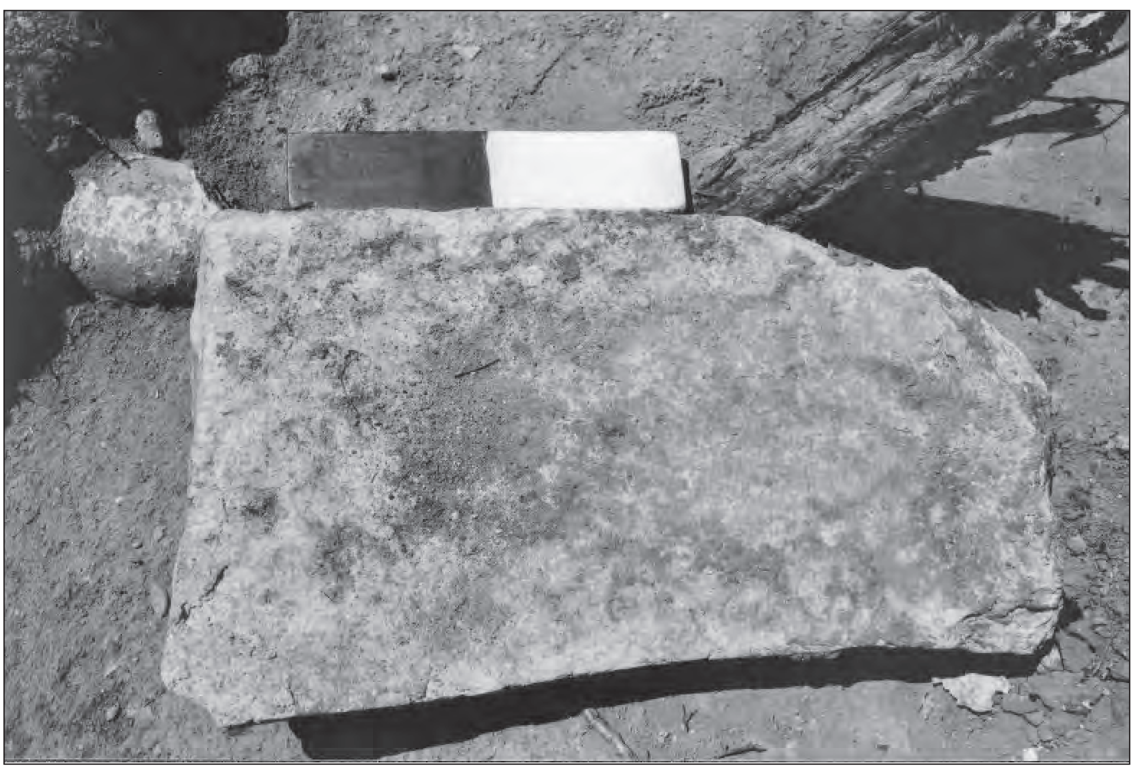


Figure 165. Slab metate from Feature 21, Area 10, LA 61290.

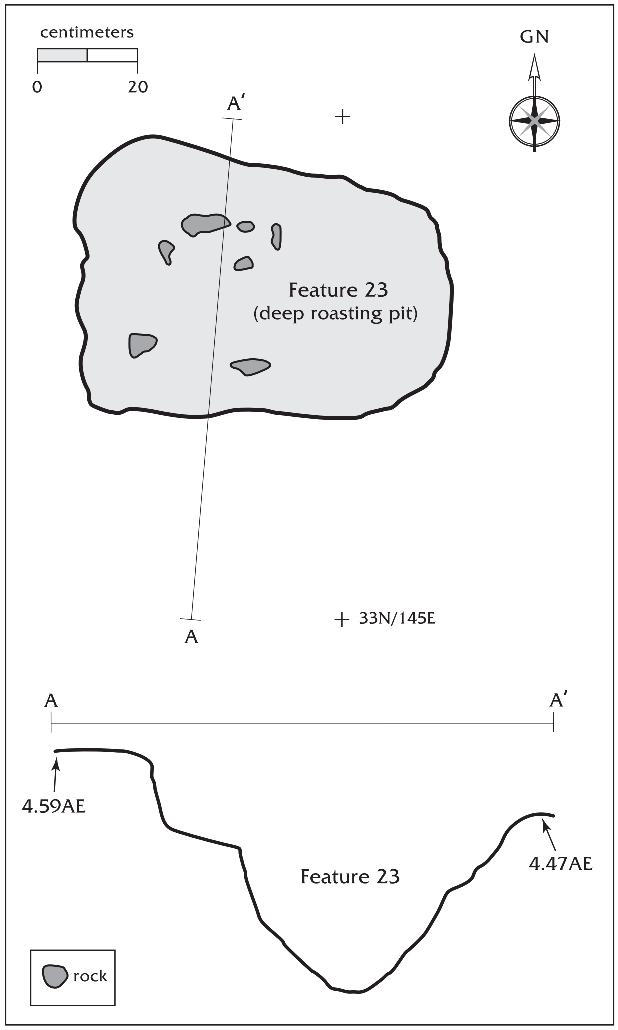


Figure 166. Plan and profile of Feature 23, Area 10, LA 61290.

Figure 167. Feature 23, Area 10, LA 61290.

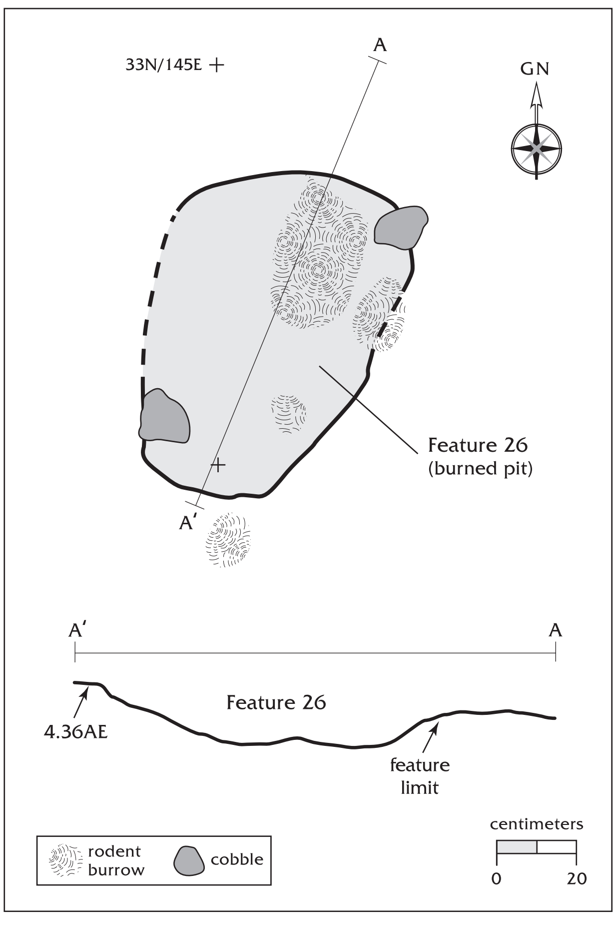


Figure 168. Plan and profile of Feature 26, Area 10, LA 61290.

on the piedmont. This activity space lacks formal spatial structure, but the combination of tools and features indicates generalized processing typical of a base camp. Thermal features were not as densely spaced as they were in Area 2, LA 61286, suggesting fewer occupations over a shorter span at LA 61290.

Wood charcoal samples from three features were submitted for radiocarbon dating. The sample from Feature 23 returned a cal. 2495–2135 BC two-sigma range. The sample from Feature 20 yielded a cal. 2277–1826 BC two-sigma range. The sample from Feature 18 yielded a cal. 2134–1739 BC two-sigma date range. The date ranges from the features fall within the middle to late portion of the Middle Archaic or the very early end of the Late Archaic period. The Feature 20 and 23 dates were statistically similar to the date ranges for Features 13 and 15, Area 11. This strongly indicates that Areas 10 and 11 were a continuous occupation surface that was occupied repeatedly over a 250- to 500-year period. The activity area extends to the east beyond the right-of-way, and a larger site is more consistent with the 250- to 500-year range.

Area 9. Before excavating in Areas 10 and 11, Area 9, a 40 sq m area with 35N/132E as the southwest corner, was surface-stripped. Within this area there was a highly diffuse charcoal-stained soil level associated with 78 pieces of fire-cracked rock and two features, Features 8 and 9. These features were exposed at elevations (5.80 and 5.15 m) that were 0.75 to1.55 m higher than Areas 10 and 11, suggesting that the Feature 8 and 9 activity area was later. Feature 25 was found in the profile of the north wall of the Area 11 excavation area following mechanical excavation. It was within the same elevation range of Features 8 and 9 and may be contemporaneous with them. Therefore, Feature 25 has been included in this description, even though it was not found within the original 40 sq m excavation area.

Features 8 and 9 were heavily deflated and eroded by slope wash and cutting by minor erosion channels (Table 40).

Feature 8 was very shallow (less than 5 cm deep) and may have had a circular outline (Fig. 169). The excavator suggested it was a surface fire or feature. (Shallow features have been found at LA 61286 and were dated to the Late Archaic period.) No contents remained in the feature, and the majority of the fill was redeposited yellowish brown sandy loam (no Munsell color chart reading taken in the field).

Feature 9 was similar to Feature 8 in that is was a relatively large (potentially 1.0 m in diameter), shallow, basin-shaped pit (Fig. 170). It contained nine pieces of fire-cracked rock. The remaining fill, which was a mixed primary and

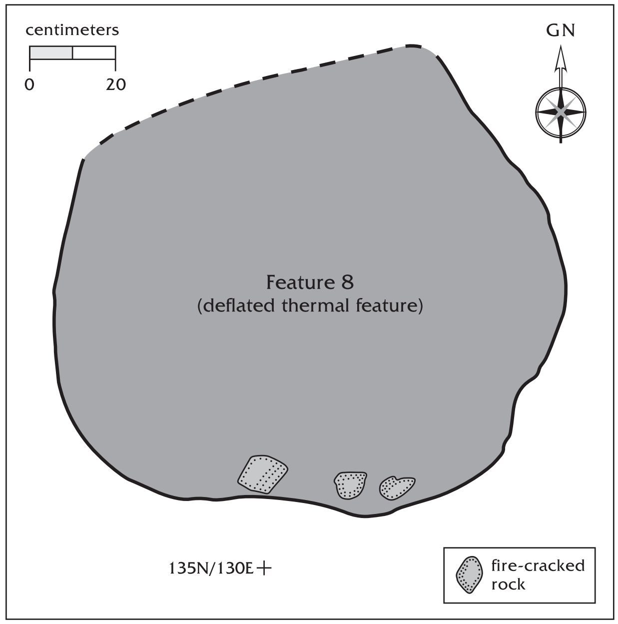


Figure 169. Plan of Feature 8, Area 9, LA 61290.

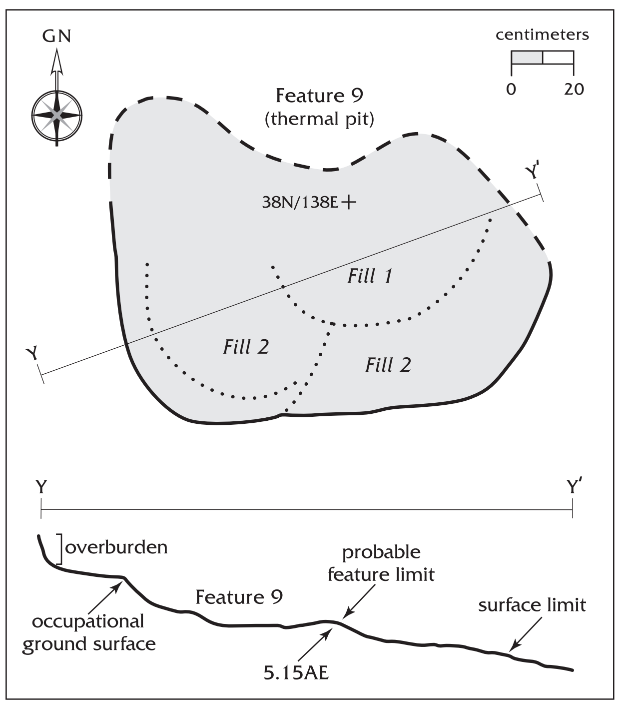


Figure 170. Plan and profile of Feature 9, Area 9, LA 61290.

secondary deposit, was a dark grayish brown sandy loam (10YR 4/2). Feature morphology was similar to that of Late Archaic features excavated at LA 61286 and LA 61293, suggesting dates of 800 BC to AD 1 for Feature 9, LA 61290. Artifact frequencies from Feature 9 were low. It appeared to be a very lightly used processing camp.

Feature 25 was excavated into the gentle colluvial slope. It was capped by 30 to 45 cm of Stratum 2 sandy loam (Figs. 171 and 172). It had steep walls and was filled with very dark brown (10YR 2/2) to black (10RY 2/1) sandy loam. There was no fire-cracked rock within the feature, and the darkly stained color suggests that abundant charcoal remained in the feature when it was covered. No ethnobotanical or faunal remains were recovered that would indicate the feature function.

The excavation of Area 9 showed that Areas 10 and 11 and adjacent areas were reoccupied after the Middle Archaic component was abandoned. The few artifacts reveal little about how the features were used or the range of activities that were conducted. An absence of absolute dates makes it difficult to determine when the area was occupied. However, the similarity between these thermal features and Late Archaic features excavated at LA 61286 and LA 61293 suggests contemporaneity. LA 61286 and LA 61293 are also similar to LA 61290 in that they were used repeatedly from Middle Archaic to Pueblo times.

Area 1. The excavation of Area 1 (88N/100E, southwest corner) covered a 9 by 11 m area that encompassed surface evidence of a thermal feature and two charcoal-infused soil stains exposed in the upper reaches of the erosion channel that drains the main site area from northwest to south-southeast. The cultural deposits and artifacts were visible on the surface, and surface stripping of 71 units in this area exposed four thermal features (Features 1, 6, 7, and 10) and a burned log of unknown association (Feature 12) (Fig. 173).

Surface stripping removed the upper 4 to 10 cm of Stratum 1. This eolian deposit was a loosely consolidated sandy loam that covered and was indistinguishable from the feature deposits from the Ancestral Pueblo occupation. Indented corrugated pottery, chipped stone debris, and fire-cracked rock were diffusely distributed across the excavation area. Fire-cracked rock clustered south and north of Features 1 and 6. Feature 7 had limited associated cultural material. The fire-cracked rock defined the limits of the activity area and the presence of discard areas. Deflation and erosion of the slope have redistributed the fire-cracked rock, but the overall form of the distribution has integrity and reflects activity-space organization.

Soil staining or the partial outline of three features was exposed by the removal of Stratum 1. Feature 1 contained part of a broken indented corrugated jar, suggesting that this area dated to the Ancestral Pueblo period. Other scattered sherds that were recovered were also from the Ancestral Pueblo period. The feature types included an undifferentiated burned pit (Feature 7), a fire-cracked rock filled roasting pit (Feature 6), a cobble-lined hearth (Feature 10), and a piñon nut roasting pit (Feature 1). Feature 12 was the remains of a burned limb, 40 cm northeast of Features 1 and 10. The relationship of Feature 12 to the other features is unclear. It is possible it remains from fire tending associated with piñon nut roasting at Feature 1, which contained substantial portions of charred logs.

Feature 1 was a partly cobble-filled burned pit that contained a large quantity of piñon nut shells in pockets of darkly charcoal-stained sandy loam. Whole piñon nuts were found in a partial indented corrugated jar (Figs. 174 and 175). The association of the piñon nuts and the indented corrugated vessel suggest that the vessel was used to shield nuts from direct heat during roasting. A few sherds were disarticulated from the main partial vessel body, and piñon nuts were in the pit interior, suggesting that the partial vessel had broken and the nuts were spilled into the fire or coals. The dimensions of Feature 1 are similar to those of many thermal features excavated within the Northwest Santa Fe Relief Route corridor and in the Las Campanas area to the north and east, suggesting that the assumption that these large features supported piñon nut collecting and roasting is partly correct. Features filled with cobbles or fire-cracked rock are common in the piedmont, but examination of flotation samples has usually returned inconclusive results.

Superimposed on the northeast perimeter of Feature 1 was Feature 10, a heavily used cobble-lined hearth (Figs. 176 and 177). It appeared to be truncated by the construction of Feature 1, indicating that it was constructed first and

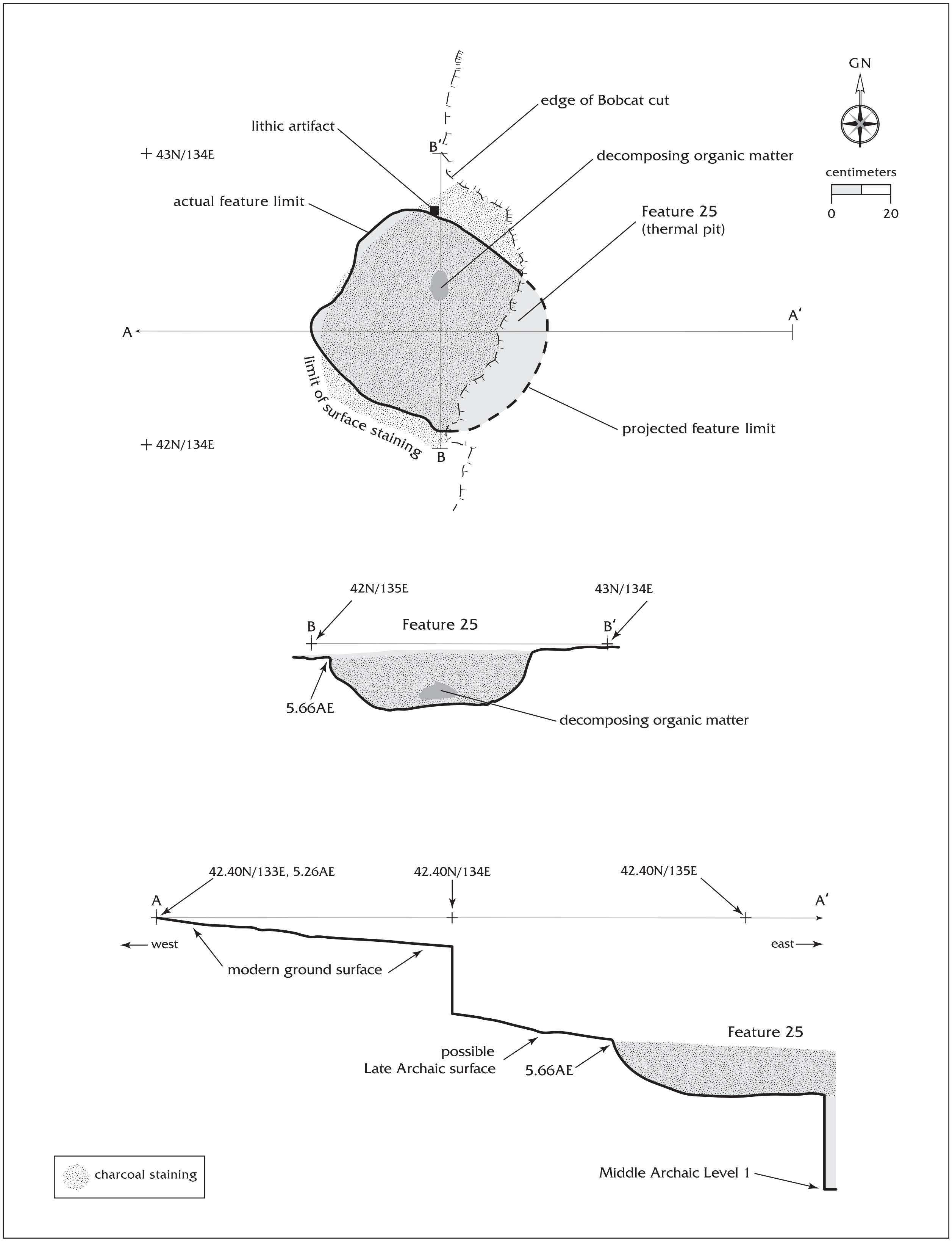


Figure 171. Plan and profile of Feature 25, Area 9, LA 61290.

Figure 172. Feature 25, Area 9, LA 61290.

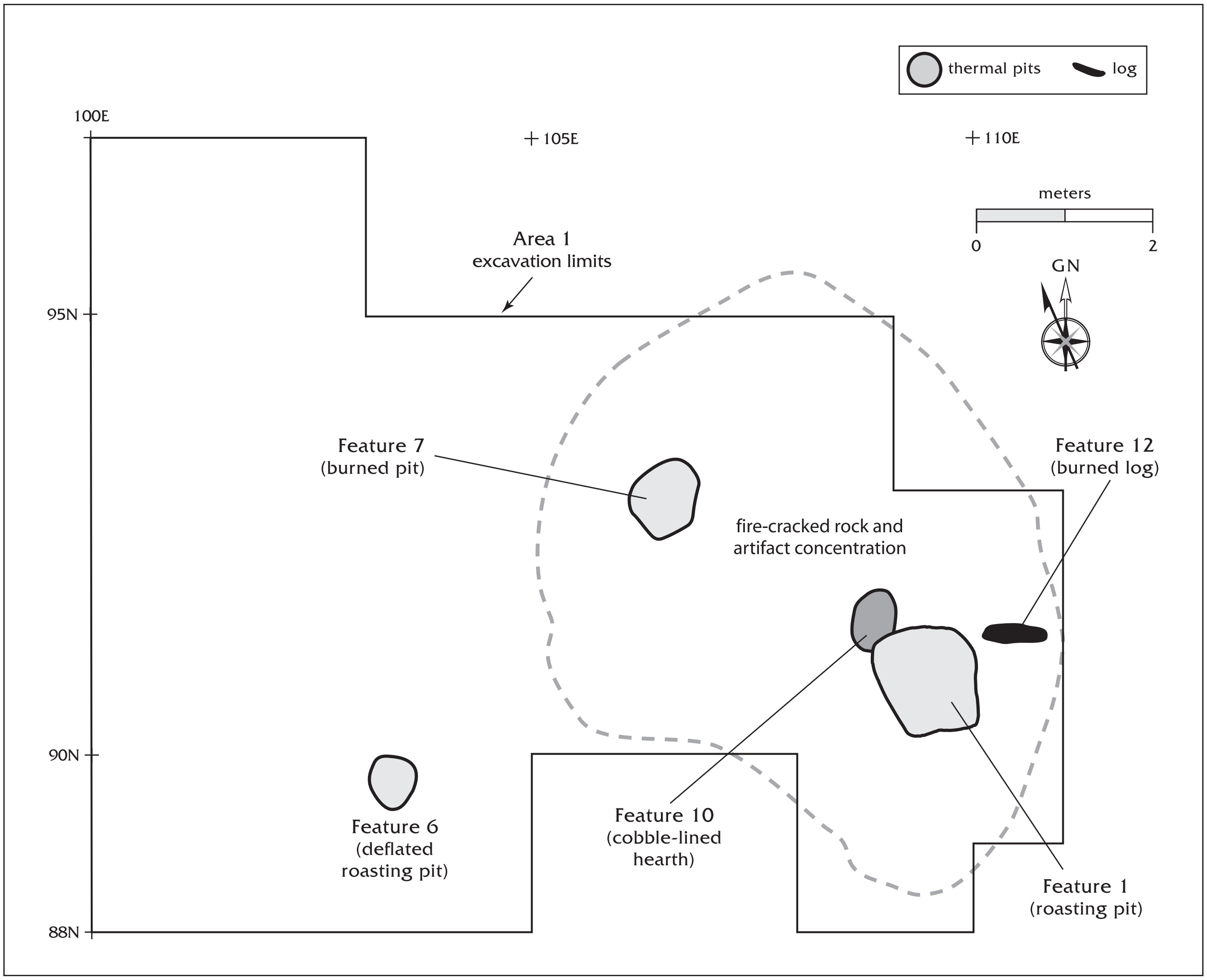


Figure 173. Plan of excavation, Area 1, LA 61290.

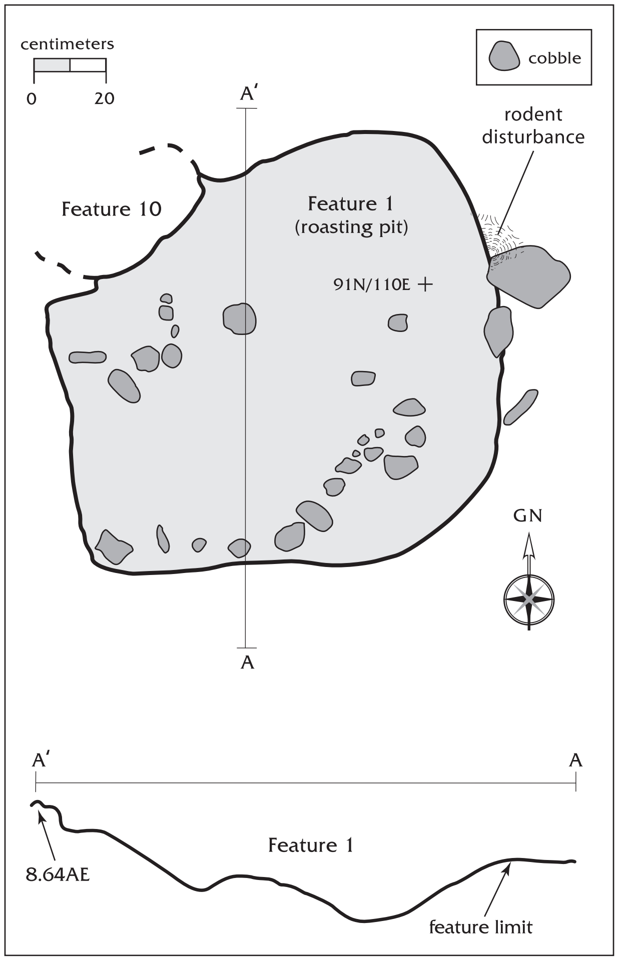


Figure 174. Plan and profile of Feature 1, Area 1, LA 61290.

Figure 175. Feature 1, Area 1, LA 61290.

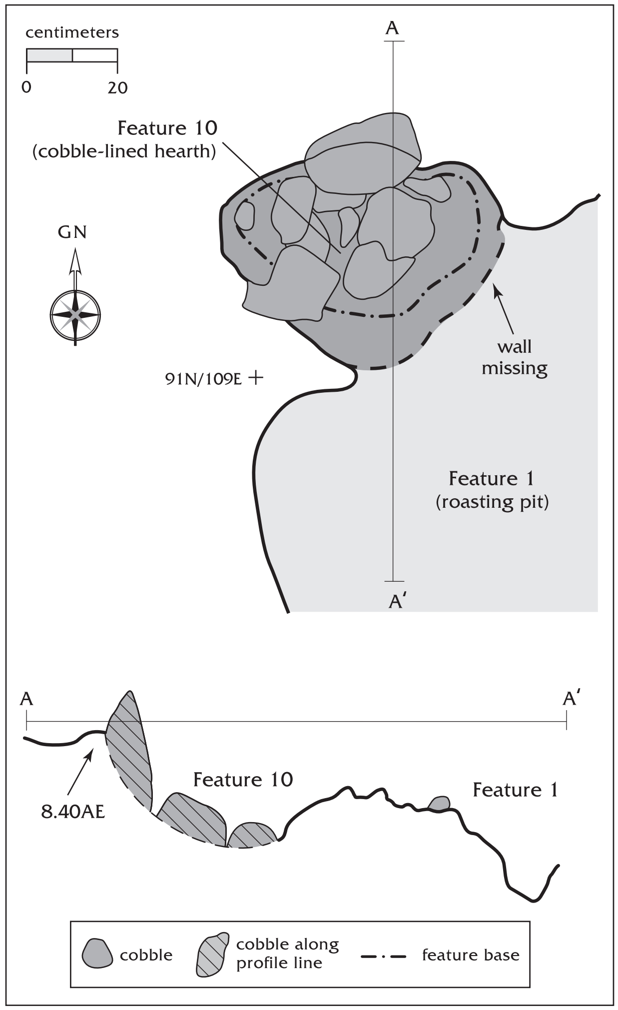


Figure 176. Plan and profile of Feature 10, Area 1, LA 61290.

Figure 177. Feature 10, Area 1, LA 61290.

Feature 1 was added on later. Feature 10 was one of the few non–Middle Archaic thermal features lined with cobbles. It was different from the Middle Archaic features because the cobbles were upright. A similar hearth (Feature 8, LA 61293) was associated with an Ancestral Pueblo occupation surface and yielded an Ancestral Pueblo–age radiocarbon date. Feature 10 showed evidence of heavy use and may have produced coals that were used in Feature 1. Oxidation of iron-rich soils within each feature suggests that both Feature 1 and 10 were used at a high temperature and that they were reused.

Feature 6 was a deflated, fire-cracked rock filled roasting pit that was similar in size, structure, and morphology to Ancestral Pueblo thermal features found at LA 61293 and LA 113954 during this project and LA 86150 and LA 98690 in the Las Campanas area to the northwest (Post 1996a). The fill was a very dark grayish brown (10YR 3/2, dry) sandy loam with abundant charcoal flecks. Eight fire-cracked cobbles were heavily stained. This 85 cm east-west by 80 cm north-south basin-shaped pit was only 8 cm deep, although the feature depth has been decreased by erosion (Fig. 178). A wood charcoal sample collected from Feature 6 yielded a cal. AD 1040–1290 two-sigma range. Though broad, this range places it in the same period as Features 1 and 10.

Feature 7 was a deflated undifferentiated burned pit similar to Feature 2 at this site and Features 5 and 30 at LA 61293 (Fig. 179). It remained from a surface fire or hearth of unknown age. It was very shallow and lacked associated artifacts and did not yield ethnobotanical remains.

Excavation of the 88N/100E area revealed a more complex feature cluster than was evident on the surface. The cluster resulted from repeated Coalition or Early Classic period occupations and perhaps a later more transient land-use pattern. The piñon nut processing feature is the first one found in the piedmont hills. Its presence reaffirms the assumption that piñon nut gathering was an important component of Ancestral Pueblo foraging. The feature cluster is interesting because it implies that Ancestral Pueblo foragers considered this an optimal location from which to stage foraging and processing activities. This in turn implies that all locations on the piedmont were not equal—in other words, the placement of foraging sites was not random, and proximity to resources influenced siting. Numerous thermal

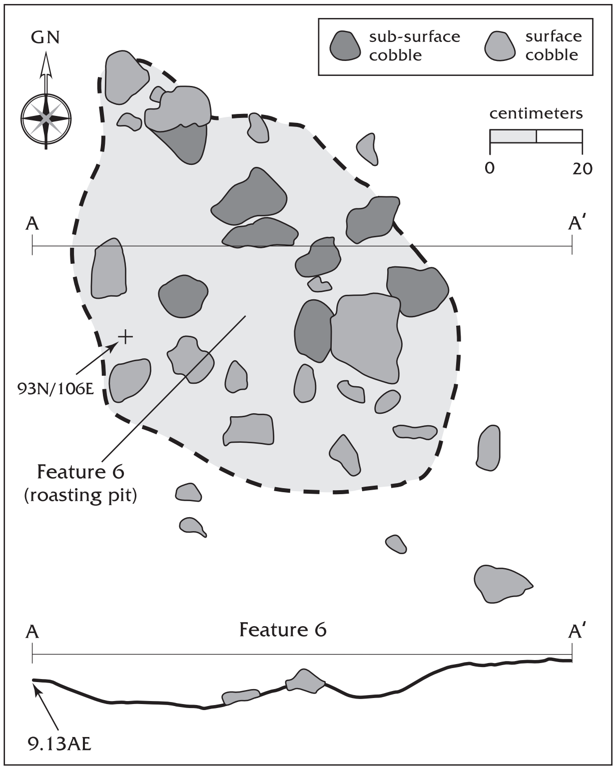


Figure 178. Plan and profile of Feature 6, Area 1, LA 61290.

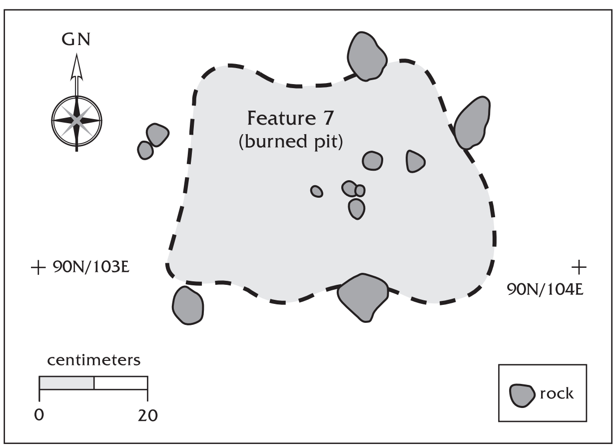


Figure 179. Plan and profile of Feature 7, Area 1, LA 61290.

features here and at nearby sites document a strategy that focused on south-facing ridge slopes between and above the major tributary arroyos.

Area 8. The excavation of Area 8 (51N/139E), a 7 by 7 m area, focused on a diffuse artifact scatter on the east slope of the arroyo channel that cuts through the main excavation area. This area was north and east of Areas 9, 10, and 11. The gentle slope was covered by a dense deposit of gravel and cobbles. Intermittent evidence of charcoal and charcoal-stained soil indicated recent burning. A thermal feature (Feature 27) was exposed 10 cm below the gravelly Stratum 1.

Removal of Stratum 1 was intended to recover artifacts and define the limits of another dispersed activity area. Only seven chipped stone artifacts and a one-hand mano were recovered from the 49 sq m area. However, the outline of a burned feature, Feature 27, was exposed.

Feature 27 was initially interpreted as a fire-cracked rock filled roasting pit. Its darkly stained charcoal-infused soil and internal fire-cracked cobbles were similar to other Ancestral Pueblo features from the Northwest Santa Fe Relief Route and the Las Campanas project. However, recovery of nine polished white ware sherd spalls from flotation samples suggests that Feature 27 may have functioned as a pottery-firing pit kiln. Comparing the feature with other pit kilns identified during excavations in the piedmont tests this observation.

Pottery-firing features long eluded identification by archaeologists working in the Northern Rio Grande and more specifically in the Santa Fe area (Post and Lakatos 1995:141; Lakatos 1996). A major factor in the limited ability to consistently identify these features was a reliance on commonly referenced ethnographic descriptions of pottery firing (Post and Lakatos 1995:141). Ethnographically observed pottery firing used fuel and furniture that would not have been available to prehistoric potters in the thirteenth century AD. These ethnographic methods produced a low-fired pottery comparable to prehistoric utility wares, but not fired at a high enough temperatures to produce decorated pottery. Because Santa Fe Black-on-white is a more highly fired pottery, it needed a different firing technology than that used by historic Pueblo potters. Archaeologists working the Upper San Juan Basin have identified and excavated at least 18 pottery kilns used to produce Mesa Verde tradition decorated pottery (Purcell 1993). Pottery replication using firing methods developed from kiln stratigraphy has successfully been used to reproduce carbon-paint decorated pottery. The Upper San Juan firing model and trench kiln technology may be closer to the methods used to produce Santa Fe Black-on-white in the Northern Rio Grande during the thirteenth and fourteenth centuries AD.

Excavators at Las Campanas de Santa Fe (Post 1996a; Lakatos 1996) identified two near-surface thermal features associated with sherd spalls similar to those found in association with Upper San Juan pit kilns. Careful excavation of the thermal features revealed internal characteristics that were partly consistent with Upper San Juan trench kiln morphology and stratigraphy. When the attributes of the Las Campanas thermal features were compared with those of other Ancestral Puebloan and Archaic pit features from the Santa Fe area, the Las Campanas features were found to be more consistent in size, content, stratigraphy, and topographic setting. When the Las Campanas thermal features were compared with Upper San Juan Basin trench kilns, similarities in stratigraphy and the presence of sherd spalls was apparent. Differences in kiln shape (oval versus rectangular) and kiln furniture (cobbles versus slabs) were explained by geological setting. The Las Campanas area lacked suitable outcrops for sandstone slabs but had abundant cobble deposits. The Upper San Juan Basin has abundant sandstone sources. The rectangular shape of the Upper San Juan trench kilns reflects use of tabular sandstone and the need to accommodate pottery of greater volume. Upper San Juan trench kilns may have been used for communal or larger-scale specialist firings, while the Santa Fe kilns appear to have been built for household production.

Santa Fe pit kilns are oval, shallow (less than 30 cm deep) basins with cobbles placed within the pit away from the pit edge. The cobbles do not fill the pit, are well spaced, rest on a layer of dark gray to black charcoal-infused sandy loam, and are covered and embedded in a heavily charcoal-infused soil layer and by a lighter gray layer of sand that may be a remnant of the "closing" layer (Swink 1993; Blinman et. al 1994). A high percentage of the associated sherds are spalls resulting from overfiring or a sudden increase in kiln temperature. Decorated pottery found in the Santa Fe pit kilns has a higher percentage of faint carbon paint than other features (Lakatos 1996).

Feature 27 had nine spalled sherds recovered from the flotation samples. No sherds were identified in the field. The stratigraphic profile of Feature 27 shows burned and fire-cracked cobbles suspended in very dark grayish brown (10YR 3/2) sandy loam mixed with dispersed charcoal flecks. No ethnobotanical remains were recovered from the feature. The nine sherd spalls are from a polished white ware vessel. The feature has an oval outline and is a shallow basin. It measures 74 cm long by 72 cm wide, smaller than the other Santa Fe pit kilns (Figs. 180 and 181).

Based on the sherd spalls and the presence of cobbles suspended in heavily charcoal-infused soil, it is likely that Feature 27 is a pit-kiln remnant. Its small size is unusual, but the Santa Fe pit-kiln sample has only three examples, and the full range of morphological variation is poorly known.

Surface stripping around Feature 27 yielded three core flakes and one piece of angular debris. They are made from locally available chert. Their association with Feature 27 is speculative. Low chipped stone frequencies have been associated with other pit kilns, but chipped stone also was associated with the historic period thermal feature, Feature 4.

Area 8 was primarily used during the Coalition or Early Classic period. One probable activity was pottery firing. As the number of seemingly nondiagnostic thermal features that have been excavated increases, more functional and behavioral insight into feature construction, use, and identification is gained. Pottery firing may not have been a regular part of Ancestral Pueblo landscape use, but it is clear that it occurred on the piedmont slopes. In this case, the kiln was used 2.1 to 3.2 km from the nearest Santa Fe River village.

Area 2. Area 2 (74N/96E) was a 4 by 6 m excavation area focused on a charcoal-infused soil stain that was visible on the surface. Surface-strip removal of Stratum 1 yielded eight pieces of fire-cracked rock and nine chipped stone artifacts. The association of artifacts and feature is probable, but not definite.

Feature 2 was a large, basin-shaped pit filled with dark gray (10YR 3/1) sandy loam. It measured 83 cm north-south by 65 cm east-west by 6 cm deep (Fig. 182). Three pieces of fire-cracked rock and no artifacts were recovered. No ethnobotanical remains were recovered from 5 liter flotation samples. The age and function of Feature 2 remains unknown.

Area 2 was a typical limited-activity area marked by a near-surface stain and a low-density artifact scatter. These activity areas make up a

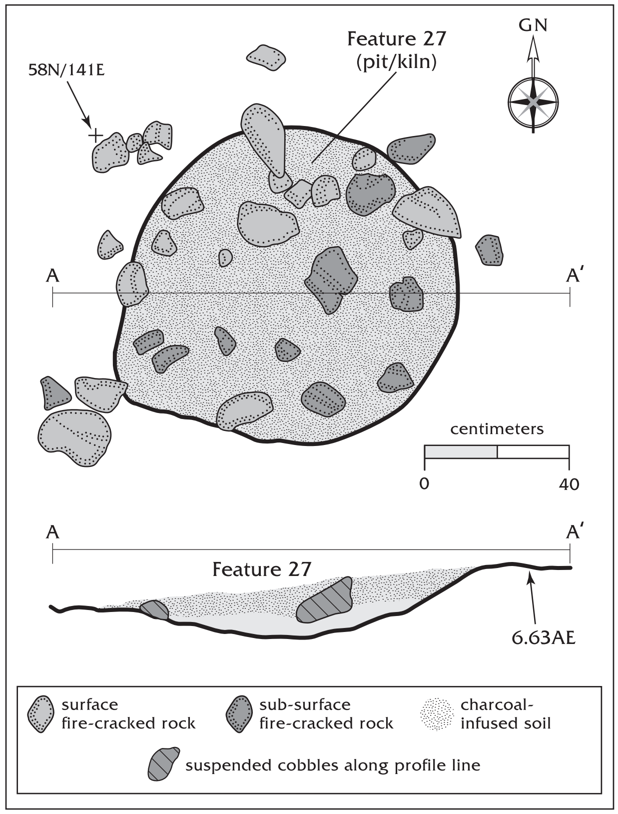


Figure 180. Plan and profile of Feature 27, Area 8, LA 61290.

Figure 181. Feature 27, Area 8, LA 61290.

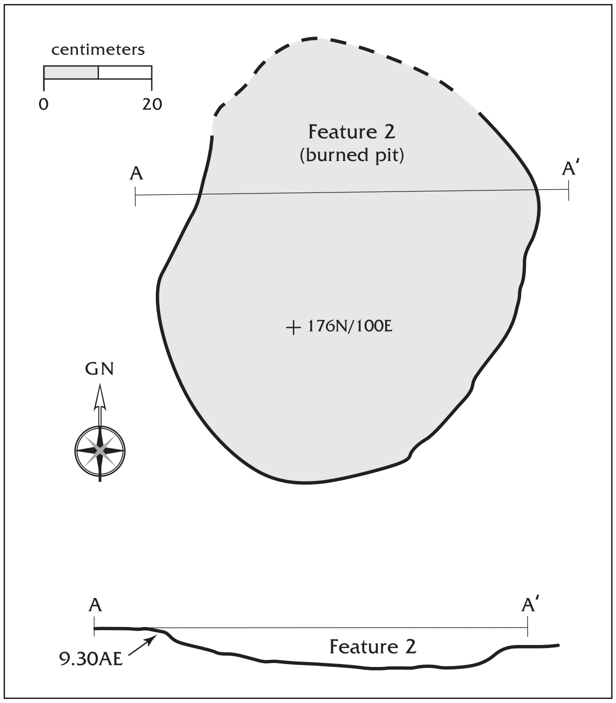


Figure 182. Plan and profile of Feature 2, Area 2, LA 61290.

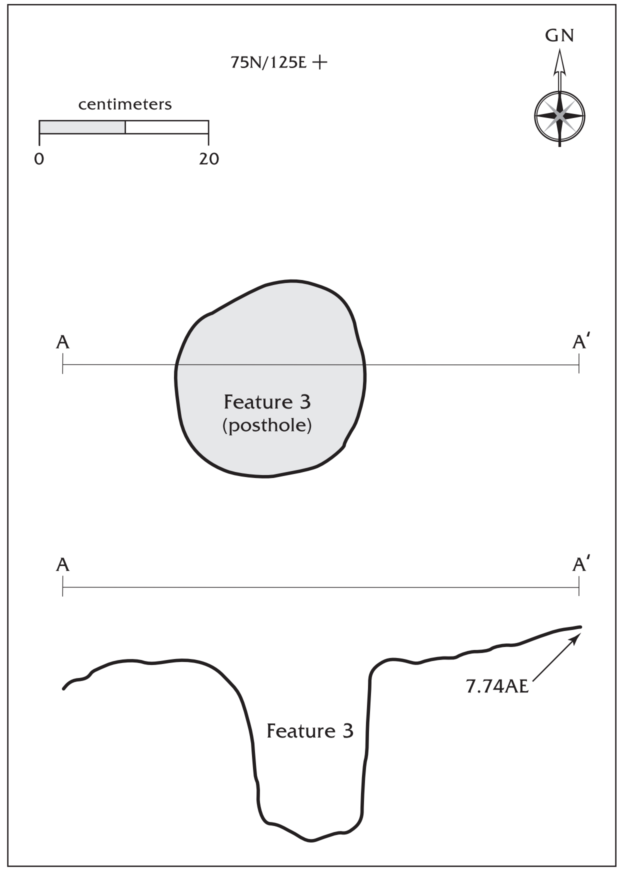


Figure 183. Plan and profile of Feature 3, Area 3, LA 61290.

substantial part of the piedmont archaeological record, but they are difficult to analyze and interpret. The best way to understand how these features were used is to accumulate a comparative database that may yield intelligible land-use patterns.

Area 3. Area 3 (73N/123E) measured 3 by 3 m and consisted of a small charcoal-infused soil stain on the east bank of the main arroyo that cut through the site. Stratum 1 was removed to expose the feature outline and recover any associated artifacts. Excavation revealed a small unburned pit, and two chipped stone artifacts were recovered. The artifacts and Feature 3 cannot be confidently associated.

Feature 3 is only 17 cm in diameter and appears to be a burned fencepost rather than a thermal feature (Fig. 183). Feature fill was redeposited Stratum 1 mixed with a few charcoal flecks. No fire-cracked rock or other cultural material were associated with or contained in the feature. The vertical walls and small diameter of the feature suggest that it was a posthole. The age and function of this isolated posthole is not known.

The excavation of Area 3 was inconclusive. Feature 3 is not similar to any other feature found during the project. The low artifact frequency in the area and the limited nature of the feature precluded further investigation.

Area 4. Area 4 (84N/88E), measuring 6 by 5 m, contained a deflated and truncated thermal feature (Feature 4) exposed in the shallow erosion channel. The feature was on the gradual middle slope and defined the western limit of the site. Numerous minor erosion channels originate at the same elevation and slope gradient that characterizes Area 4.

Stratum 1 was surface-stripped, exposing the outline of Feature 4 and resulting in the recovery of eight chipped stone artifacts. Excavation revealed an oval pit with gently sloping walls and an irregular bottom (Fig. 184). The pit fill was a very dark grayish brown silty loam that was loosely consolidated. It was mixed with pockets of charcoal and ash and 43 pieces of fire-cracked rock. Ethnobotanical analysis identified charred seeds of *Chenopodium* and *Portulaca,* juniper berries, and piñon nuts. The wood charcoal was

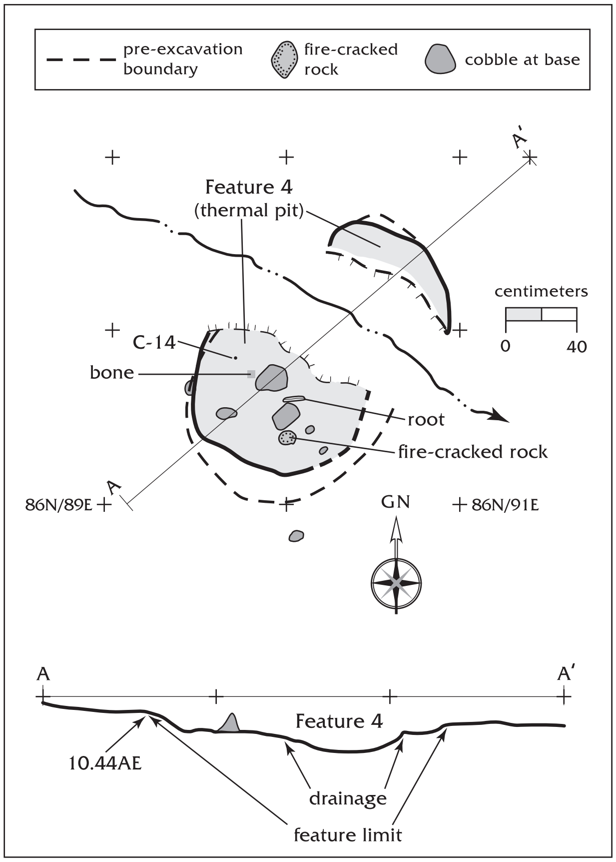


Figure 184. Plan and profile of Feature 4, Area 4, LA 61290.

piñon and juniper. A wood charcoal sample submitted for radiocarbon dating returned a post-1950 reading, indicating that the hearth was used during this century and potentially within the last 50 years. Twelve burned bones represented a small perching bird, a small mammal, a cottontail rabbit, and a jackrabbit. This mammal distribution reflects hunting and consumption of species that were immediately available on the piedmont. Feature 4 had a greater variety of plant and animal remains than any other feature excavated at LA 61290. The assemblage suggests a transient camp occupied by people who were consuming wild resources. No historic artifacts were recovered from or near Feature 4.

The eight chipped stone artifacts are not associated with the Feature 4 component. They reflect expedient and situational reduction of local raw materials. A light scatter of prehistoric chipped stone artifacts is typical of most of the excavation areas at LA 61290.

Area 4 was a briefly used modern hunting or subsistence camp. Commercially obtained goods would be expected at a site dating to post-1950, but none were found. It is interesting that the construction and fill of the feature are similar to those of Ancestral Pueblo and Archaic period features. Basic subsistence technologies appear to have changed little over 7,000 years.

Area 5. Area 5 (54N/110E) measured 4 by 4 m and contained a fire-cracked rock filled roasting pit that was bisected by a shallow erosion channel. The east-west-draining erosion channel emptied into the 20 m to the east. This middle slope has a gentle gradient, and it is covered with a shallow mantle of Stratum 1. No surface artifacts were observed in association with the exposed thermal feature (Feature 5).

Excavation of 16 1 by 1 m units yielded 2 lithic artifacts and 19 pieces of fire-cracked rock. The fire-cracked rock is probably redeposited from the feature interior. The low artifact frequency and the limited nature of the feature precluded further investigation. Insufficient wood charcoal for radiocarbon dating was recovered from Feature 5.

Feature 5 was oval with moderately sloping sides. The mostly intact south half of the feature contained abundant fire-cracked rock. The feature fill was a very dark brown (10YR 3/1) to black (10YR 2/1) sandy loam that was poorly consolidated with loose, blocky structure (Fig. 185). Charcoal flecks were sparse, but the dark soil suggested that abundant charcoal left in the feature had diffused through time. This fill was mixed with fire-cracked rock, and rock lay on top of a stained and lightly burned surface, suggesting that it had been placed in a dense layer of coals. Ethnobotanical analysis revealed no identifiable charred economic plant remains. This feature was similar in form to Late Archaic roasting pits excavated at LA 61286 and LA 61293. Feature 5 may be contemporaneous with Feature 25 in Area 9, suggesting long-term use by small, task-specific groups radiating from seasonal base camps.

Area 7. Area 7 (Area 80N/108E) measured 2 by 3 m and contained a shallow, charcoal-infused soil stain (Feature 11). The gradual slope that housed the feature faced northeast, and three shallow erosion channels contributed to modern deflation and erosion. Stratum 1 was removed to expose the feature outline and recover any associated artifacts. Excavation revealed a small unburned pit (Feature 11). No artifacts were

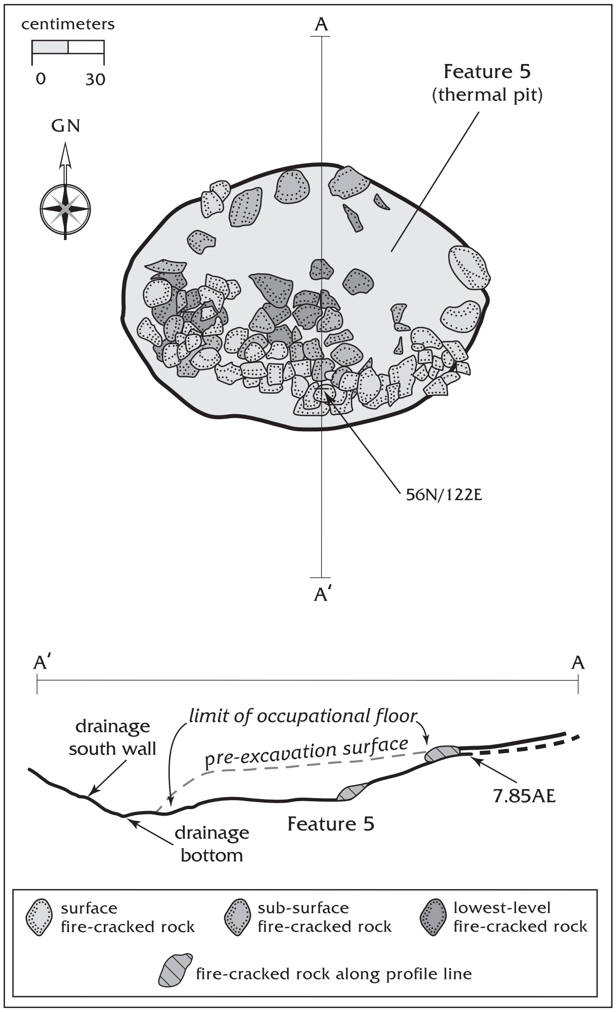


Figure 185. Plan and profile of Feature 5, Area 5, LA 61290.

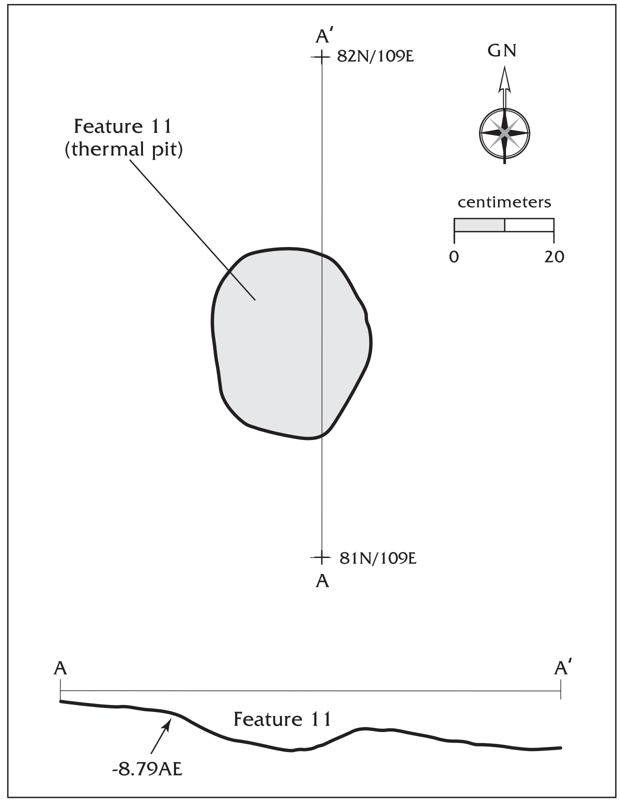


Figure 186. Plan and profile of Feature 11, Area 2, LA 61290.

recovered. Excavation of Area 7 halted with the exposure of Feature 11, since no artifacts were present, and there was no evidence of a more extensive cultural deposit.

Feature 11 was a lightly used oval thermal feature. The feature fill was a dark gray (10YR 4/1) fine sandy loam, poorly consolidated, with a loose, blocky structure (Fig. 186). No fire-cracked rock or other cultural material was associated with or contained in the feature. The gently sloped walls were lightly burned and charcoal-stained. Feature 11 is similar in form and contents to Feature 7, but smaller.

Excavation of Area 7 was inconclusive. Feature 11 remained from a surface fire or hearth of unknown age. It was shallow, lacked associated artifacts, and did not yield ethnobotanical remains. Its presence reflects long-term, low-intensity use of the middle to upper piedmont slopes.

Area 6. Area 6 (68N/105E) measured 6 by 8 m and contained a diffuse chipped stone artifact scatter in the upslope site area. This upslope area had a shallow colluvial deposit and moderate ground cover. The gentle slope has retarded artifact movement, providing the potential for a concentration of artifacts that could be temporally and functionally associated. An En Medio–style projectile point was observed on the surface, suggesting a Late Archaic or Latest Archaic occupation.

Stratum 1 was surface-stripped in 48 1 by 1 m units. The units yielded 0–10 artifacts each. Fewer than four artifacts were recovered from most of the units. The five units yielding the highest number of artifacts underwent deeper excavation. Excavation revealed a 10–20 cm thick mantle of Stratum 1 on top of an early high-carbonate silty loam. All cultural materials would have occurred within the upper 20 cm. It is likely that the lower caliche layer was more than 30,000 years old. No features or buried cultural deposit were encountered in Stratum 1.

The 72 chipped stone artifacts reflect all stages of core reduction and even limited biface production or maintenance. Local chert predominates in the core-reduction debris, while obsidian was used for all of the biface flakes. Combined with an En Medio–style projectile point, the assemblage suggests a short-term occupation incorporating a mixed range of foraging and hunting activities. That occupation was short lived, based on the relatively low artifact counts and their restricted distribution. This assemblage coincides with the other Late to Latest Archaic use of the piedmont area, where evidence is limited to a small scatter of artifacts or a cluster of thermal features with few or no associated artifacts. This pattern suggests that task groups moved into the landscape from base camps to acquire resources and returned to the base camp to process and consume them.

Chipped Stone

Excavation yielded 224 chipped stone artifacts weighing a total of 6.52 kg and consisting mainly of debitage, with few cores and formal tools (Table 41). Nonutilized debitage weighs a total of 4.41 kg, or 67.6 percent of the total assemblage weight. In general, the assemblage emphasizes core reduction, but Area 3 reflects limited raw-material procurement, and Areas 2, 5, 6, and 10 reflect limited formal tool production or maintenance. Areas 1 and 10 reflect tool usage.

With the exception of three pieces of red or mottled red Madera chert debitage, which retain an indeterminate type of cortex, all chert and quartzite artifacts retaining cortex have waterworn cortex; therefore, it is believed that these artifacts were obtained from local gravel deposits rather than an in-situ bedded source. The obsidian and basalt lack cortex. With the exception of one piece of obsidian debitage, only undifferentiated chert and the Madera chert exhibit flaws. Flawed material accounts for the majority (53.5 percent) of the total assemblage. The flaws mainly take the form of cracks or incipient fracture planes but also include crystals and voids.

The undifferentiated chert ranges from fine to medium grained. The Madera cherts range from fine to coarse grained. The basalt and silicified wood are fine grained. Obsidian is glassy. The metaquartzite and orthoquartzite range from fine to medium grained.

The Cenozoic era Santa Fe group gravel, namely the Ancha formation, contains chert. These sedimentary deposits also contain metaquartzite cobbles and small amounts of silicified wood. The Sangre de Cristo foothills contain Precambrian era granite and gneiss overlain by Paleozoic era Pennsylvanian deposits of sandstone, shale, and limestone. Within some of this limestone, namely of the Madera formation, are bedded nodules and veins of chert, which were quarried prehistorically (Lang 1993:6, 13; Lang 1995:5; Viklund 1994:1; Ambler and Viklund 1995:5). Madera chert also occurs as cobbles and pebbles in the later Santa Fe group gravel. Nonlocal materials such as obsidian, Pedernal chert, and basalt are found in the axial gravel of the Rio Grande. However, the primary sources of the obsidian and Pedernal chert lie in the Jemez Mountains. A small amount of obsidian can also be found scattered across Caja del Rio Mesa. Besides the Rio Grande, the closest source of basalt is the Caja del Rio escarpment (Kelley 1980:11–17).

Area 1. Area 1 yielded 56 chipped stone artifacts (Table 42). The majority of these artifacts (94.7 percent) are debitage, including core flakes and angular debris. The remaining artifacts are two cores and a middle-stage biface.

Debitage from Area 1 represents all stages of core reduction. No biface flakes, which can indicate formal tool production or maintenance, were recovered.

The majority of core flakes (58.1 percent) lacks dorsal cortex. Substantial proportions (19.4 percent and 22.6 percent, respectively) retain 10–50 percent dorsal cortex and 60–100 percent dorsal cortex. The majority of angular debris (63.6 percent) retains 10–50 percent cortex. A considerable proportion of angular debris (31.8 percent) lacks cortex, and one piece of angular debris retains 60–100 percent cortex. A preponderance of core flakes (58.1 percent) has 1–2 dorsal scars. Considerable proportions (16.1 percent and 22.6 percent, respectively) have no scars or 3–5 scars. One core flake has an indeterminate number of dorsal scars due to the flawed nature of the material.

Comparable proportions of core flakes (48.4 percent and 51.6 percent, respectively) account for single-facet and cortical platforms and various platform breakage. The single-facet and

Table 41. Chipped stone artifact type by material type, all areas, LA 61290

Number Row % Column %	Chert	Madera Chert, Yellow/Red Mottled	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Silicified Wood	Obsidian	Basalt	Metaquartzite	Orthoquartzite	Total
Angular debris	15	1	60	10	1	2	-	9	-	98
	15.3%	1.0%	61.2%	10.2%	1.0%	2.0%	-	9.2%	-	100.0%
	68.2%	33.3%	51.3%	33.3%	100.0%	8.3%	-	36.0%	-	43.8%
Core flake	6	2	52	18	-	5	1	14	1	99
	6.1%	2.0%	52.5%	18.2%	-	5.1%	1.0%	14.1%	1.0%	100.0%
	27.3%	66.7%	44.4%	60.0%	-	20.8%	100.0%	56.0%	100.0%	44.2%
Biface flake	1	-	1	-	-	17	-	-	-	19
	5.3%	-	5.3%	-	-	89.5%	-	-	-	100.0%
	4.5%	-	0.9%	-	-	70.8%	-	-	-	8.5%
Unidirectional core	-	-	-	1	-	-	-	1	-	2
	-	-	-	50.0%	-	-	-	50.0%	-	100.0%
	-	-	-	3.3%	-	-	-	4.0%	-	0.9%
Multidirectional core	-	-	2	-	-	-	-	1	-	3
	-	-	66.7%	-	-	-	-	33.3%	-	100.0%
	-	-	1.7%	-	-	-	-	4.0%	-	1.3%
Tested pebble	-	-	-	1	-	-	-	-	-	1
	-	-	-	100.0%	-	-	-	-	-	100.0%
	-	-	-	3.3%	-	-	-	-	-	0.4%
Early-stage uniface	-	-	1	-	-	-	-	-	-	1
	-	-	100.0%	-	-	-	-	-	-	100.0%
	-	-	0.9%	-	-	-	-	-	-	0.4%
Middle-stage biface	-	-	1	-	-	-	-	-	-	1
	-	-	100.0%	-	-	-	-	-	-	100.0%
	-	-	0.9%	-	-	-	-	-	-	0.4%
Total	22	3	117	30	1	24	1	25	1	224
	9.8%	1.3%	52.2%	13.4%	0.4%	10.7%	0.4%	11.2%	0.4%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 42. Chipped stone artifact type by material type, Area 1, LA 61290

Number Row % Column %	Chert	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Obsidian	Basalt	Metaquartzite	Total
Angular debris	5	7	1	1	-	8	22
	22.7%	31.8%	4.5%	4.5%	-	36.4%	100.0%
	55.6%	38.9%	16.7%	100.0%	-	38.1%	39.3%
Core flake	4	10	5	-	1	11	31
	12.9%	32.3%	16.1%	-	3.2%	35.5%	100.0%
	44.4%	55.6%	83.3%	-	100.0%	52.4%	55.4%
Unidirectional core	-	-	-	-	-	1	1
	-	-	-	-	-	100.0%	100.0%
	-	-	-	-	-	4.8%	1.8%
Multidirectional core	-	-	-	-	-	1	1
	-	-	-	-	-	100.0%	100.0%
	-	-	-	-	-	4.8%	1.8%
Middle-stage uniface	-	1	-	-	-	-	1
	-	100.0%	-	-	-	-	100.0%
	-	5.6%	-	-	-	-	1.8%
Total	9	18	6	1	1	21	56
	16.1%	32.1%	10.7%	1.8%	1.8%	37.5%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

cortical platforms suggest early- to middle-stage reduction. No complex platform types suggestive of later-stage reduction are represented.

Equal proportions of the core flakes (29 percent) are whole and lateral portions. Proximal and distal portions account for sizable proportions of the core flakes (22.6 percent and 19.4 percent, respectively). These comparable proportions may point to some degree of postreduction breakage. A total of 22.6 percent of the core flakes are flawed. These flaws may have contributed to breakage.

The whole measurements summary (Table 43) indicates a fairly wide dispersion by the minimum and maximum values and the relatively large standard deviation statistics. This supports the notion that the assemblage reflects all stages in the core-reduction sequence.

Three pieces of debitage display thermal alteration. One is nonred Madera chert that shows a color change and crazing. The other two are red or mottled red Madera chert that show crazing. It is unclear whether these artifacts are the product of intentional heat treatment or incidental heating.

Informal tool: FS 170 is utilized angular debris. It is fine-grained, gray chert. The utilized edge is slightly convex and measures 41 mm with an edge angle of 36 degrees. The opposing edges remain cortical. The cortex may serve as a natural backing (Chapman and Schutt 1977:92) that would make it easier to hold facilitate manual prehension. It lacks hafting modification. This informal tool was bimarginally retouched. The wear pattern consists of rounding and step-fracturing, which is

Table 43. Core flake mean whole measurements, Area 1, LA 61290

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Number	15	12	16	16	9
Mean	11.7	41.7	36.6	13.2	24.8
SD	8.8	20.1	20	10.8	31.4
Minimum	3	7	10	4	0.2
Maximum	35.6	77	76	45	84.1

consistent with a cutting or sawing function. The tool measures 58 mm long by 53 mm wide by 24 mm thick and weighs 78.7 g.

Formal tool: FS 88-8 is a fragment of a middle-stage biface manufactured from a fine-grained, red Madera chert. The facial scarring pattern is semiregular. The intact margin is convex and rounded, and manifests discontinuous step-fracturing. The rounding may indicate platform preparation or utilization. Abrasion is commonly used to strengthen a platform or manipulate platform angle. If utilized, then wear is consistent with cutting. The edge measures 73 mm and has an angle of 50 degrees. It measures 47 mm long by 29 mm wide by 15 mm thick and weighs 18.3 g.

Area 1 yielded one unidirectional core and one multidirectional core. The unidirectional core is a medium-grained blocky metaquartzite core flake with four complete scars removed from the dorsal surface. The ventral lateral and distal margins were used as the striking platform. The core retains 30 percent waterworn cortex. It measures 86 mm long by 71 mm wide by 51 mm thick and weighs 364.9 g. The multidirectional core, of medium-grained metaquartzite, retains 30 percent waterworn cortex and has four complete negative flake scars oriented from multiple platforms. It measures 120 mm long by 93 mm wide by 80 mm thick and weighs 645.4 g

Area 2. The chipped stone assemblage from Area 2 is comprised entirely of debitage: four pieces of angular debris, three core flakes, and nine biface flakes (Table 44). This ratio of core flakes to biface flakes (1:3) indicates an emphasis on bifacial reduction.

All biface flakes are of obsidian, a nonlocal material (Table 45). It appears that flake type is discriminated by material type, although this remains untested. All obsidian flakes lack dorsal cortex. These observations suggest that the parent material (obsidian) was imported in a partially reduced state. The majority of biface flakes (7) have 3–5 dorsal scars, while two have six or more. A preponderance of biface flakes (6) show platform breakage, including crushing and collapse. Platform width was not recorded for these platform types, but the flake can be considered whole. Three biface flakes have multifaceted, abraded, or retouched platforms. The majority of biface flakes (4) are proximal portions followed by medial (3), whole (1), and distal (1) portions. The presence of these flakes suggests that formal tool production or maintenance occurred on-site.

All core flakes lack dorsal cortex. The majority of angular debris (1) lacks cortex, while one piece has 60–100 percent cortex. The chert core flake is whole. It has 1–2 dorsal scars and a simple single-facet or cortical platform measuring 3.6 mm. This artifact measures 17 mm long by 16 mm wide by 4 mm thick and weighs 1.0 g. The obsidian core flakes are lateral portions. They have 3–5 dorsal scars and broken platforms. One measures 16 mm long by 16 mm wide by 3 mm thick and weighs 0.6g. Another measures 14 mm long by 10 mm wide by 2 mm thick and weighs 0.3 g.

Area 3. One tested pebble, a core, was recovered during excavation of Area 3. It is a fine-grained mottled red Madera chert. The pebble exhibits two negative flake scars and retains 70 percent waterworn cortex. Its maximum linear measurements are 28 mm long by 20 mm wide by 11 mm thick, and it weighs 5.9 g. It spite of its small size, it may have been reduced freehand, and it lacks definitive evidence of bipolar reduction. This artifact reflects the testing of local gravel for suitable lithic raw material.

Area 4. The chipped stone from Area 4 is entirely comprised of debitage, including three pieces of angular debris and one core flake (Table 46). The core flake is whole. It retains 10 percent dorsal cortex and has two dorsal scars and a single-facet platform. FS 63 retains 40 percent angular debris cortex, and FS 79 retains 20 percent. FS 66 lacks cortex.

Area 5. Debitage comprises the entire Area 5 chipped stone assemblage (Table 47). This debitage includes a core flake, two pieces of angular debris, and a biface flake. The core flake and angular debris reflect core reduction, while the biface flake reflects bifacial reduction. Both flakes lack dorsal cortex. The biface flake is a distal portion lacking a platform. It has four dorsal scars. The core flake is a lateral portion with a multifacet platform and six dorsal scars. Both pieces of angular debris have 10–50 percent cortex.

Area 6. Area 6 yielded 72 chipped stone artifacts (Table 48). All artifacts are debitage, including 38 pieces of angular debris, 27 core flakes, and 7 biface flakes. The ratio of core flakes to biface flakes (1:0.26) suggests an emphasis on

Table 44. Chipped stone artifact type by material type, Area 2, LA 61290

Number Row % Column %	Chert	Madera Chert, Red and Mottled Red	Silicified Wood	Obsidian	Total
Angular debris	1	1	1	1	4
	25.0%	25.0%	25.0%	25.0%	100.0%
	100.0%	50.0%	100.0%	8.3%	25.0%
Core flake	-	1	-	2	3
	-	33.3%	-	33.3%	100.0%
	-	50.0%	-	16.7%	18.8%
Biface flake	-	-	-	9	9
	-	-	-	11.1%	100.0%
	-	-	-	75.0%	56.3%
Total	1	2	1	12	16
	6.3%	12.5%	6.3%	75.0%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%

Table 45. Biface flakes, Area 2, LA 61290

FS No.	Material	Portion	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
44	Obsidian	Proximal	1.3	21	17	4	1.3
48	Obsidian	Medial	-	11	14	2	0.4
54	Obsidian	Proximal	1	18	19	2	0.8
55	Obsidian	Proximal	1.6	15	8	2	0.1
56-1	Obsidian	Distal	-	25	11	2	0.4
56-2	Obsidian	Proximal	-	14	18	2	0.6
56-3	Obsidian	Whole	-	23	11	3	0.4
58	Obsidian	Medial	-	22	12	2	0.4
59	Obsidian	Medial	-	12	9	1	0.1

Table 46. Chipped stone, Area 4, LA 61290

FS No.	Morphology	Material	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
44	Angular debris	Madera chert, nonred	-	31	25	19	7.1
48	Angular debris	Madera chert, nonred	-	16	14	7	1
54	Core flake	Madera chert, red and mottled red	4.5	37	23	7	6.5
55	Angular debris	Madera chert, red and mottled red	-	43	28	16	21.7

Table 47. Chipped stone, Area 5, LA 61290

FS No.	Material	Morphology	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
68	Obsidian	Biface flake	-	20	14	2	7
106	Madera chert, red and mottled red	Core flake	11.3	45	37	17	28.2
107	Madera chert, nonred	Angular debris	-	65	39	26	64.9
162	Chert	Angular debris	-	24	17	7	2.8

Table 48. Chipped stone artifact type by material type, Area 6, LA 61290

Number Row % Column %	Chert	Madera Chert, Yellow/Red Mottled	Madera Chert, Nonred	Obsidian	Polvadera Peak Obsidian	Metaquartzite	Orthoquartzite	Total
Angular debris	1	35	2	-	-	-	-	38
	2.6%	92.1%	5.3%	-	-	-	-	100.0%
	100.0%	63.6%	50.0%	-	-	-	-	52.8%
Core flake	-	20	2	3	-	1	1	27
	-	74.1%	7.4%	11.1%	-	3.7%	3.7%	100.0%
	-	36.4%	50.0%	33.3%	-	100.0%	100.0%	37.5%
Biface flake	-	-	-	6	1	-	-	7
	-	-	-	85.7%	14.3%	-	-	100.0%
	-	-	-	66.7%	100.0%	-	-	9.7%
Total	1	55	4	9	1	1	1	72
	1.4%	76.4%	5.6%	12.5%	1.4%	1.4%	1.4%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

core reduction rather than bifacial reduction. The biface flakes reflect some degree of formal tool production or maintenance.

The majority of core flakes (74.1 percent) lack dorsal cortex. A considerable proportion of core flakes (22.2 percent) retain 60–100 percent dorsal cortex, while one flake retains 10–50 percent. The majority of angular debris (60.5 percent) lacks cortex. A substantial proportion of angular debris (31.6 percent) retains 10–50 percent dorsal cortex, while a small proportion (7.9 percent) retains 60–100 percent.

A preponderance of core flakes (51.9 percent) have 1–2 dorsal scars, while smaller proportions (33.3 percent and 14.8 percent) have 3–5 and 0 dorsal scars, respectively. Core flakes with single-facet or cortical platforms are the most prevalent (66.7 percent), followed by those that exhibit some form of platform breakage (33.3 percent). The most frequently represented portions are lateral (51.9 percent) and whole (33.3 percent), followed by proximal (11.1 percent) and one distal portion. The high frequency of breakage may indicate the later stages of reduction. A sizable proportion of core flakes (63.0 percent) are flawed, which may have contribute to breakage during reduction.

Mean whole core flake measurements (Table 49) indicate a relatively wide dispersion, which is expected in an assemblage reflecting all stages of core reduction.

A small proportion of the assemblage (9.7 percent) consists of biface flakes. All biface flakes are of obsidian, which is a nonlocal material. Flake type may be distinguished by material type, although this remains untested. Also, all obsidian flakes lack dorsal cortex. These observations suggest that the parent raw material was imported in a partially reduced state. The majority of biface flakes (4) have 3–5 dorsal scars, and those remaining (3) have six or more. Platform breakage including crushing and collapse are the most frequent (5), followed by complex platform types (2), including multifaceted, abraded, and retouched platforms. Flakes with crushed or collapsed platforms can be considered whole, but platform width is not recorded. No whole biface flakes were recovered. Equal proportions of proximal and lateral portions (3 each) are represented, as well as one medial portion (Table 50).

Formal tool: FS 275 is a late-stage biface that exhibits a fairly regular facial scarring pattern and continuous bimarginal scalar scarring. This corner-notched projectile point has excurvate blades, relatively broad and deep notches, and a slightly expanding stem with a convex base. One barb is fractured; therefore, a whole width measurement could be obtained. The following whole measurements were obtained: length (40.1 mm), thickness (5.2 mm), neck thickness (5.1 mm), stem length (10.5 mm), and stem width (16.5 mm). This point closely resembles the En Medio Corner-notched type described by Turnbow (1997:182–186). All whole measurements fall within the reported ranges. Thoms (1977:132–141) distinguishes six types: Española Wide-blade,

Table 49. Core flake mean whole measurements, Area 6, LA 61290

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Number	18	15	12	12	9
Mean	9.9	37	32.6	10.6	14.6
SD	4.7	13.1	16.3	6	15.9
Minimum	2.9	12	13	4	0.6
Maximum	17.5	56	60	22	41.0

Table 50. Biface flakes, Area 6, LA 61290

FS No.	Material	Portion	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
1	Obsidian	Lateral	-	22	15	3	1
7	Obsidian	Proximal	1.1	9	12	3	0.2
26	Obsidian	Proximal	-	16	14	3	0.6
26	Obsidian	Lateral	-	24	15	2	0.9
27	Obsidian	Lateral	-	26	15	3	1
28	Obsidian	Proximal	1.5	17	11	2	0.4
30	Polvadera Peak obsidian	Medial	-	21	18	3	0.9

Santa Cruz Barbed, Jemez Short Barb, Short-wide Barbed, Ojo Barbed, and Echo Shouldered, all of which may be subsumed by En Medio Corner-notched (Turnbow 1997:185–186). For all six, a Late Archaic period date of 1000 BC to 400 AD is suggested (Thoms 1977:132–141). The point also appears similar in form to the third AEM 7 point in Irwin-Williams (1967:29, Fig. 7). The AEM 7 points were recovered from Zone B-1 in En Medio Shelter. Feature 8 within Zone B-1 yielded a charcoal sample dating to 10 BC (Irwin-Williams 1967:8–9).

Area 8. Debitage comprises the entire Area 8 chipped stone assemblage: three core flakes and one piece of angular debris. Two core flakes (FS 181 and FS 182) have 60–100 percent dorsal cortex, while the remaining core flake has 10–50 percent dorsal cortex. The angular debris lacks cortex. All core flakes have single-facet platforms and one dorsal scar. FS 182 is a lateral portion, and the other two core flakes are whole (Table 51).

Area 9. A total of 21 chipped stone artifacts were recovered from Area 9 (Table 52). With the exception of one multidirectional core, all artifacts are debitage, including 14 pieces of angular debris and 6 core flakes. Based on the distributions of core flake attributes, it appears that the early and middle stages of core reduction are represented.

The majority of core flakes (4) lack dorsal cortex. One core flake retains 60 percent dorsal cortex, and one flake retains 10–50 percent. Equal proportions of angular debris retain 10–50 percent cortex and lack cortex. A preponderance of core flakes (3) have 1–2 dorsal scars, two have 3–5 scars, and one has no scars. Core flakes with single-facet or cortical platforms are the most prevalent (4), those remaining include one platform breakage and one complex platform Represented portions include whole (3), proximal (2), and lateral (1). In part, the high frequency of breakage may be due to the high frequency of flawed material (4).

The very small sample size may lead to skewed distributions (Table 53). However, the relatively high minimum values may indicate that the earlier stages of reduction are represented.

Area 9 yielded one fine-grained, flawed, mottled red–light gray Madera chert multidirectional core. It lacks cortex and displays seven complete flake scars. It measures 44 mm long by 38 mm wide by 32 mm thick and weighs

Table 51. Chipped stone, Area 8, LA 61290

FS No.	Morphology	Material	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
181	Core flake	Madera chert, red and mottled red	17	99	78	33	250.5
182	Core flake	Madera chert, nonred	5.3	45	28	11	17
184	Core flake	Madera chert, red and mottled red	8.8	51	38	12	15.8
185	Angular debris	Madera chert, red and mottled red	-	18	9	5	0.8

Table 52. Chipped stone artifact type by material type, Area 9, LA 61290

Number Row % Column %	Chert	Madera Chert, Yellow/Red Mottled	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Metaquartzite	Total
Angular debris	3	-	8	2	1	14
	21.4%	-	57.1%	14.3%	-	100.0%
	75.0%	-	80.0%	50.0%	-	66.7%
Core flake	1	1	1	2	1	6
	-	16.7%	16.7%	33.3%	16.7%	100.0%
	-	100.0%	10.0%	50.0%	50.0%	28.6%
Multidirectiona	-	-	1	-	-	1
core	-	-	100.0%	-	-	100.0%
	-	-	10.0%	-	-	4.8%
Total	4	1	10	4	2	21
	19.0%	4.8%	47.6%	19.0%	9.5%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 53. Core flake mean whole measurements, Area 9, LA 61290

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Number	5	4	5	5	3
Mean	7.5	30	29	12.2	4.1
SD	6.2	11.9	7.5	3.4	1.6
Minimum	0.9	20	21	9	2.4
Maximum	17.2	46	39	18	5.5

73.1 g.

Area 10. Area 10 yielded 41 chipped stone artifacts (Table 54). The majority of these artifacts (95.1 percent) are debitage, and the other two are cores. The core flake to biface flake ratio is 1:.083. This ratio indicates an emphasis on core reduction.

Core flake data indicates that the debitage represents all stages of core reduction. Only two biface flakes, which can indicate formal tool production or maintenance, were recovered. Equal proportions of core flakes (33.3 percent) lack dorsal cortex, retain 10–50 percent dorsal cortex, and retain 60–100 percent dorsal cortex. The majority of angular debris (61.5 percent) retains 10–50 percent cortex. Considerable proportions of angular debris (23.1 percent and 15.4 percent, respectively) lack cortex and retain 60–100 percent cortex. A preponderance of core flakes (66.7 percent) have 1–2 dorsal scars. Smaller proportions (25.0 percent and 8.3 percent, respectively) have no scars or 3–5 scars.

Core flakes with single-facet and cortical platforms and those with various platform breakage are equally represented (50 percent). The single-facet and cortical platforms suggest early- to middle-stage reduction. No complex platform types suggestive of later-stage reduction are represented. The most frequent portions are whole (37.5 percent), lateral (29.2 percent), and proximal (12.5 percent). Distal portions account for 8.3 percent. In part, the high frequency of breakage may be accounted for by the relatively high frequency (62.5 percent) of flawed material.

A wide spread is indicated by the mean whole measurements (Table 55), which support the notion that the assemblage reflects all stages in the core-reduction sequence. Furthermore, the similarity in material types between core and biface flakes may suggest a core-reduction strategy geared toward the production of flake blanks suitable for further bifacial reduction.

A very small proportion of the assemblage (4.9 percent) consists of biface flakes. The two biface flakes indicate very limited formal tool production or maintenance. Both lack cortex. Both also have single-facet platforms and 3–5 dorsal scars. One flake is whole, and the other is a proximal portion. The platform of the whole flake measures 2.9 mm. The entire flake measures 10 mm long by 8 mm wide by 3 mm thick and weighs 0.1 g. The platform of the proximal portion measures 1.5 mm. The entire flake measures 9 mm long by 12 mm wide by 2 mm thick and weighs 0.3 g.

Informal tool: FS 212-5 is utilized angular debris of a fine-grained, mottled gray-white Madera chert. The sinuous utilized edge measures

Table 54. Chipped stone artifact type by material type, Area 10, LA 61290

Number Row % Column %	Chert	Madera Chert, Yellow/Red Mottled	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Metaquartzite	Total
Angular debris	4	1	6	2	-	13
	30.8%	7.7%	46.2%	15.4%	-	100.0%
	66.7%	50.0%	27.3%	20.0%	-	31.7%
Core flake	1	1	14	7	1	24
	4.2%	4.2%	58.3%	29.2%	4.2%	100.0%
	16.7%	50.0%	63.6%	70.0%	100.0%	58.5%
Biface flake	1	-	1	-	-	2
	50.0%	-	50.0%	-	-	100.0%
	16.7%	-	4.5%	-	-	4.9%
Unidirectional	-	-	-	1	-	1
core	-	-	-	100.0%	-	100.0%
	-	-	-	10.0%	-	2.4%
Multidirectiona	-	-	1	-	-	1
core	-	-	100.0%	-	-	100.0%
	-	-	4.5%	-	-	2.4%
Total	6	2	22	10	1	41
	14.6%	4.9%	53.7%	24.4%	2.4%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 55. Core flake mean whole measurements, Area 10, LA 61290

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Number	12	12	12	12	9
Mean	7.6	32.3	36.9	12	12.7
SD	3.4	14.4	19.4	6.5	16.7
Minimum	1.5	10	17	5	0.8
Maximum	13.1	57	82	26	55.8

43 mm. The edge angle measures 35 degrees. This informal tool exhibits unidirectional retouch and wear, which may reflect a scraping function. This artifact lacks hafting modification. Its small size and the presence of opposing cortical backing indicate that it was finger held. It measures 53 mm long by 30 mm wide by 15 mm thick and weighs 19.1 g.

Hand tool: FS 263-10 is a large core flake of a mottled red-yellow Madera chert. The original termination is obscured by flake removals from the dorsal surface. Step-fracturing and battering along this distal edge indicate it was used as a chopper. The slightly convex edge measures 67 mm and has an angle of 52 degrees. A cortical platform and lateral margin provide a natural backing. It lacks hafting modification, and in all likelihood it was hand held. This chopper measures 100 mm long by 82 mm wide by 26 mm thick and weighs 261.8 g.

A multidirectional core and a unidirectional core were recovered during excavation of Area 10. The multidirectional core is a fine-grained, flawed, mottled red-gray Madera chert that retains 40 percent cortex and exhibits four complete scars. The core shows thermal alteration in the form of crazing. It measures 74 mm long by 48 mm wide by 47 mm thick and weighs 235.9 g. The unidirectional core is a fine-grained, flawed, mottled gray-brown Madera chert. It displays one noncortical platform with seven complete flake scars. The remaining four scars are obscured by subsequent flake removals but appear similarly oriented. This unidirectional core retains 40 percent waterworn cortex. It measures 100 mm long by 86 mm wide by 37 mm thick and weighs 377.2 g.

Area 11. Excavation in Area 11 yielded four pieces of debitage, including three core flakes and one piece of angular debris (Table 56). One core flake (FS 147) is whole, with 100 percent dorsal cortex and a cortical platform. The remaining core flakes have single-facet platforms and lack cortex. One (FS 188-1) is a proximal portion with two dorsal scars. The other (FS 188-2) is a lateral portion with one dorsal scar. The angular debris lacks cortex.

Informal tool: FS 243-1 is an early-stage biface that was manufactured from a fine-grained mottled red Madera chert. One entire surface shows facial retouch. Approximately 70 percent of the opposing surface exhibits facial retouch. The remaining portion is cortical. Due to the variability in spacing and dimensions of the retouch scars, facial retouch is considered irregular. The edge outline remains fairly irregular. The artifact lacks evidence of marginal scarring. It measures 45 mm long by 40 mm wide by 17 mm thick and weighs 30.7 g.

Ground Stone

Four ground stone artifacts were recovered: two shallow basin metate edge fragments, one whole slab metate, and one one-hand mano end fragment (Table 57). All are a fine or medium-grained quartzite, with the exception of the slab metate, which was manufactured from a tabular piece of schist. The plan view outline form of the slab metate is subrectangular. The ground surface of this metate is roughly subrectangular and measures 387 mm long by 224 mm wide. Due to the fragmentary condition of the remaining artifacts, plan view outline forms cannot be ascertained. The ground surface of the slab metate is flat in transverse cross section and slightly concave in longitudinal cross section. These cross-section forms suggest use with a mano that was comparable to or longer than the width of the metate; otherwise, it is more likely that a basin would have been formed. Both of the basin metates have ground surfaces that are concave in transverse and longitudinal cross section. The mano has a convex ground surface with a wear pattern suggesting that it was used in a reciprocal motion. The mano is heat fractured and reddened. All metates display some degree of production input, which implies the anticipation of intense use.

Site Summary

The excavation of LA 61290 revealed a complex and widely distributed array of cultural features and deposits. Excavation of the 11 areas revealed 27 thermal features associated with a potential 4,500-year occupation span. Higher-elevation areas of this gentle south-facing slope exhibited a depositional pattern that may contain the whole site occupation span within a 20 cm topsoil layer. Isolated and clustered features and artifact concentrations in the upslope area reflect repeated short-duration foraging, hunting, and camping, almost always in association with a thermal feature. The Ancestral Pueblo era piñon nut processing pit (Feature 1) is the first such feature recorded for the piedmont hills. It was clustered with three other features, emphasizing the favored status of this upslope setting. The lower slope area had the deeply buried Middle Archaic residential or logistical camp. The feature frequency and spatial extent of the cultural deposit suggest two or more occupations. Geomorphological evaluation of the excavation area suggested that the camp was on a gentle slope to flat area that sustained long-term gradual colluvial deposition before and after the occupation. A formal structure foundation was not found, but the feature variability and artifact assemblage diversity suggest a full range of processing activities that would accompany a residential occupation. No temporally diagnostic artifacts were recovered, but carbon-14 dating provided a cal. 2558–1739 BC two-sigma occupation range. Reoccupation of the same camps suggests an intragenerational land-use pattern. Short-term climatic stability favorable to high biomass resources may have influenced the occupation pattern. Combined with LA 61286, LA 61289, LA 61293, and LA 67959, LA 61290 makes an important contribution to our understanding of Archaic and Ancestral Pueblo subsistence strategies and settlement patterns in the piedmont hills north of the Santa Fe River.

Table 56. Chipped stone, Area 11, LA 61290

FS No.	Morphology	Material	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
147	Core flake	Madera chert, nonred	7.2	34	27	11	9.3
188-1	Core flake	Madera chert, red and mottled red	6.8	28	17	8	2.2
188-2	Core flake	Madera chert, red and mottled red	4.2	17	10	4	0.7
196	Angular debris	Madera chert, red and mottled red	-	16	8	4	0.6

Table 57. Ground stone, LA 61290

FS No.	Function	Material Type	Production Input	Shaping	Number of Use Surfaces	Primary Wear	Secondary Wear	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
261-12	mano fragment	metaquartzite	none	none	1	grinding	furrow striations, linear, orientation indeterminate	122	66	26	343.4
273-22	basin metate fragment	metaquartzite	slightly modified	pecking	1	grinding	pecking	291	231	37	2150
265-20	basin metate fragment	orthoquartzite	mostly modified	flaking and pecking	2	grinding	pecking	260	150	40	1225.1
234-24	slab metate	schist	slightly modified	flaking	1	grinding	none	397	224	43	7300

LA 61293

LA 61293 was between centerline stations 691+50 and 696+00 on both sides of the right-of-way, and the west limit extended beyond the right-of-way. This site was not included in the testing program because landowner permission could not be obtained. It was recommended for data recovery based on the survey data.

The site occurred on the southwest-, south- and southeast-facing slopes of a broad ridge that separates the Arroyo de Gallinas from an unnamed drainage to the north. This gentle to moderately steep slope is dissected by two southwest-draining, secondary arroyos that are fed by numerous minor erosion channels. The lower slope areas are heavily eroded and deflated, and the soil is unstable. The upper slope areas are cobble and gravel. The depth of the overlying soil depends on the proximity of the tilted Tesuque sandstone, which is exposed in primary and secondary drainages. The main site area is within and on the slopes of a large swale that is exposed to the south-southeast. Within the lower reaches of the swale, deep colluvium covers Tesuque sandstone. This sandstone occurs at depths from shallow (15 cm below the modern ground surface) in the upper slope to deeply buried (more than 1 m) in the lower slope, suggesting that the main site area was a series of shelves or benches that were used as camp sites.

Preexcavation Description

LA 61293 measured 100 m east-west and 60 m north-south according to the 1988 survey (Wolfman 1989 et al:40–41, Fig. 16). Southwest Archaeological Consultants, Inc., extended the site limit 50 m to the south during their 1996 inventory (Anschuetz and Viklund 1997). Site limits were defined by the lithic artifacts scattered over a wide area, and two discrete concentrations were noted at the northwest site limit. Artifacts numbered between 100 and 250 and consisted almost entirely of core flakes resulting from reduction of locally available red chert and pink-white chalcedony. There was a high density of unmodified raw lithic material on the site, suggesting that it was used for lithic material procurement. One Wiyo Black-on-white sherd was observed, suggesting that the site was occupied between AD 1300 and 1400. A hearth was found east of a private road that bisected the site north-south. Defined by a small circle of quartzite cobbles, it was about 50 cm in diameter and contained potentially datable material.

Excavation Methods

Reexamination of the site before excavation revealed a more complex feature distribution than was recognized during survey. Erosion channels within what was eventually designated Area 1 had five eroded roasting pits or deflated hearths exposed in the banks. The arroyos and erosion channels along the south site limit had no buried cultural deposits. Examination of the expanded site area yielded only two artifact clusters of sufficient density for excavation. Overall the site area was expanded to 150 mm east-west by 115 m north-south, or 17,250 sq m, and eight excavation areas were established.

A site datum was established at 200N/100E, on the upper slope at centerline station 695+00 (Figs. 187 and 188). An excavation grid, Area 1, covered a 16 by 12 m area. Of 192 units, 173 were surface-stripped. Excavation within Area 1 revealed a pit structure and nine extramural thermal features from two or more occupation periods. Slope position and soil characteristics suggested that Features 9, 11, and 12 remained from the latest prehistoric occupation. Features 6, 8, and 10 were between the latest and earliest components, and Features 8 and 10 may represent one occupation. Features 3, 4, 7, and 13 (the pit-structure foundation) represented the early portion of the occupation. Radiocarbon dating indicated that Features 6, 8, 9, 10, 11, and 12 were from the Ancestral Pueblo period. The pit-structure foundation (Feature 13) dated to the Latest Archaic period. Features 3, 4, and 7 date to the Late Archaic period. Feature excavations

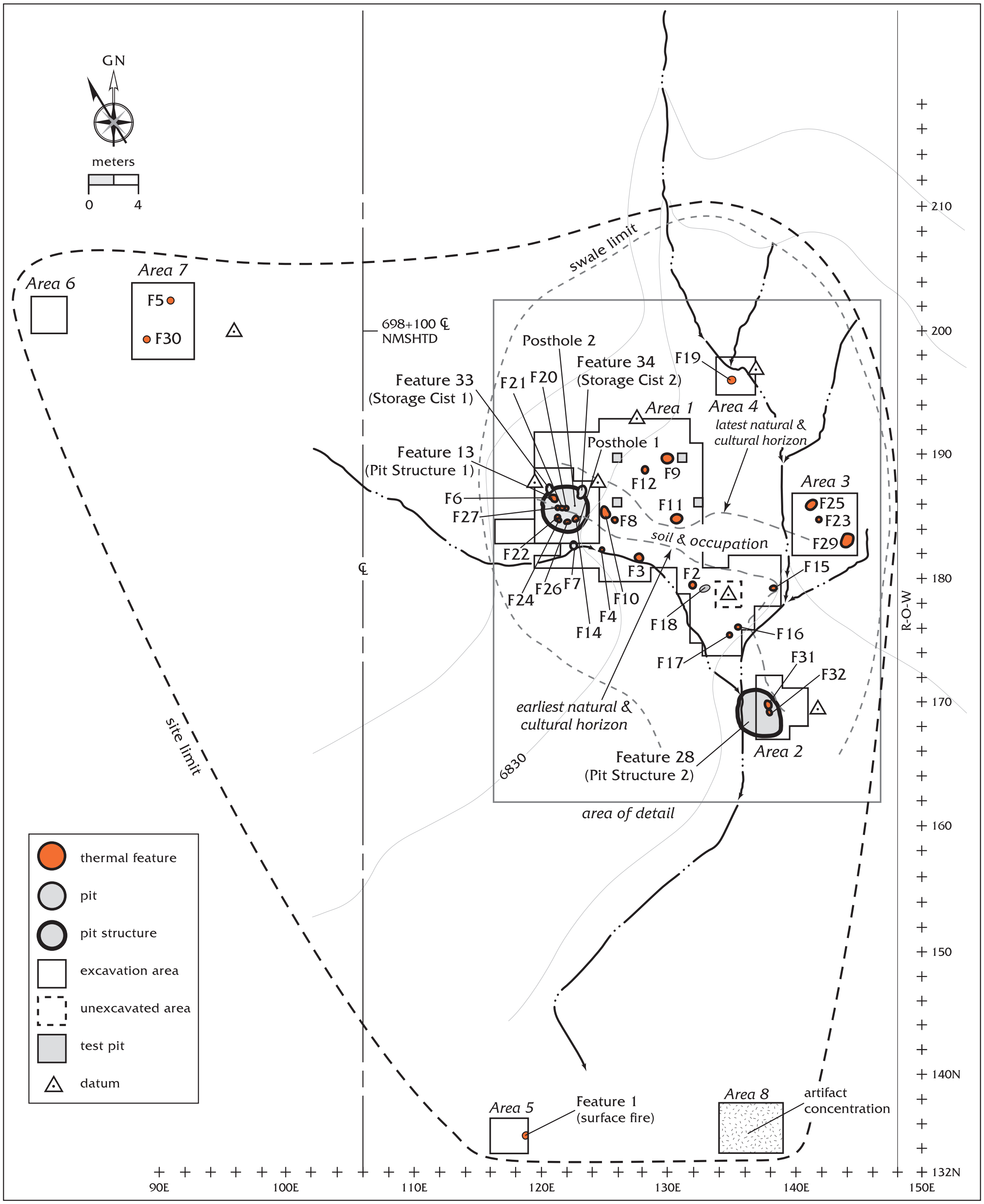


Figure 187. Plan of LA 61293.

Figure 188. LA 61293 before excavation.

in Area 1 and throughout the site followed the procedures outlined for LA 61286.

A 4 by 5 m area within Area 1 surrounding Feature 13 was excavated 10 to 15 cm below surface strip to better define the limits of the structure. Within the pit structure, the dark, charcoal-infused soil was removed in 10 cm levels. All floor-contact artifacts were piece-plotted. Intramural features were exposed as stained outlines and excavated in the usual manner. All floor and feature fill was screened with 1/8-inch mesh. Flotation and C-14 samples were recovered from primary and moderately disturbed contexts. The pit structure was excavated into a layer of coarse sand that capped the underlying sandstone bedrock. Excavation showed that the natural deposit on the middle slope was shallow and that earlier cultural deposits would have to be downslope, where colluvial deposition was substantial and had not eroded. In this middle slope area, the Ancestral Pueblo and Latest Archaic deposits were mixed, and the features were associated with the same transitional ground surface.

Other charcoal-infused soil stains or fire-cracked rock concentrations were visible in the south arroyo and near the confluence of the arroyos that cut through or defined the limits of Area 1. Thirty-eight 1 by 1 m units were excavated 15 to 75 cm below the modern ground surface, exposing Features 2, 15, 16, 17, and 18. These features were partly exposed in arroyo cuts or capped by a 50 cm thick sandy loam colluvium. The units, which yielded few artifacts, were excavated in 10 and 20 cm levels to and through the old ground surface. The deepest excavations provided a stratigraphic profile of Area 1. The old ground surface and substratum contained lenses of coarse sand, indicating periodic high-energy deposition preceding the occupation. Sixteen auger holes to the north of this area revealed a consistent presence of bedrock from 80 to 132 cm below the modern ground surface. The auger results show that excavation did reach the bottom of the cultural deposit and that occupation occurred some time after the exposed bedrock was capped and soil deposition slowed and stabilized. Of interest is the association between Feature 13 and the bedrock in the upper part of Area 1 and the lack of association between bedrock and the downslope features. This suggests that the Late Archaic occupation would have been removed from the area around Feature 13 but had been more stable where the main erosion channel cut through Area 1. Pre–Latest Archaic occupations were best represented in the deeper colluvium that had collected in the lower reaches of the horseshoe-shaped swale that defines the area.

Excavation of 17 1 by 1 m units incorporated a 10 to 15 cm thick charcoal-infused soil stain in the east bank of the arroyo that cuts the east portion of the main excavation area. This area was designated Area 2. The bank sloped moderately to steeply down to the arroyo. The upper 10 to 60 cm of colluvial overburden was removed without screening, since no cultural deposit was evident in the arroyo cut. The 10 to 15 cm level above the stain was screened through 1/4-inch mesh, yielding few artifacts above and in transition with the cultural deposit. Excavation of the stain revealed a basin-shaped enclosure (Feature 28) with two shallow fire pits (Features 30 and 31). The enclosure was interpreted as the deflated remains of a pit-structure foundation. The floor fill was removed in 10 cm levels and screened through 1/8-inch mesh. Except for a possible mano, no artifacts, were recovered. The south one-quarter of the structure was heavily eroded and rodent disturbed. The poor condition of the feature and the lack of cultural materials from surrounding units influenced the decision to halt excavation in this area.

A 5 by 5 m area on the moderate to steep slope of the east arroyo, but north of Feature 28, was excavated where a charcoal-infused stain was visible on the surface (Area 3). Surface stripping revealed three features, including two deflated roasting pits (Features 15 and 29) and an undifferentiated burned pit (Feature 23). These features were associated with few artifacts, though a glaze ware pottery sherd concentration occurred within 5 m of the features, but outside the right-of-way. The features were excavated, and samples were collected. Because of the low number of associated artifacts, no further work was conducted in this area.

A 3 by 3 m area, 195N/134E (southwest corner), was excavated around a deflated charcoal-infused soil stain (Feature 19). This area was designated Area 4. The stain was exposed at the confluence of the main east arroyo and a minor erosion channel. The loose alluvial topsoil was removed, exposing a heavily deflated stain and disarticulated burned cobbles. The feature was on top of bedrock, eliminating the possibility of its being associated with a deeper, more extensive cultural deposit. No age could be assigned to Feature 19.

A 3 by 3 m area, 140N/116E (southwest corner), was excavated around an eroded charcoal-infused soil stain with associated faunal remains (Feature 1). This area was designated Area 5. The thermal feature was exposed near the modern ground surface by the bank of the main arroyo that drained the east and southeast site area. Surface stripping revealed an irregularly shaped thermal feature with abundant animal bone and associated chipped stone. It was suggested that Feature 1 dated to the historic period, because the animal bone looked like that of domesticated sheep or goat. The feature was excavated as described for LA 61286. All animal bone was collected. There was no evidence of more deeply buried or more extensively distributed deposits. Excavation was halted with the feature excavation.

A 3 by 3 m area, 200N/80E (southwest corner), was defined on the upper ridge slope in a concentration of 5 to 10 pieces of chipped stone (Area 6). Surface stripping removed 8 to 12 cm of gravelly colluvium. Seven artifacts, including surface artifacts, were recovered. There was no depth to the cultural deposit or associated features. Excavation was halted with the surface stripping.

A 5 by 5 m area, 198N/88E (southwest corner), was defined on the upper ridge slope in a concentration of five pieces of chipped stone (Area 7). Surface stripping of 8 to 12 cm of cobbly colluvium yielded seven chipped stone artifacts and exposed two surface hearths. The hearths, Features 5 and 30, were extremely deflated. The remnants of surface fires, they were not built into the slope. The cultural deposit had no apparent depth, and the features remained from isolated, brief occupations. Investigation was halted with the surface stripping and feature excavation.

A 4 by 5 m area, 134N/134E (southwest corner), was defined within a dispersed artifact scatter of 10 to 15 pieces of chipped stone (Area 8). Surface stripping of 5 to 10 cm on the gentle, colluvial slope yielded seven lithic artifacts. A 1 by 1 m unit was excavated to 40 cm below the modern ground surface, revealing homogeneous colluvial sandy loam. An auger hole to 1 m below the modern ground surface revealed only natural deposits. Excavation was halted in this area because of the shallow and dispersed nature of the cultural deposit.

The site limits were defined by a spatially extensive artifact scatter as determined by the 1988 and 1996 inventories. Reexamination of the site did not reveal concentrations, so the surface artifacts were pinflagged and recorded in the field. The site was divided into quadrants, using the private road and the centerline as divisions. Forty-six surface artifacts were recorded according to morphological and functional attributes (OAS 1994). Fragments of three formal tools and a one-hand mano were collected for more detailed analysis. The surface artifact data can be compared with feature-associated assemblages from LA 61293 and with surface assemblages recovered during testing of other Northwest Santa Fe Relief Route sites.

After the excavation of the site and surface-artifact recording were completed, the site was transit-mapped. The site boundaries were plotted, and profiles of the excavation areas were drawn.

Excavation Results

The excavation of LA 61293 revealed a more complex site than was recorded during the previous inventories (Maxwell 1988; Anschuetz and Viklund 1997), which identified an artifact scatter and one cobble-ring hearth. The artifacts reportedly were distributed in low density over an 8,000 sq m area. Reexamination of the site in preparation for excavation expanded the site limits to 150 mm east-west by 115 m north-south, or 17,250 sq m (Fig. 187). Initially, there were five eroded thermal features exposed in a deep arroyo cut and an erosion channel within Area 1. Excavation and radiocarbon dating of feature deposits revealed a multicomponent site with four discrete occupation areas representing at least four broad periods: Late Archaic, Latest Archaic, Ancestral Pueblo, and historic. Eight excavation areas yielded 34 features and two low-frequency artifact scatters (Table 58; Figs. 187 and 189).

Areas 1 and 2

Areas 1 and 2 encompassed a 43 m north-south by 34 m east-west natural south-facing swale (Figs. 189 and 190). The swale was bounded on three sides by the east slope of the broad gravel ridge that separates Arroyo Gallinas from the next major tributary to the north. The swale was drained by two erosion channels. These narrow channels joined at the mouth of the swale, forming a deeply incised arroyo that drains south into a primary tributary of Arroyo Gallinas. The main arroyo cut exposed intermittent deep colluvial deposits capped by dense eroded gravel terraces and tilted, highly eroded Tesuque sandstone. The Area 1 swale was underlain by Tesuque sandstone outcrops capped with sandy loam colluvium 20 to 90 cm thick. The upper colluvial layer was mixed with a dense gravel/cobble deposit that reflects relatively recent downslope erosion of the cobble pediment that capped the upper ridge slopes. The elevation profile of the sandstone outcrops that could be reconstructed by excavation and auger holes suggest that a series of benches or shelves were used by site occupants throughout the 3,500-year site history.

Within the main excavation area, three temporal components were defined. Radiocarbon dating indicates that there were three main temporal components: Late Archaic, Latest Archaic, and Ancestral Pueblo. Within the Ancestral Pueblo component, there may be Coalition and Early Classic period components.

The Late Archaic period component represented by Feature 28, a pit-structure foundation, included an occupation surface that was within the deep colluvial deposits defined by excavation in the southeast portion of Areas 1 and 2. Features 15, 16, and 17 may also have been associated. Feature 3, 10 m upslope, is also contemporaneous with Feature 28. Intermediate features such as Features 2, 4, and 18 may also date to the Late Archaic period, since they show similarity to Feature 3 in construction and content.

The Latest Archaic component is Feature 13 and its intramural features: Features 14, 20, 21, 22, 24, 26, 27, 33, and 34. Extramural features are not easily associated with the pit-structure occupation because the surrounding features yielded radiocarbon dates ranging from 1710 BC to AD 1494. In fact, Feature 6 was built into the upper fill of Feature 13 and was radiocarbon-dated to cal. AD 1039–1277, two-sigma range. The Latest Archaic period occupation sits on top of the coarse sand that caps the bedrock in the upslope area, which incorporates Feature 13, the

Table 58. Features, LA 61293

Feature No.	Type	Grid	Dimensions (cm)	Artifacts	Radiocarbon Age (B.P.)
1	Hearth	140-141N/118-119E	68 by 30 by 22 deep	lithic (1), animal bone (106), low-fired clay objects	
2	Fire-cracked rock filled roasting pit	179-180N/131-132E	114 by 100 by 18 deep		
3	Fire-cracked rock filled roasting pit	181-182N/128-129E	~87 diameter by 15 deep	lithics (2)	
4	Fire-cracked rock filled roasting pit	182N/126E	69 by 52 by 15 deep	lithic (1)	3300±50
5	Undifferentiated burned pit	201-202N/90-91E	54 by 30 by 5 deep		
6	Cobble-lined roasting pit	186N/121E	100 by 66 by 20 deep		850±50
7	Undifferentiated burned pit	183-184N/123E	60 by 52 by 10 deep		
8	Cobble-lined hearth	184-185N/126E	45 diameter by 20 deep	lithic (1)	520±70
9	Cobble roasting pit	190-191N/130E	91 by 50 by 8 deep		
10	Fire-cracked rock filled roasting pit	185N/125-126E	100 by 70 by 18 deep	lithics (9)	
11	Fire-cracked rock filled roasting pit	180-181N/130-131E	90 by 85 by 10 deep	lithic (1)	
12	Deflated roasting pit	189-190N/128E	75 by 70 by 3 deep		
13	Pit-structure foundation	185-188N/120-124E	4 m by 3 m by 40 deep	lithics (37), projectile point (1), hammerstones (2), manos (2), ground stone (1), animal bone (1)	
14	Hearth within Feature 13	184-185N/122-123E	61 by 44 by 22 deep		
15	Undifferentiated burned pit	180N/138E	50 by 40 by ~3 deep		
16	Cobble-lined hearth	177N/135E	45 by 38 by 8 deep		
17	Undifferentiated burned pit	176N/134-135E	65 by 40 by 8 deep		
18	Possible roasting pit with abundant cobbles	180N/132-133E	170 by 100 by 15 deep		
19	Undifferentiated burned pit	195-196N/135E	70 by 50 by 8 deep		
20	Hearth within Feature 13	185N/122-123E	35 diameter by 15 deep	lithic (1)	
21	Hearth within Feature 13	185-186N/121E	43 by 41 by 18 deep	lithic (1)	1920±50
22	Hearth within Feature 13	185N/121E	42 by 30 by 16 deep		
23	Undifferentiated burned pit	184-185N/141-142E	30 by 26 by 26 deep		
24	Hearth within Feature 13	184N/121E	30 diameter by 12 deep	lithics (2)	
25	Possible cobble discard or stock pile	185-186N/141E	105 by 90 by 10 deep		
26	Possible storage pit	184N/122E	40 by 30 by 18 deep		
27	Hearth within F. 13	185-186N/121E	47 by 36 by 16 deep		
28	Pit-structure foundation	169-173N/136-138E	~3.25 m by 1.75 m by 18	mano (1)	3190±50
29	Deflated roasting pit	182-183N/142-143E	113 by 103 by 18 deep		
30	Undifferentiated burned pit	199N/88-89E	83 by 40 by 5 deep		
31	Hearth within Feature 28	216N/38E	60 by 30 by 8 deep		
32	Hearth within Feature 28	171N/137-138E	63 by 45 by 5 deep		
33	Possible storage pit within Feature 13	186-187N/120-121E	100 by 75 by 25 deep		
34	Possible storage pit within Feature 13	186-187N/123E	100 by 80 by 30 deep		

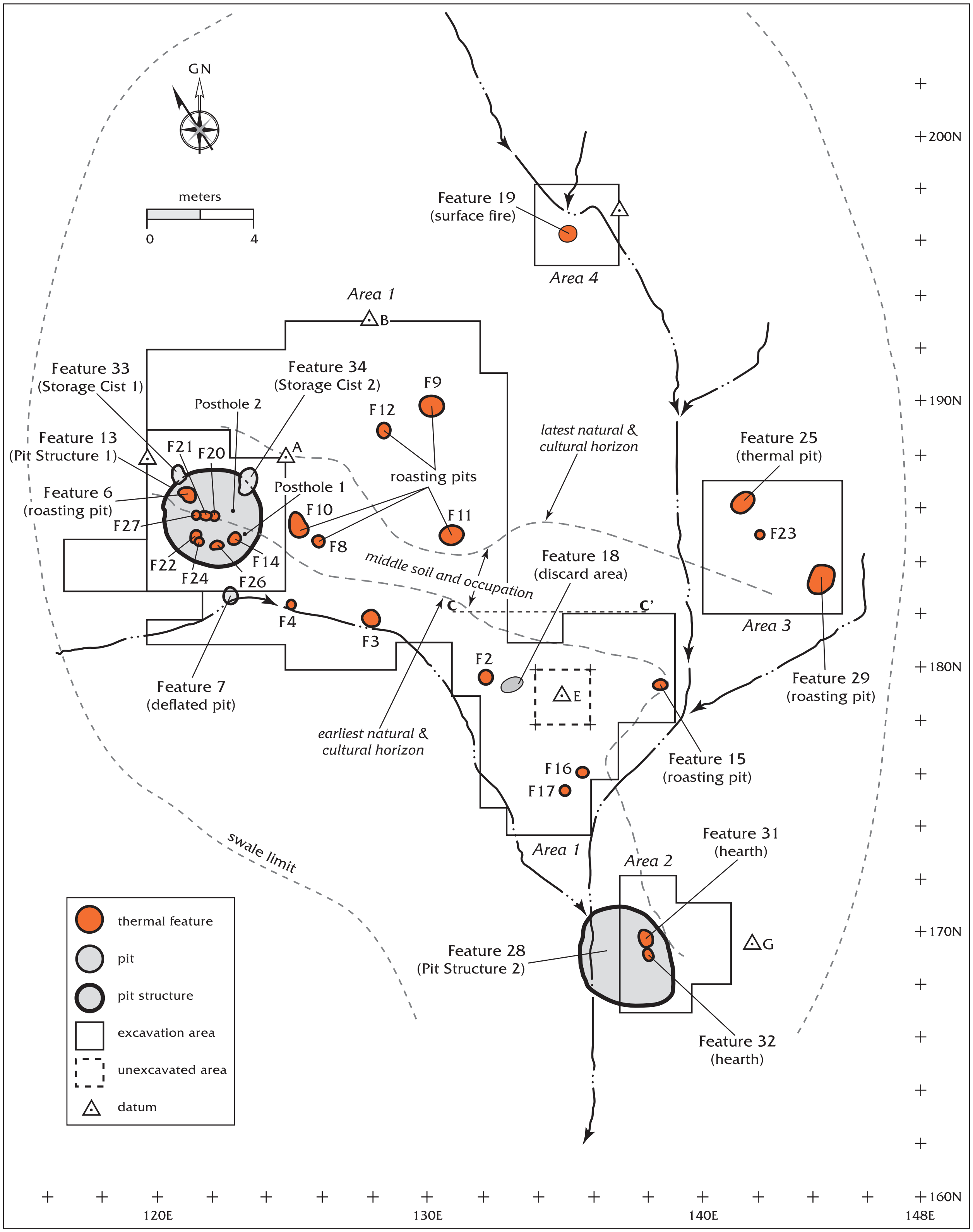


Figure 189. Excavation plan, Area 1, LA 61293.

Figure 190. Area 1, LA 61293.

pit-structure foundation. The earlier features were probably buried when Feature 13 was occupied.

The Ancestral Pueblo component is represented by two radiocarbon-dated features, Features 6 and 8. Stratigraphically, it appears that these features are associated with Features 9, 10, 11, 12, 23, 25, and 29. These seven features lack chronological data, but they are on the highest stratigraphic surface, 20 to 90 cm above the Tesuque sandstone. Pottery recovered from LA 61293 and observed outside the right-of-way indicate that occupations during Coalition and Early Classic periods were common and repeated.

Stratigraphy. Three main strata were defined in the wall profiles of the excavation units and are described relative to bedrock. Figure 191 is a representative profile from the north wall of 181N/131–138E.

Stratum 1 was a 2 to 18 cm thick, brown (10YR 5/4), fine to medium sandy loam, weak, with a subangular blocky structure, high organic content, 10 to 40 percent gravel, and a smeared and wavy boundary. This was the topsoil that covered the excavation area in the upslope areas above the erosion channels and where bedrock was within 80 cm of the modern ground surface. This stratum contained the majority of the chipped stone artifacts and fire-cracked rock, indicating that surface artifact distributions could reflect the temporal range of the full occupation.

Stratum 2 was a 2 to 100 cm thick, brown (10YR 5/3), fine to medium sandy loam, nonplastic when moist, weakly structured, with 1 to 3 percent imbricated pea gravel and sparse carbonate filaments, and an abrupt and wavy boundary. Stratum 2 contains and caps the late and Latest Archaic occupations. It is exposed on the surface along the banks of the erosion channels where Stratum 1 has eroded.

Stratum 3 was a 16 to 60 cm thick, brownish yellow (10YR 6/6), coarse sand with a weak blocky structure and 5 to 10 percent pea-sized gravel. Stratum 3 is on top of the bedrock and contains some of the Archaic occupation features.

Features. Thirty-one features were excavated and recorded in Areas 1 and 2. Two pit-structure foundations with multiple intramural features were identified. Feature 28 had two informal hearths, Features 31 and 32. Feature 13 had nine intramural features, including six thermal and three possible storage features. The remaining eighteen extramural features were dated to Late Archaic, Ancestral Pueblo, and unknown periods.

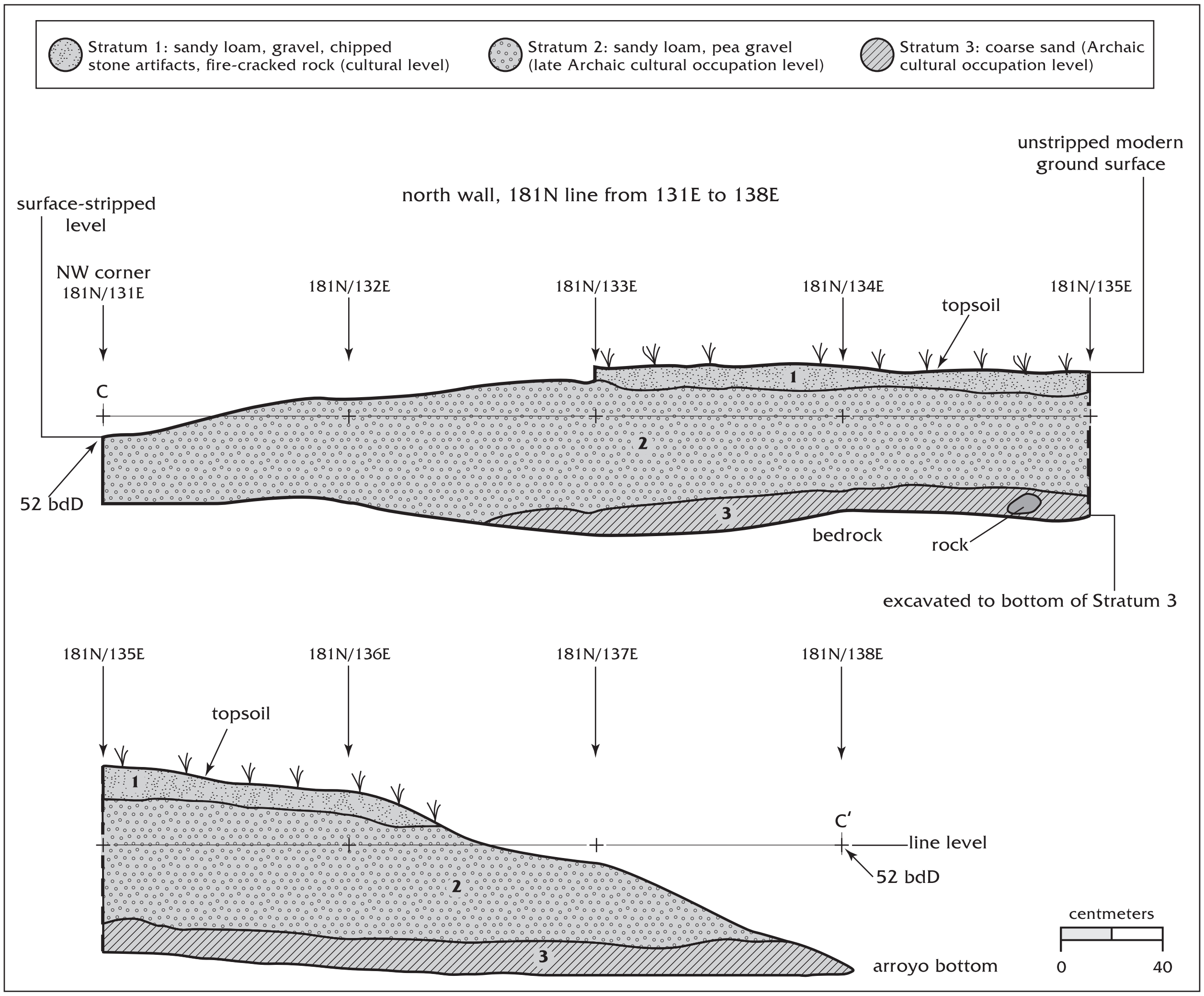


Figure 191. Stratigraphic profile of the north wall of 181N/131-138E, LA 61293.

These include thermal features that were cobble or fire-cracked rock filled, cobble-lined, and unlined pits.

The Late Archaic component is represented by Feature 28 and its intramural hearths, Feature 31 and 32; and Feature 3, a burned, fire-cracked rock filled pit. Features 2, 4, 15, 16, 17, and 18 may also be temporally associated. These features probably were not from one occupation episode but remain from repeated occupations as reflected in an ephemeral structure and fairly substantial processing features.

As described previously, Feature 28 was identified as a 10 to 15 cm thick charcoal-infused soil stain in the east bank of the arroyo. This light gray sandy loam charcoal-infused layer was exposed at the level of the arroyo bottom. At the deepest point to the east of the arroyo, the ephemeral structure foundation was capped by 70 cm of Strata 1 and 2. Accumulation of colluvial deposit suggests that the structure was placed in a low, level spot that was protected but not subject to heavy sheet wash or erosion. While removing the overburden to the top of the cultural layer, no artifacts or intrusive cultural deposits were encountered. It is possible that isolated artifacts that washed down from Area 1 were missed.

The excavation of Feature 28 revealed a shallow, almost basin-shaped structure that probably had an oval plan. Its estimated dimensions were 3 m north-south by 1.75 m east-west (partial measurement) and 8 to 10 cm deep (Figs. 192 and 193). The structure fill was a mottled brown to dark brown (7.5YR 5–4/2) sandy loam. It was slightly plastic when wet, with 2 to 5 percent pea gravel inclusions. There

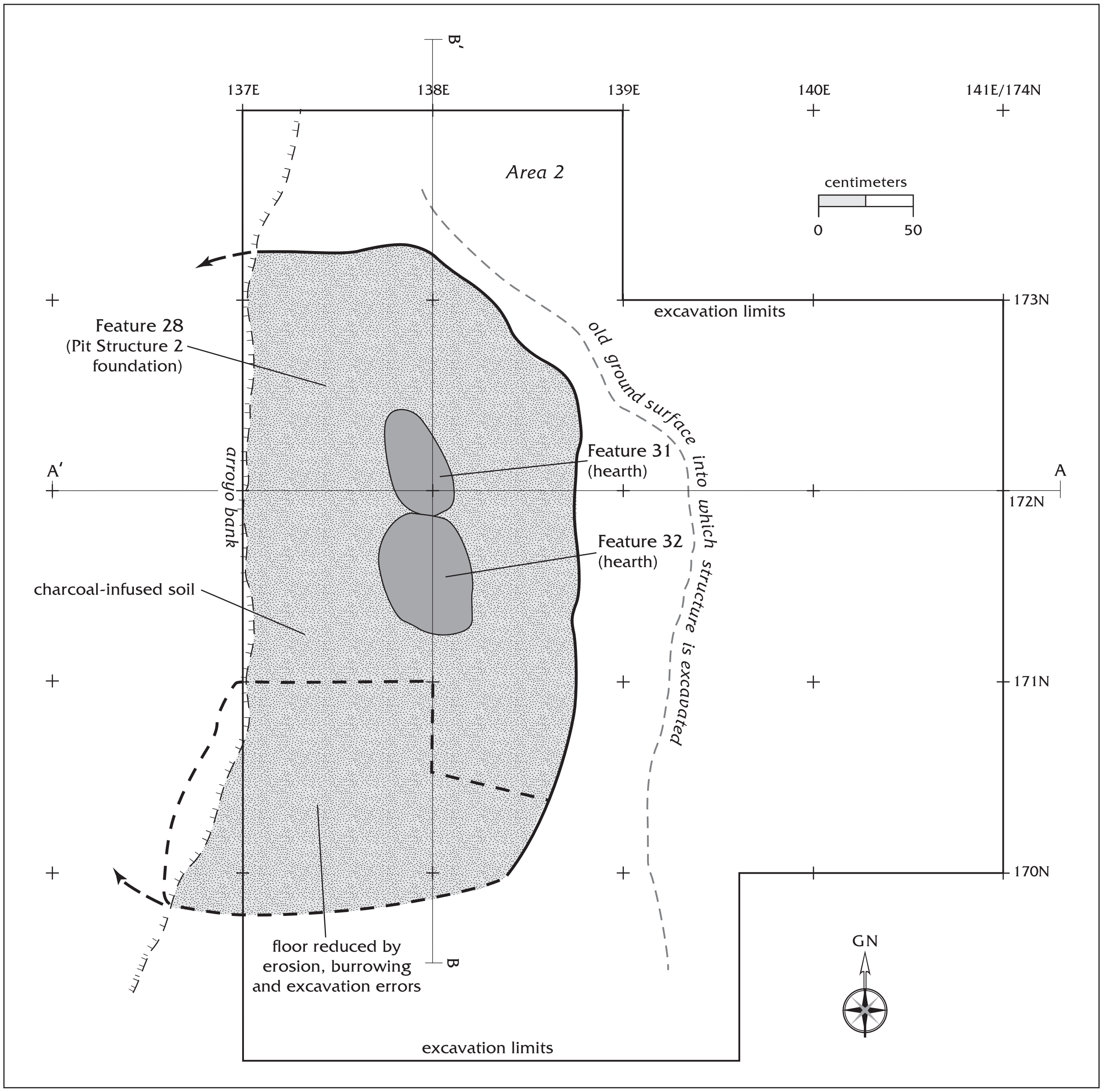


Figure 192. Plan and profile of pit structure foundation, Feature 28, Area 2, LA 61293, including Features 31 and 32.

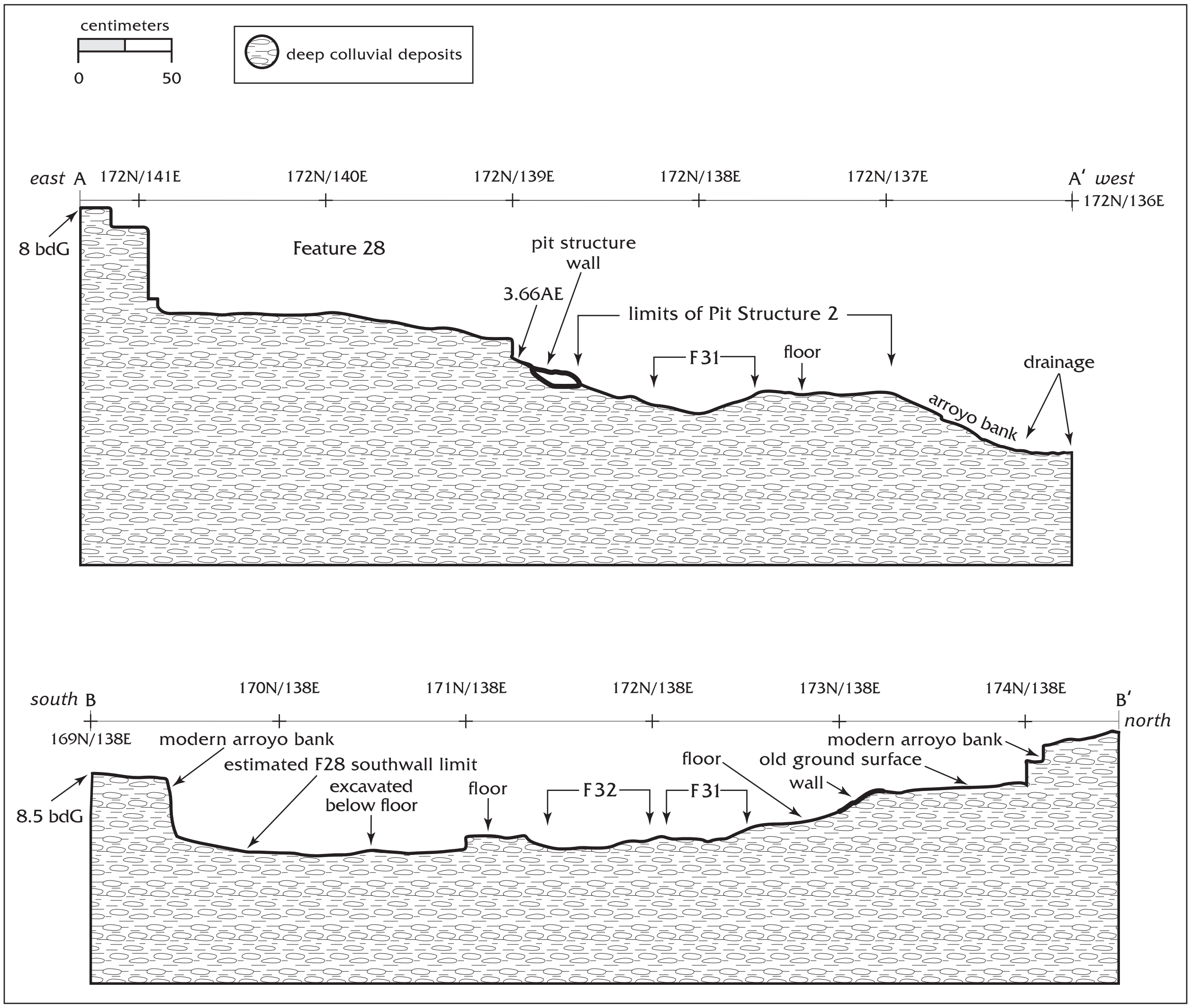


Figure 192 (continued).

Figure 193. Pit structure foundation, Feature 28, Area 2, LA 61293.

was light staining that resulted from diffusion and dissemination of charcoal from the two informal hearths, Features 31 and 32. There was no evidence that Feature 28 had burned following abandonment or that it had been used after abandonment as a shelter, an extramural activity area, or a refuse dump. The absence of formal intramural features and artifacts may be evidence that Feature 28 was a minimally used warm-season shelter. Unburned pit structures are the most difficult to find and interpret, since they often show evidence of limited, short-term use (Kennedy 1998). However, other structures from this period from North Ridgetop Road (Lakatos et al. 2001) and Tierra Contenta (Schmader 1994a) show considerable intramural organization and variability. Differences in these pit structures and camp structure may reflect changing mobility strategies and subsistence organization (Kelly 1992; Kent 1991). Before Feature 28 was truncated by the erosion channel, it may have had up to 8 sq m of floor space. Charcoal recovered from the floor fill of Feature 28 yielded a two-sigma range of cal. 1601–1374 BC. This places the occupation firmly in the Late Archaic.

The intramural features, Feature 31 and 32, lacked formal preparation, contained no fire-cracked rock or artifacts, and were less than 5 cm deep. They were surface or informal hearths used for heating but not processing or repeated, long-term use. A possible mano associated with these features was very lightly used and fits with the overall impression that Feature 28 had limited use.

A fire-cracked rock filled thermal feature, Feature 3, was exposed in the east-west erosion channel, 10 m west and upslope from Feature 28. The proximity and exposed nature of Feature 3 indicated that it was contemporaneous with Feature 13. Radiocarbon dating of wood charcoal recovered from Feature 3 yielded a cal. two-sigma range of 1689–1450 BC. This range overlaps and is statistically similar to the Feature 28 date range and much earlier than that of Feature 13. Since radiocarbon dates lack sufficient precision to claim that Feature 28 and Feature 3 originate from the same occupation, it can only be stated that they were contemporaneous during the Late Archaic period. Although other features exposed in the erosion channel and buried by Stratum 2 were not dated, the Feature 3 date lends greater support for the conclusion that many if not all of the downslope features date to the Late Archaic period.

Feature 3 was a fairly large (87 cm diameter) basin-shaped pit filled with 86 cobbles that were burned and fire-cracked (Figs. 194 and 195). The cobbles were quartzite and indurated sandstone, reflecting use of locally available materials. The cobbles are mixed with a black (10YR 2/1) sandy loam. The dark soil color indicates diffusion of a considerable amount of charcoal. Such a condition would result if the cobbles had been placed in an active fire or bed of coals. The cobbles had settled to the bottom of the feature, so it could not be determined if a thick bed of coals preceded the cobble layer.

Features 2 and 4 were similar to Feature 3 in shape, size, and content (Figs. 196–198). They are both partly or completely filled with cobbles that are burned and suspended in a darkly charcoal-stained sandy loam. No artifacts were recovered from the features or directly associated with them. No ethnobotanical remains were recovered from any of the three features, and their temporal association is primarily based on their similarities.

Features 7, 15, 16, 17, and 18 may also be temporally associated with the Late Archaic component. These deflated features were or had been deeply buried by the sandy loamy colluvium that was Stratum 2. The features are downslope from Feature 13 and topographically are more consistent with Features 2, 3, and 4, and 28. Features 15, 16, and 17 are thermal features. Feature 18 may be a heavily deflated cobble-filled thermal pit or the discard area for Feature 2. Features 7, 15, 16, and 17 are small to medium pits with maximum dimensions ranging between 45 and 65 cm (Figs. 199–203). Their reduced depths range from 3 to 8 cm. They yielded no artifacts, and only Feature 15 yielded a small amount of charred *Physalis*. Feature 18 was defined by a concentration of fire-cracked rock that was not bounded by a pit (Fig. 204). Its proximity to Feature 2 suggests that it represents feature maintenance. The lack of a formal pit is seen as support for this observation.

Combined, Feature 28 and the seven extramural features that may date to the Late Archaic period are evidence of repeated occupations. The morphological and, possibly, the functional differences in the features indicate that the occupations may have changed focus through time. The ephemeral nature of Feature 28 suggests short-term occupation. The formal and well-defined morphology of Features 2, 3, and 4 suggests a focus on processing that might be carried out at a limited-activity site. Robust feature construction would have supported repeated seasonal visits when targeted resources were available. The less formal Features 15, 16, and 17 indicate less structured or focused activity, which would fit a low-intensity domestic occupation. One or more of these features may have been built and used by the Feature 28 residents. Low ethnobotanical and artifact yields limit interpretations of seasonality and function, except in the most general sense. The concentration of features and their relative diversity suggest that LA 61293 was a favored Late Archaic setting.

The Latest Archaic component is represented by the Feature 13 pit-structure foundation and its intramural features. While it is expected that many of the near-surface artifacts were left by Feature 13 occupants, the presence of later components introduces the possibility of mixed assemblages. Artifacts within Feature 13 may have been associated with the occupation and dumped into the structure upon abandonment.

The Feature 13 pit-structure foundation is at the transition between the middle and upper slope. At a higher elevation in the swale, it does not have the protection that Feature 28 enjoyed, but it was more open to solar gain, with a less obstructed view to the south-southeast. The foundation was excavated into the top of the decomposing Tesuque sandstone ledge underlying the upper limits of the swale. Originally identified as two thermal features because of the darkly stained sandy loam that was exposed immediately below the surface strip, Feature 13 was evident as a large, roughly circular, charcoal-stained soil outline. The upper limits of the pit-structure foundation fill were mottled and disturbed by rodent and root activity. A juniper had grown to the northeast of the foundation.

Feature 13 was excavated in 1 by 1 m units and arbitrary levels, revealing that the depression of the pit-structure foundation was filled with very darkly stained sandy loam. Soil colors within the structure were dark gray (10YR 4/1) to very dark brown (10YR 2/2) (Fig. 205). Considerable bioturbation had homogenized the fill, and individual filling episodes were not stratigraphically apparent. Rodent burrows, root

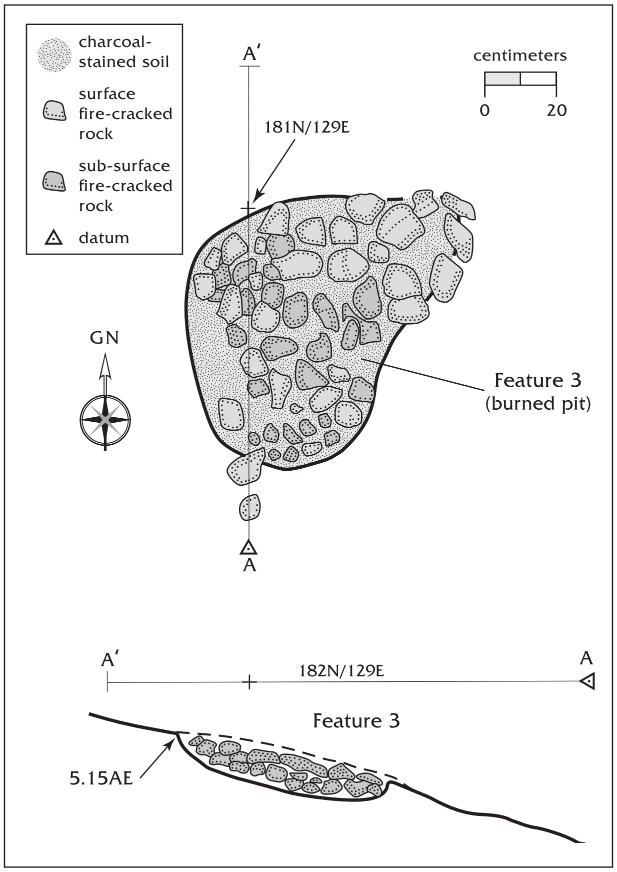


Figure 194. Plan and profile of Feature 3, Area 1, LA 61293.

Figure 195. Excavation in progress, Feature 3, Area 1, LA 61293.

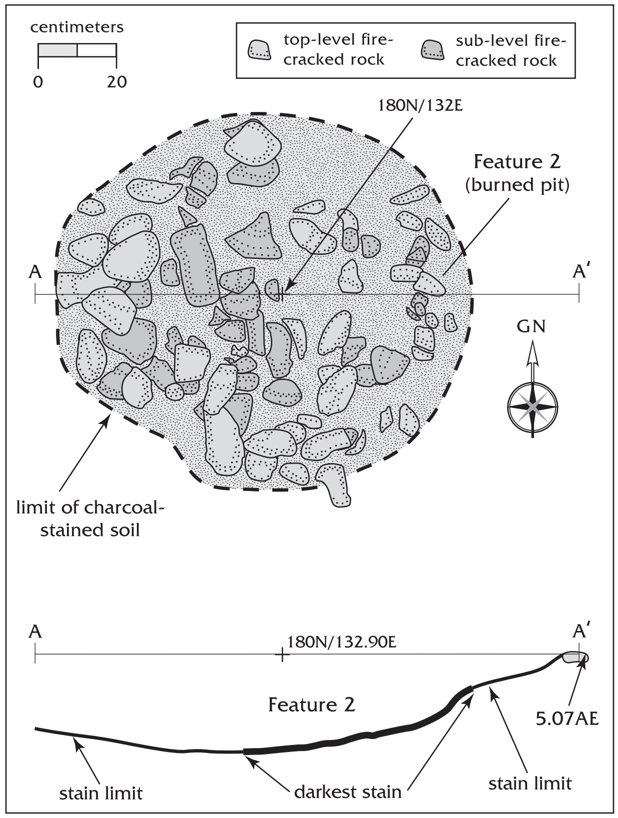


Figure 196. Plan and profile of Feature 2, Area 1, LA 61293.

Figure 197. Feature 2, Area 1, LA 61293.

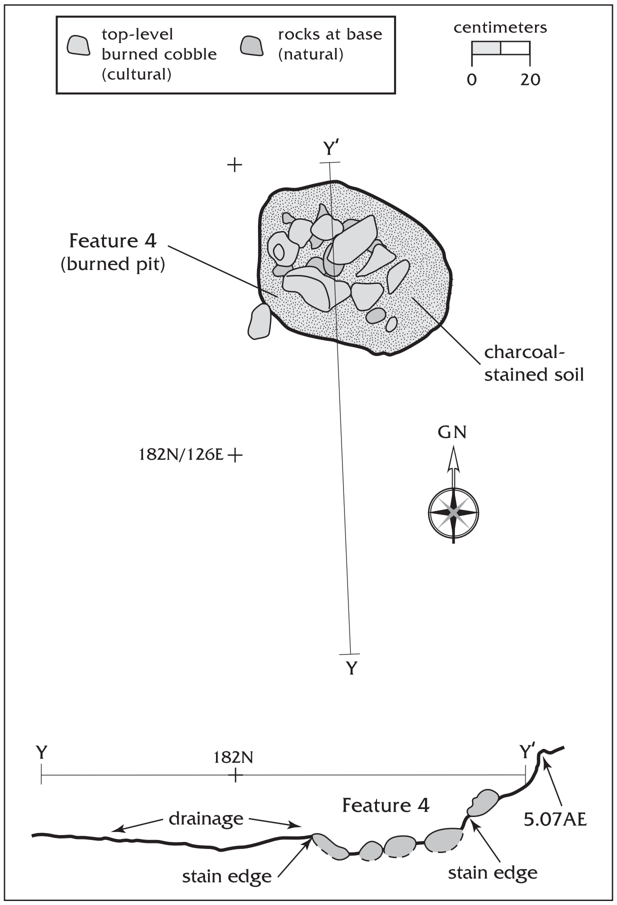


Figure 198. Plan and profile of Feature 4, Area 1, LA 61293.

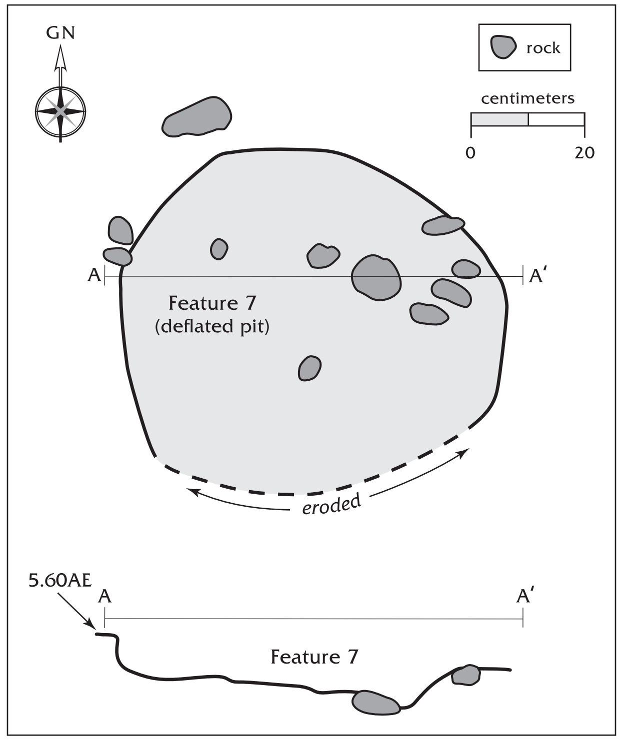


Figure 199. Plan and profile of Feature 7, Area 1, LA 61293.

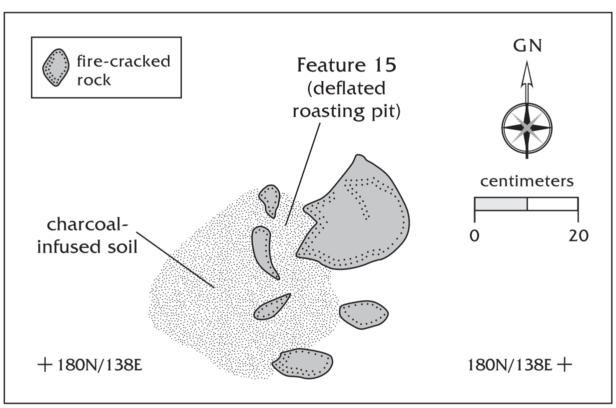


Figure 200. Plan of Feature 15, Area 1, LA 61293.

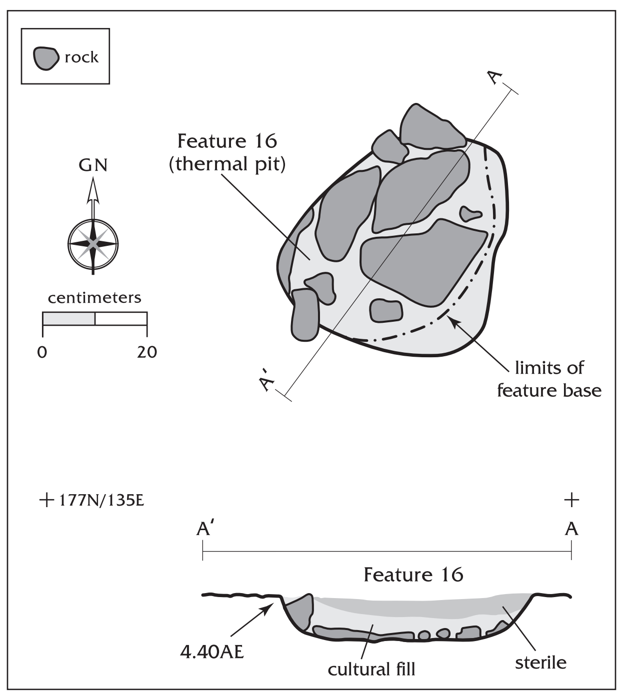


Figure 201. Plan and profile of Feature 16, Area 1, LA 61293.

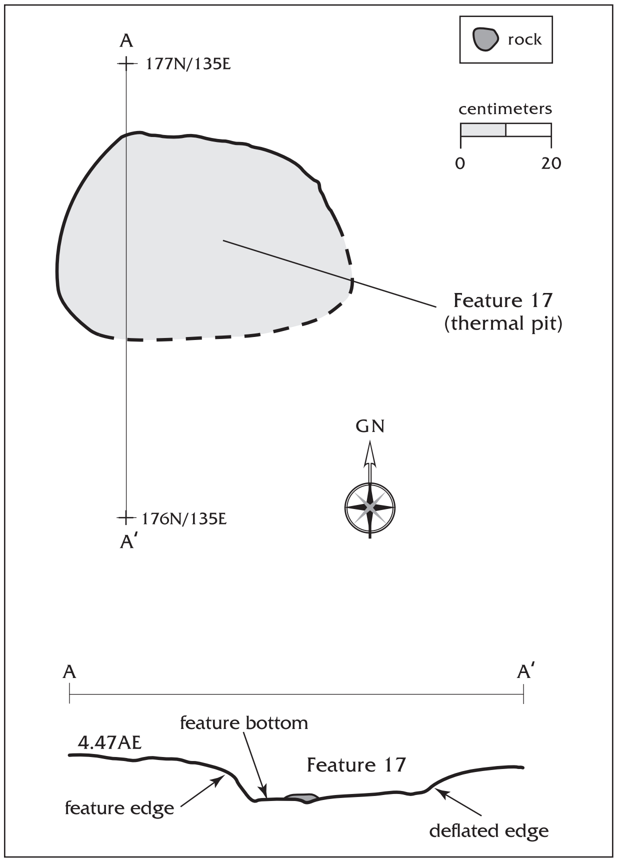


Figure 202. Plan and profile of Feature 17, Area 1, LA 61293.

Figure 203. Features 16 and 17, Area 1, LA 61293.

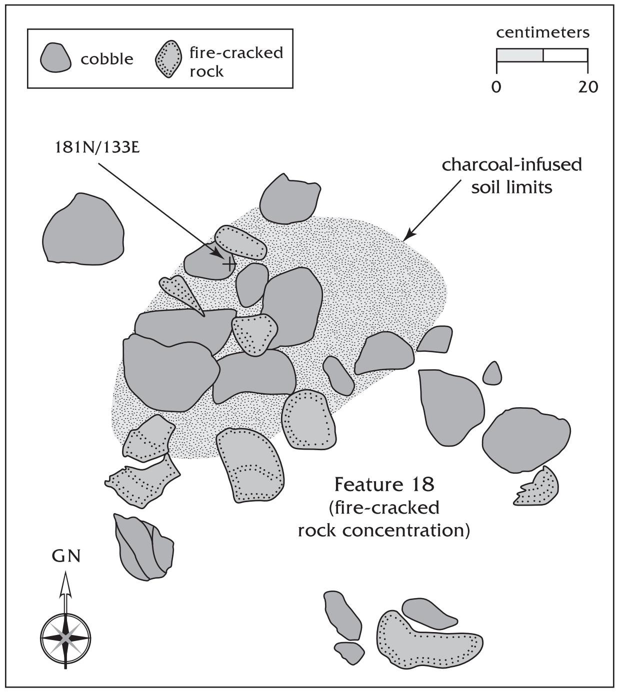


Figure 204. Plan and profile of Feature 18, Area 1, LA 61293.

Figure 205. Pit structure foundation, Feature 13, Area 1, LA 61293.

action, and insect tunnels were abundant. Within this homogenized pit-structure fill, excavation units yielded from 1 to 15 pieces of fire-cracked rock and 1 to 5 chipped stone artifacts. The occurrence of artifacts and fire-cracked rock was low enough to suggest the majority washed in after abandonment and burning. Fire-cracked rock and artifacts on and near the surface surrounding Feature 13 indicate unplanned or sheet discard of refuse. Unlike the Latest Archaic component at LA 61286, Feature 13 did not have a spatially discrete discard area. The amount of charcoal-staining and the evidence of burning on the structure floor argue for a burned superstructure. The staining is more than can be accounted for by diffusion from intramural thermal features.

In general, this dark sandy loam continued to contact the structure floor. Intramural thermal features were identified by even darker (very dark gray to black) staining at floor contact, and they were excavated into the friable Tesuque sandstone. Differences in pit-fill staining may reflect last use rather than filling subsequent to abandonment. The darkest stained fill should remain from the last use, while less stained pit fill may reflect intentional filling and mixing with burned superstructure and colluvial deposition subsequent to abandonment.

Feature 13 was excavated into the friable Tesuque sandstone in the north three-quarters of perimeter. The estimated structure dimensions were 4 by 3 m by up to 40 cm deep (Figs. 206 and 207). The total floor space was 9.4 sq m, the largest floor area of Santa Fe Relief Route pit structures regardless of age. The south foundation wall was lined with cobbles that may have been removed from the planned pit-structure interior and used to shore up the southern, downslope wall, which was moderately consolidated colluvial sandy loam. Foundation construction took advantage of the sandstone substratum and the abundant cobbles that occurred on the slope. Two postholes were found in the east half of the structure. They do not indicate much about the superstructure, except that interior poles may have been used. The pit-structure floor was unprepared. The floor level was defined as the contact between stained soil and stained sandstone or a thin colluvial layer just above the sandstone. Eight floor-contact artifacts included two projectile point fragments and a hammerstone. These few floor-contact artifacts provide little evidence of intramural activities and spatial organization. A wood charcoal sample from Feature 21, an intramural thermal feature, yielded a cal. 1 BC–AD 224 two-sigma range.

Nine intramural features were identified. Seven features were thermal features (Features 14, 20, 21, 22, 24, 26, and 27) (Figs. 208–211), and two may have been storage pits (Features 33 and 34). All thermal features were filled with darkly stained soil. In terms of size and depth, these features exhibit expected consistency given the space constraint within the structure. The maximum dimensions of the intramural features were between 30 and 63 cm; six of the seven were smaller than 50 cm. The largest feature was Feature 14, which was 22 cm deep. It is unlikely that all seven features were concurrently used. Features 20, 21 and 27 are superimposed and seem to reflect three different occupation and remodeling episodes. Features 22 and 24 are connected and may also indicate remodeling or relocating of a processing feature. Features 14 and 26 are adjacent, but Feature 14 is larger. If three features were used concurrently, then the south half of the structure was the main activity area, and the greatest open space was in the north half. Ethnobotanical samples from feature fill yielded little evidence of plant processing. Features 21 and 26 yielded small amounts of *Chenopodium*, *Amaranthus*, and cheno-ams. Feature 26 yielded a high concentration of juniper berries. Juniper is not usually a food item, but it was used as a condiment and for medicinal purposes. Since the berries are charred, it is unlikely that they were brought by rodents. Juniper was the predominant wood recovered.

The two possible storage features were poorly defined wall pits excavated into Tesuque sandstone. These pits took form as we tried to define a poorly preserved north wall. They were unburned and larger than the floor thermal pits. They covered 0.60 sq m and had a volume of 0.20 cu m. Pits of this volume could have stored a maximum of 153 kg of seeds, such as *Chenopodium* or *Amaranthus*.

No extramural features were radiocarbon-dated to the same period as Feature 13, so the pit-structure foundation and intramural features are the only unambiguous evidence of Latest Archaic occupation. Obviously, the occupation

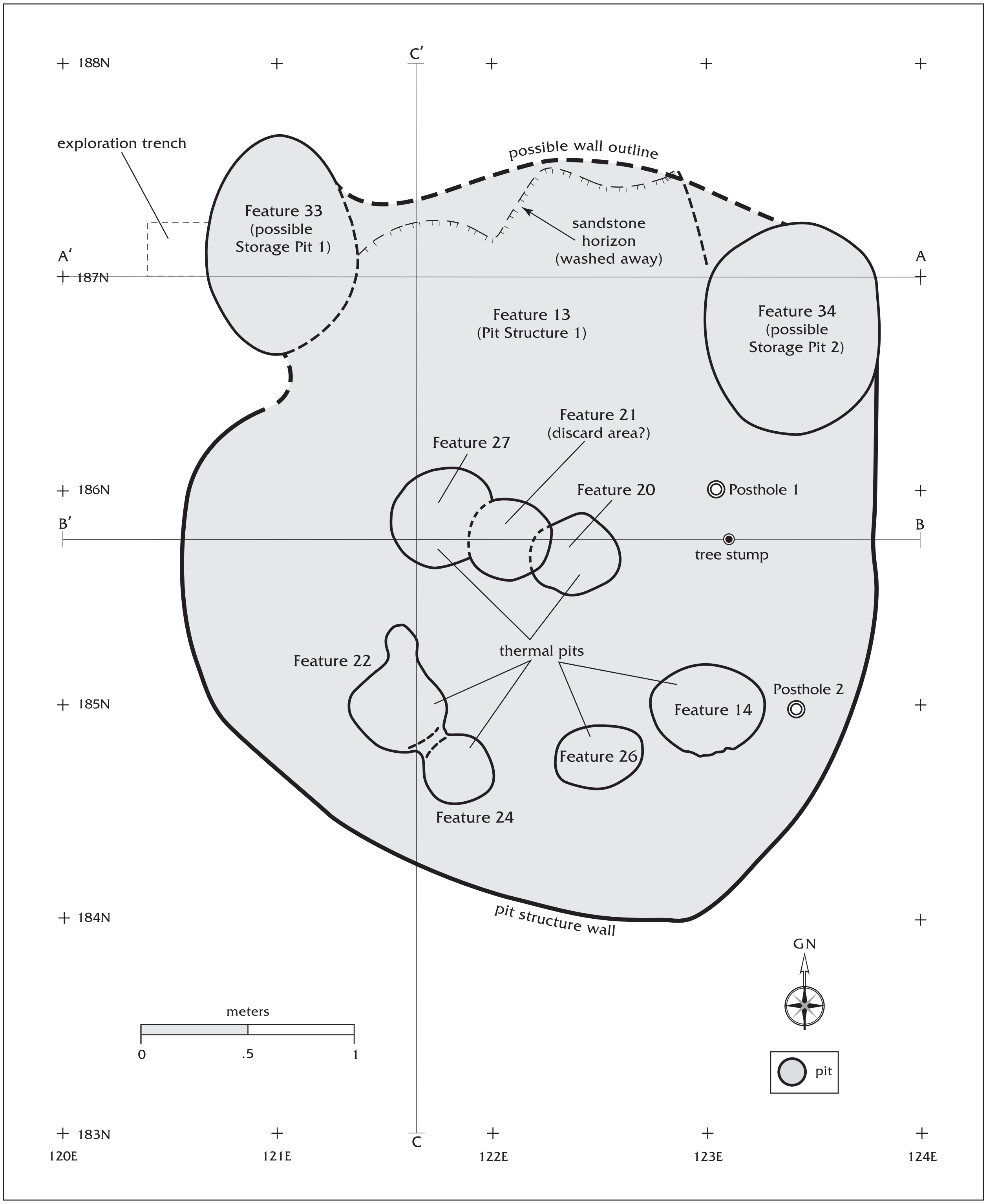


Figure 206. Plan and profiles of pit structure foundation, Feature 13, Area 1, LA 61293, including Features 20, 21, 22, 27, 33, and 34.

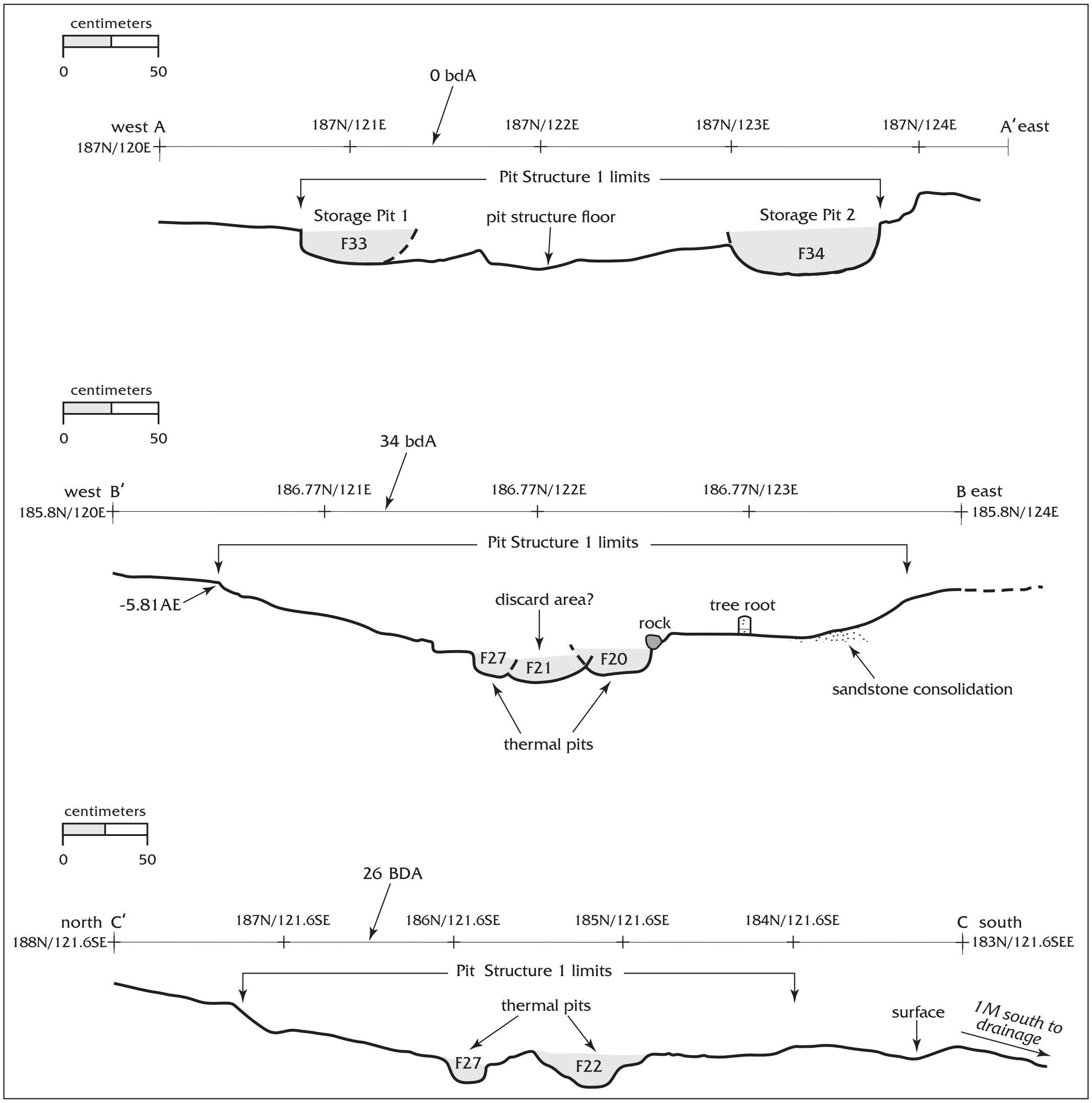


Figure 206 (continued).

Figure 207. Feature 13, Area 1, LA 61293.

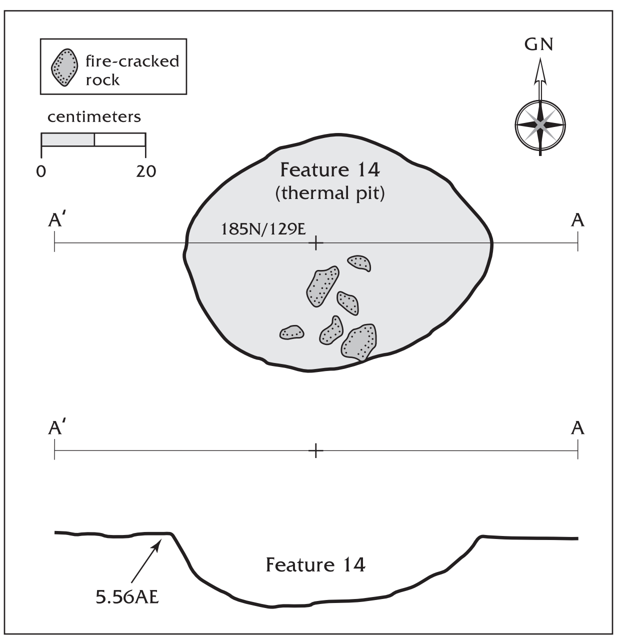


Figure 208. Plan and profile of Feature 14, Area 1, LA 61293.

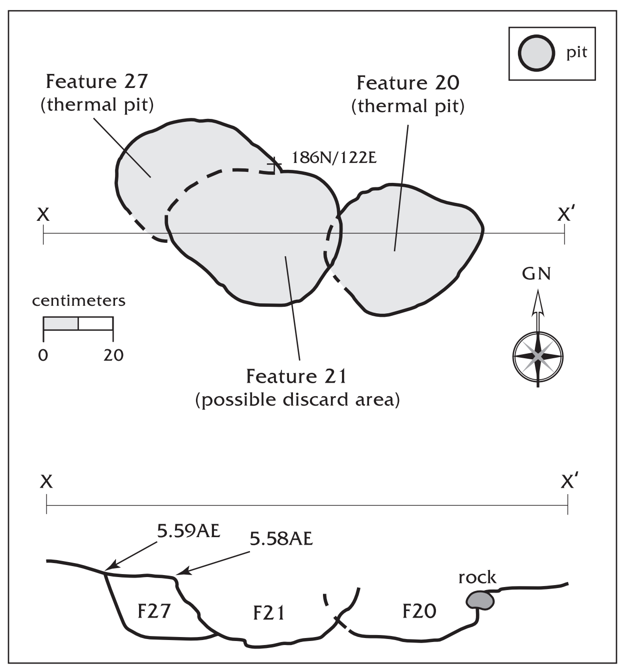


Figure 209. Plan and profile of Features 22 and 24, Area 1, LA 61293.

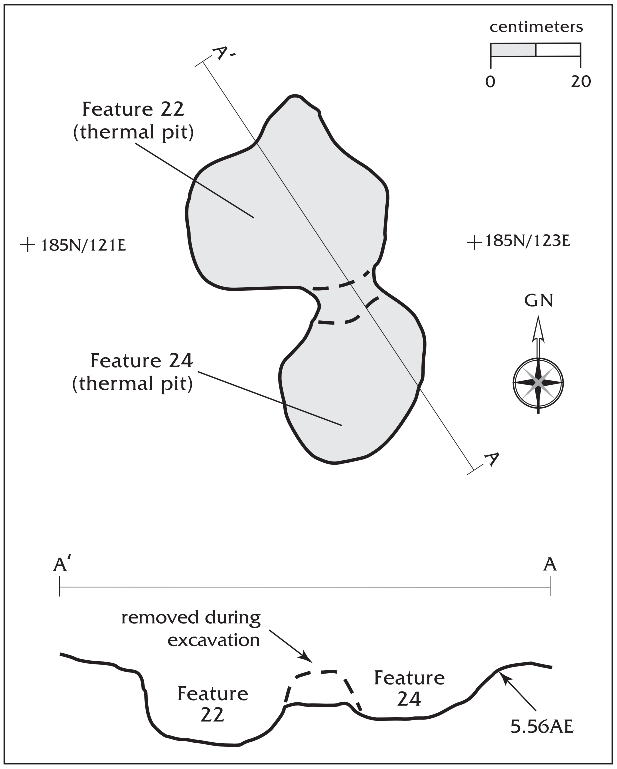


Figure 210. Plan and profile of Features 20, 21, and 27, Area 1, LA 61293.

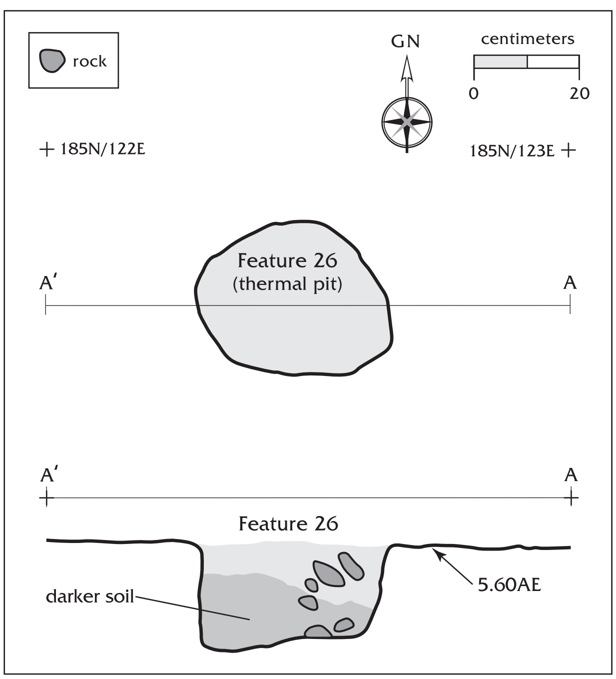


Figure 211. Plan and profile of Feature 26, Area 1, LA 61293.

was distinctly residential. The presence of up to three intramural thermal features and two possible storage features indicates cold or inclement-weather occupation. Multiple thermal features would have supported a wide range of processing and domestic activities. Intramural storage provided ready access to foods, as well as control and security, while the site was occupied. Depending on the what foods were stored, the two storage pits could have supplied as much as 300 kg of volume. This storage capacity would have contributed significantly to the group's ability to stay in this area for an extended period and perhaps over the winter. The three intramural feature construction episodes suggest that the structure was occupied during different years. The floor space of 9.4 sq m could have accommodated up to three people comfortably but may have slept as many as five. Basically, a small family group could have occupied Feature 13, and actual available floor area may have been determined by the number of concurrently open and actively used features.

The Ancestral Pueblo component is represented by Santa Fe Black-on-white and Smeared Indented Corrugated pottery. Two radiocarbon dates have a combined cal. AD 1039–1494 two-sigma range, which spans the Late Developmental to the Middle Classic, but the pottery suggests an AD 1200–1425 range. The features that are most likely to be associated with this component are Features 6 and 8, which were radiocarbon-dated, and Features 9, 10, 11, 12, 23, 25, and 29.

Features 9, 11, and 12 combine with Features 6, 8, and 10 to form one possible spatial Pueblo period component. These six features are clustered within a 55 sq m area. It is unlikely that they are all from one occupation or were constructed and used by the same group of Pueblo foragers. Instead, they reflect intensive reuse of a restricted space within a broader physical landscape.

The form of these features varies. Feature 6 is a large oval cobble-lined thermal feature that was used for in-field roasting or processing. It is the only cobble-lined roasting pit with a large opening encountered during the project (Figs. 212 and 213). Its construction suggests a specialized function. The cobbles were locally available metamorphic and granitic rocks. The cobbles were tightly wedged into the pit, and any small

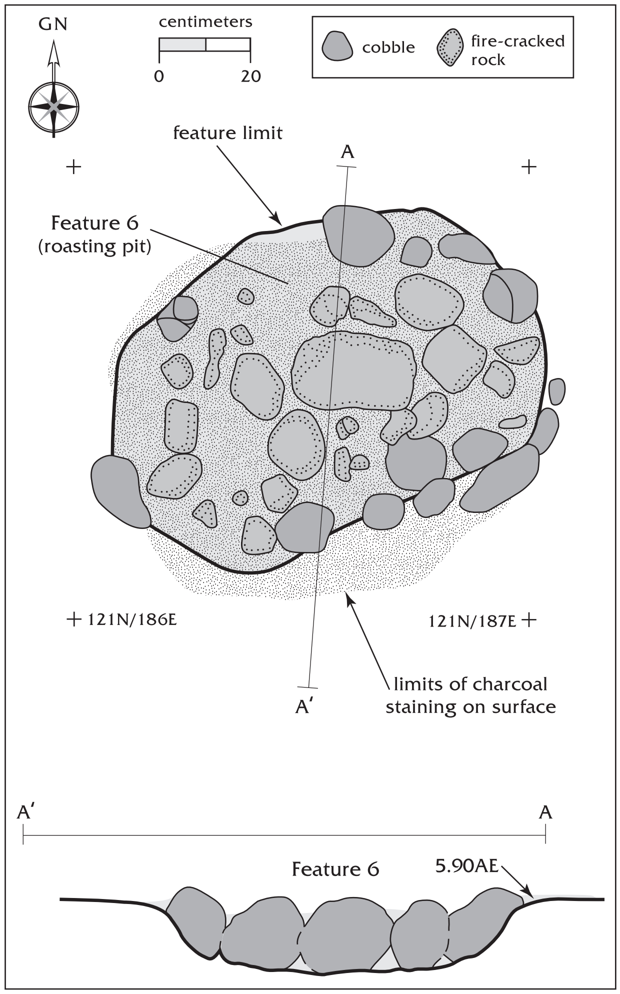


Figure 212. Plan and profile of Feature 6, Area 1, LA 61293.

Figure 213. Feature 6, Area 1, LA 61293.

interstices were packed with pebbles or small cobbles. The pit fill was a black sandy loam mixed with small pebbles and 57 pieces of fire-cracked rock. Charcoal was abundant, and piñon was the predominant wood species. *Leguminosae* was the only economic plant species recovered. The formal and permanent construction of Feature 6 suggests it was used over many seasons, which reinforces the observation that Area 1 was a relatively important location in Pueblo foraging.

Feature 8 was unusual because it was cobble lined, like Feature 10 at LA 61290. Unlike Feature 6, it was circular with steep walls (Figs. 214 and 215). It was filled with darkly stained sandy loam, indicating it was abandoned with considerable charcoal content. Seventeen fire-cracked rocks were recovered from the upper fill. One lithic artifact was recovered. No economic plant species were recovered. Fuelwood included *Pinus*, *Juniperus*, and *Quercus*. *Quercus* was rare in this project, suggesting greater biotic diversity during the Ancestral Pueblo period than earlier. Feature 8 is similar to Feature 6 in its formal construction, suggesting that it was built to last, so that it would be available for many episodes. It is also evidence that Pueblo foraging was staged with repeated seasonal visits to specific locations, a strategy that

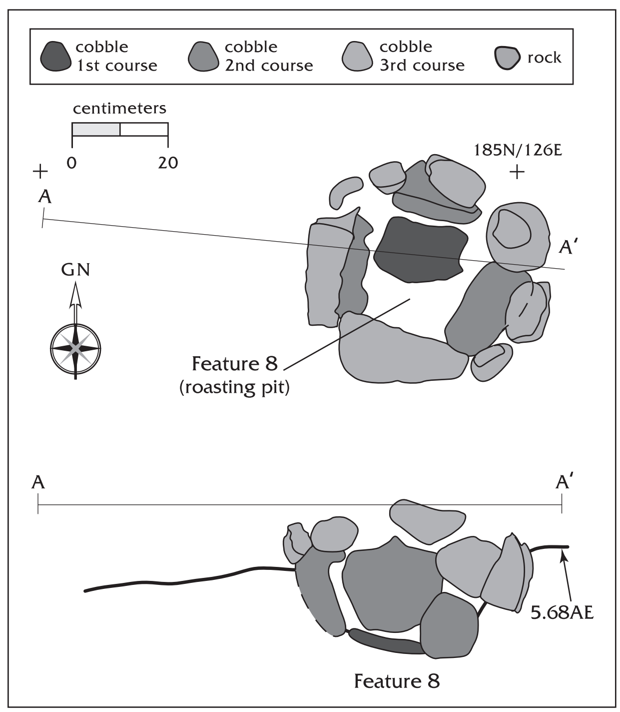


Figure 214. Plan and profile of Feature 8, Area 1, LA 61293.

Figure 215. Feature 8, Area 1, LA 61293.

was supported by durable facility construction.

Feature 8 abutted Feature 10. That they were functionally and temporally associated is assumed but cannot be demonstrated or supported other than by their proximity. They are similar in their contrasting morphology and content to Features 1 and 10 at LA 61290. Feature 10, LA 61293, was an oval, basin-shaped pit that contained a charcoal-stained secondary deposit with seventeen pieces of fire-cracked rock (Fig. 216). This feature was not filled with fire-cracked rock, but rock was apparently incorporated into the processing activity. Features 10 and 11 are of similar size and shape, suggesting that they supported a similar activity within the Pueblo foraging strategy. Co-occurrence of two side-by-side pits is a common occurrence in Santa Fe Ancestral Pueblo sites (Post 1996a, 1998). What is unusual about the LA 61293 and LA 61290 pairings is that the two features are morphologically and, presumably, functionally different.

Features 9, 11, and 12 were near-surface, deflated cobble or fire-cracked filled roasting pits (Figs. 217–219). The different depths of the roasting pits may reflect deflation, function, or preservation. Between 17 and 51 fire-cracked rocks were encountered within each pit. They were oval or roughly circular in outline and contained varying levels of charcoal-stained sandy loam. Artifacts were rare, and flotation samples yielded only a charred *Mentzelia* seed from Feature 11. Piñon and juniper charcoal were recovered from each feature with *Cercocarpus*. The Ancestral Pueblo age of these features is based on near-surface location and proximity to the surface sherds that were recovered.

Features 23, 25, and 29 may form a second spatial Ancestral Pueblo period component. Features 23, 25, and 29 are a near-surface feature cluster on the east side of the arroyo (Figs. 220–222). Feature 23 is a small, deep thermal feature that may have been used to produce coals that were used in Feature 29. Feature 29 is a deflated fire-cracked rock filled roasting pit. Feature 25 is either a deflated roasting pit or discard area. Numerous cobbles, some burned, were exposed, but there was no formal feature outline. No economic plant remains were recovered from these features. The near-surface position of these features and their proximity to Glaze A pottery outside the right-of-way indicates that they may be from the Ancestral Pueblo period. Tightly spaced clustering of these features indicates that they may be contemporaneous and functionally related. Since LA 61293 was regularly visited by hunter-gatherers and foragers for over 3,000 years, feature proximity does not assure contemporaneous age.

One historic feature was excavated in Area 5. Feature 1 was visible as a charcoal stain exposed on the upper bank of the erosion channel that drains the site to the south. A 3 by 3 m area was excavated around Feature 1 to expose its limits and recover associated artifacts. The feature was oval with a steep-walled irregular profile (Fig. 223). Feature 1 fill was sandy loam mixed with charcoal and 102 animal bones. Animal bones included mice, woodrat, medium bird, lizard, cottontail, jackrabbit, small mammal/canine, and sheep/goat. The most diverse and unusual assemblage recovered during the project, it reflects woodland hunting. This level of subsistence hunting is difficult to interpret, but it seems that Feature 1 was a fire in short-term subsistence camp. Whether the faunal remains reflect resource gathering or transient living is not known.

The age of three features is unknown. Feature 19 was in Area 4. Features 5 and 30 are in Area 7. Feature 19 was in a shallow erosion channel southeast of Area 1. A 3 by 3 m area was excavated around Feature 19 to expose the feature outline and recover associated artifacts. This thermal feature was heavily reduced by erosion. It measured 78 by 59 cm, was only 5 to 8 cm deep, and had a triangular outline (Fig. 224). Seven fire-cracked rocks were associated. It appears to have been a simple surface or camp fire.

Features 5 and 30 were exposed while surface-stripping within a diffuse artifact scatter in the upper slope site area. A 5 by 5 m area (Area 7) was investigated, revealing few associated artifacts and no other activity areas associated with the features. Feature 5 was exposed as a shallow oval outline of charcoal-stained sandy loam. It measured 54 by 30 cm and was 3 cm deep (Fig. 225). Feature 30 was a larger oval thermal feature. It measured 83 by 40 cm and was a maximum of 5 cm deep. This shallow basin contained dark gray (10YR 4/1) sandy loam. The feature was very deflated. Neither feature had associated artifacts. Their surface context, informal construction, and

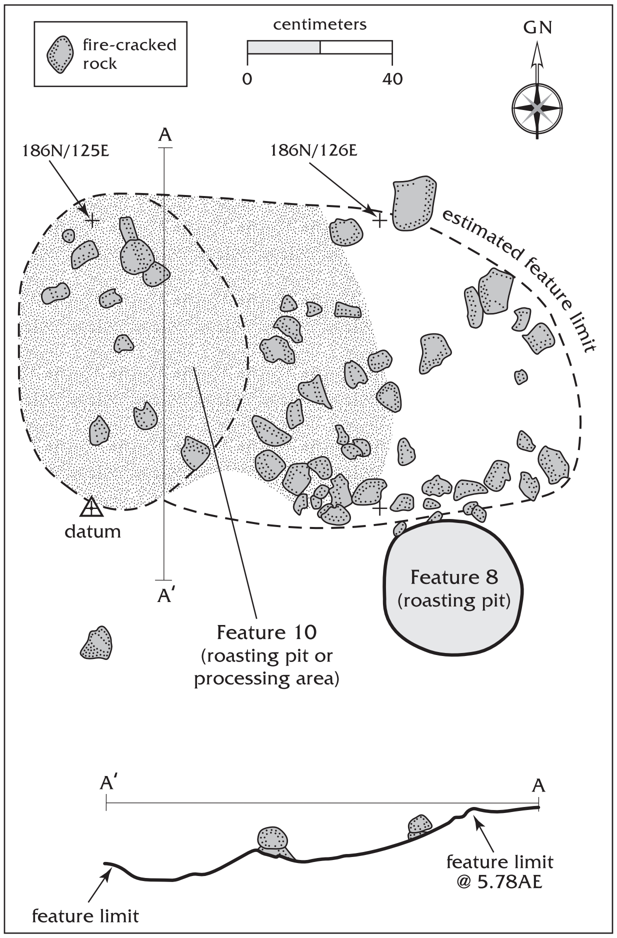


Figure 216. Plan and profile of Feature 10, Area 1, LA 61293.

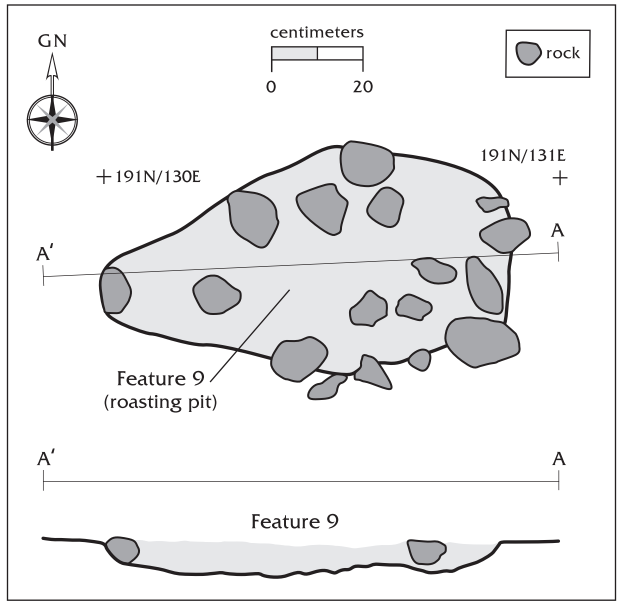


Figure 217. Plan and profile of Feature 9, Area 1, LA 61293.

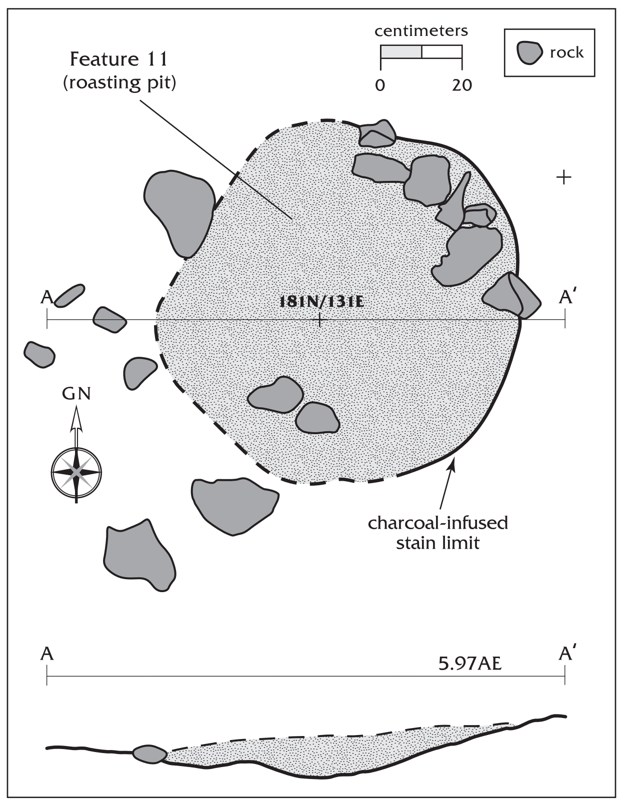


Figure 218. Plan and profile of Feature 11, Area 1, LA 61293.

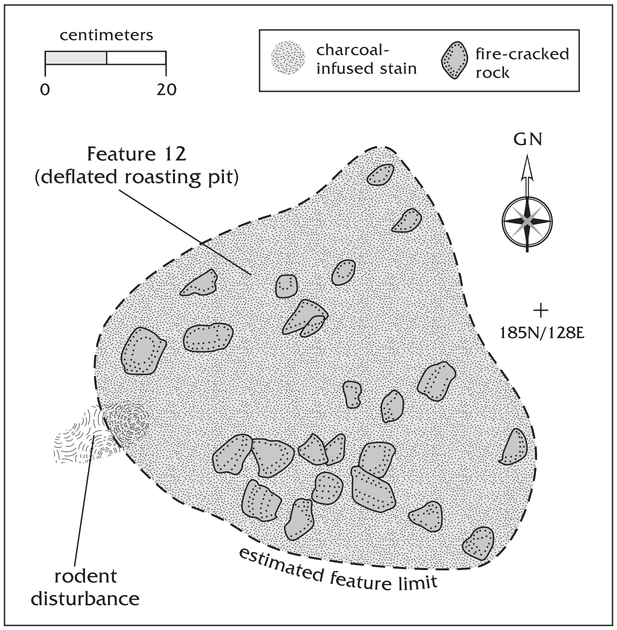


Figure 219. Plan of Feature 12, Area 1, LA 61293.

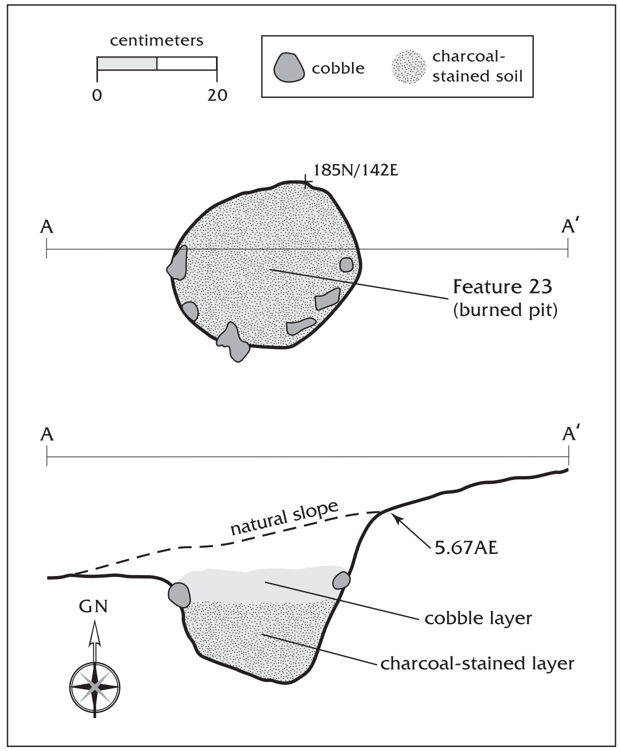


Figure 220. Plan and profile of Feature 23, Area 1, LA 61293.

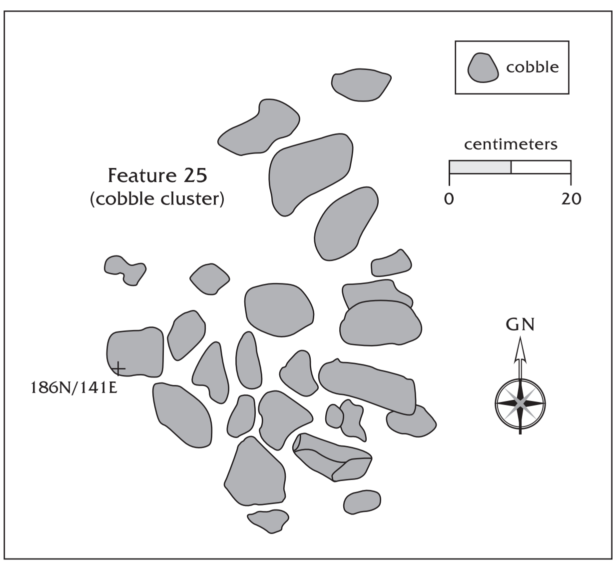


Figure 221. Plan of Feature 25, Area 1, LA 61293.

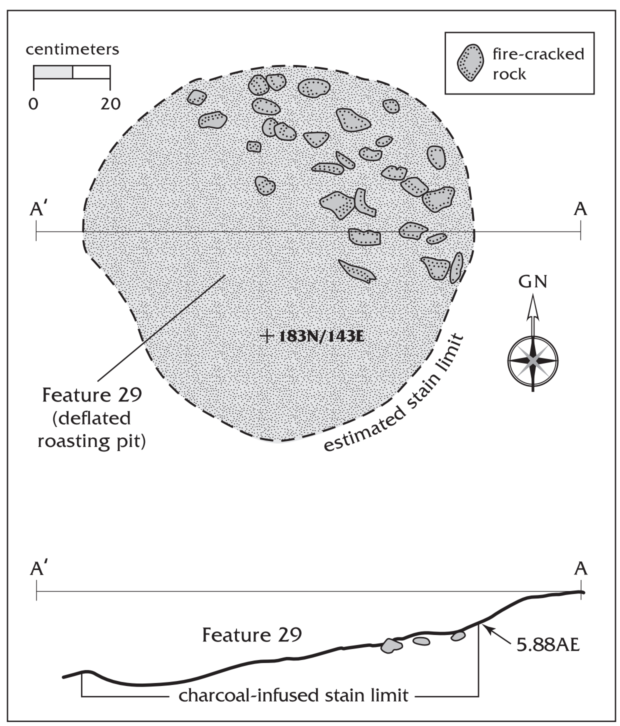


Figure 222. Plan and profile of Feature 29, Area 1, LA 61293.

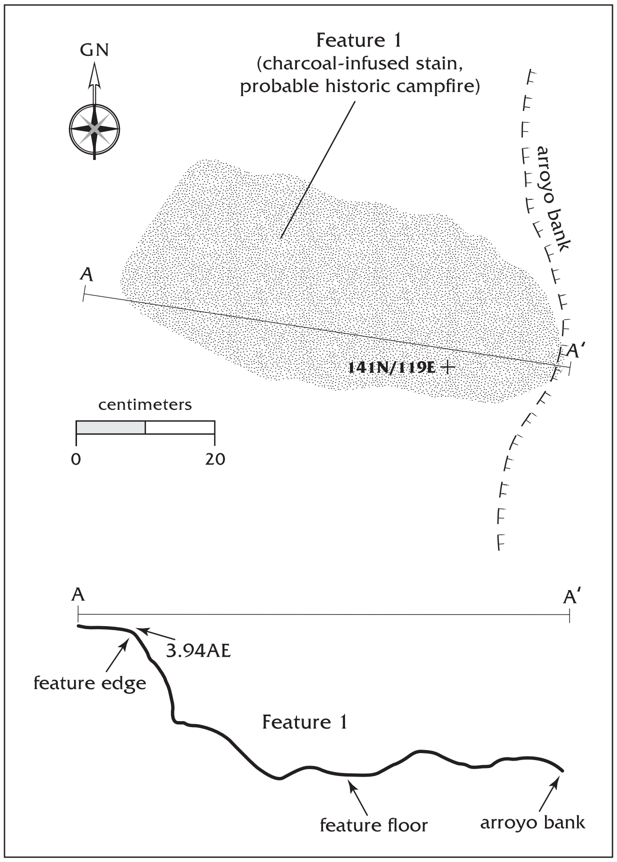


Figure 223. Plan and profile of Feature 1, Area 5, LA 61293.

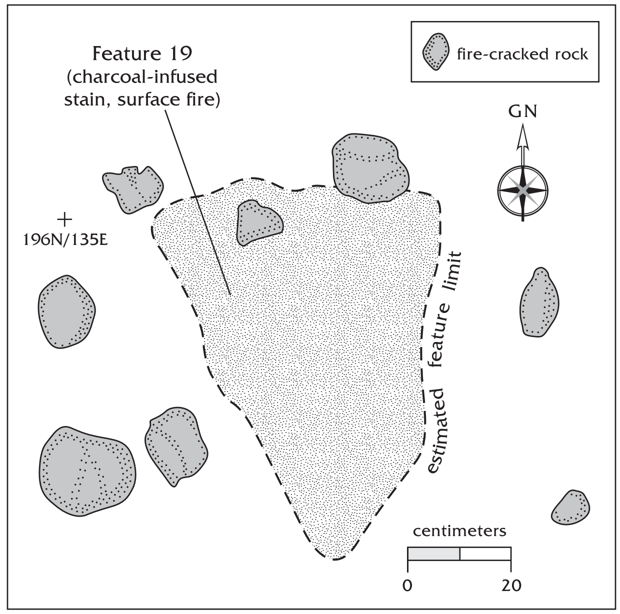


Figure 224. Plan of Feature 19, Area 4, LA 61293.

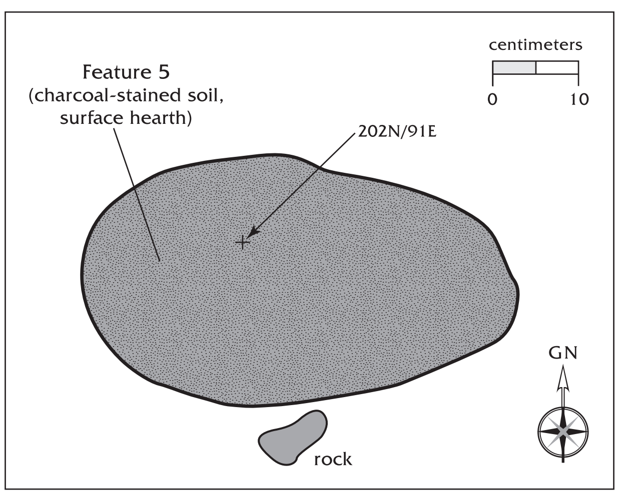


Figure 225. Plan of Feature 5, Area 7, LA 61293.

location on the open slope suggest short-term, perhaps historic period occupation.

Areas 6 and 8 yielded only low frequencies of lithic artifacts. Area 6 was in an upper slope area near the ridge top. Surface stripping in Area 6 yielded three pieces of core-reduction debris. The artifacts reflect low-level accumulation of debris within the site limit resulting from low-intensity, long-term land-use patterns and subsistence activities. Area 8 was in a lower slope area in a relatively flat place overlooking the arroyos that drained the site to the south into Arroyo de las Trampas. Excavation of a 5 by 5 m area yielded seven core flakes and a biface flake of local material. It is likely that these artifacts represent one use episode, but their low frequency reinforces the low level of land use that occurred during most of the site's history.

Outside the excavation areas, a low-density chipped stone scatter covered most of the site area. Field recording resulting in detailed characterization of 46 artifacts, including a biface fragment, a scraper fragment, and a unifacial knife. They reflect low-intensity raw-material procurement, core reduction, and occasional tool replacement and discard. These formal tools and the majority of the debitage were Madera chert, which was the primary raw material found in the gravel. In contrast with the more stable occupation of the sheltered main excavation area, the exposed upper and west-facing slopes were used as a resource area focused on production, maintenance, and discard of tools.

Chipped Stone

A total of 240 chipped stone artifacts weighing 7.16 kg were recovered from LA 61293. This total consists mainly of debitage, with few cores and tools. Nonutilized debitage weighs a total of 3.06 kg, or 42.7 percent of the total assemblage weight. In general, the assemblage reflects core reduction, but Area 1 reflects raw-material procurement, and Areas 1 and 8 reflect very limited tool production or maintenance.

Since all chert artifacts that retain cortex have waterworn cortex, it is believed that these artifacts were obtained from local gravel deposits rather than an in-situ bedded source. Only undifferentiated chert and the Madera cherts exhibit flaws. Flawed material accounts for 36.6 percent of the total assemblage. The flaws mainly take the form of cracks or incipient fracture planes but also include crystals and voids.

The undifferentiated chert ranges from fine to coarse grained. The Madera cherts range from fine to medium grained. Chalcedony, Pedernal chert, and silicified wood are fine grained. Obsidian is glassy. The metaquartzite and orthoquartzite range from fine to medium grained.

The Cenozoic era Santa Fe group gravel, namely the Ancha formation, contain chert. These sedimentary deposits also contain metaquartzite cobbles and small amounts of silicified wood. The Sangre de Cristo foothills contain Precambrian era granite and gneiss overlain by Paleozoic era Pennsylvanian deposits of sandstone, shale, and limestone. Within some of this limestone, namely the Madera formation, are bedded nodules and veins of chert, which were quarried prehistorically (Lang 1993:6, 13; Lang 1995:5; Viklund 1994:1; Ambler and Viklund 1995:5). Madera chert also occurs as residual cobbles and pebbles in the later Santa Fe group gravel. Nonlocal materials such as obsidian and Pedernal chert are found in the axial gravel of the Rio Grande. However, the primary sources of these materials lie in the Jemez Mountains. A small amount of obsidian can also be found scattered across Caja del Rio Mesa (Kelley 1980:11–17).

Area 1. Radiocarbon dating of features within Area 1 demonstrated the presence of three temporal components. The dated features are closely spaced, indicating that mixing of artifacts is more probable than not. Except for the few chipped stone artifacts recovered from the floor and floor fill of Feature 13, artifact/feature associations are tenuous at best.

Area 1 yielded 183 pieces of debitage, including 120 core flakes, 59 pieces of angular debris, and 4 biface flakes (Table 59). Debitage accounts for 90.2 percent of the assemblage. The core flake to biface flake ratio is 1:0.03. This low ratio indicates an emphasis on core reduction.

Core flake and angular debris material types were consolidated into two material classes. Chalcedony and silicified wood were included with the chert. Orthoquartzite was included with metaquartzite to comprise the quartzite material class. The following discussion is geared toward discerning core-reduction trajectories and exploring differences between the chert and

Table 59. Chipped stone artifact type by material type, Area 1, LA 61293

Number Row % Column %	Chert	Madera Chert, Yellow/Red Mottled	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Chalcedony	Pedernal Chert	Silicified Wood	Obsidian	Metaquartzite	Orthoquartzite	Total
Indeterminate	-	-	-	-	-	-	-	-	1	-	1
fragment	-	-	-	-	-	-	-	-	100.0%	-	100.0%
	-	-	-	-	-	-	-	-	5.6%	-	0.5%
Angular debris	24	-	21	6	-	-	1	-	7	-	59
	40.7%	-	35.6%	10.2%	-	-	1.7%	-	11.9%	-	100.0%
	42.9%	-	21.2%	37.5%	-	-	100.0%	-	38.9%	-	29.1%
Core flake	27	5	67	9	1	-	-	-	8	3	120
	22.5%	4.2%	55.8%	7.5%	0.8%	-	-	-	6.7%	2.5%	100.0%
	48.2%	71.4%	67.7%	56.3%	100.0%	-	-	-	44.4%	100.0%	59.1%
Biface flake	2	-	1	-	-	1	-	-	-	-	4
	50.0%	-	25.0%	-	-	25.0%	-	-	-	-	100.0%
	3.6%	-	1.0%	-	-	100.0%	-	-	-	-	2.0%
Tested cobble	-	-	1	-	-	-	-	-	-	-	1
	-	-	100.0%	-	-	-	-	-	-	-	100.0%
	-	-	1.0%	-	-	-	-	-	-	-	0.5%
Tested pebble	-	-	1	-	-	-	-	-	-	-	1
	-	-	100.0%	-	-	-	-	-	-	-	100.0%
	-	-	1.0%	-	-	-	-	-	-	-	0.5%
Unidirectional core	-	1	3	-	-	-	-	-	-	-	4
	-	25.0%	75.0%	-	-	-	-	-	-	-	100.0%
	-	14.3%	3.0%	-	-	-	-	-	-	-	2.0%
Multidirectional core	1	1	2	-	-	-	-	-	2	-	6
	16.7%	16.7%	33.3%	-	-	-	-	-	33.3%	-	100.0%
	1.8%	14.3%	2.0%	-	-	-	-	-	11.1%	-	3.0%
Unworked cobble	1	-	-	-	-	-	-	-	-	-	1
tool	100.0%	-	-	-	-	-	-	-	-	-	100.0%
	1.8%	-	-	-	-	-	-	-	-	-	0.5%
Early-stage uniface	-	-	1	1	-	-	-	-	-	-	2
	-	-	50.0%	50.0%	-	-	-	-	-	-	100.0%
	-	-	1.0%	6.3%	-	-	-	-	-	-	1.0%
Early-stage biface	-	-	1	-	-	-	-	-	-	-	1
	-	-	100.0%	-	-	-	-	-	-	-	100.0%
	-	-	1.0%	-	-	-	-	-	-	-	0.5%
Middle-stage biface	-	-	1	-	-	-	-	-	-	-	1
	-	-	100.0%	-	-	-	-	-	-	-	100.0%
	-	-	1.0%	-	-	-	-	-	-	-	0.5%
Late-stage biface	1	-	-	-	-	-	-	1	-	-	2
	50.0%	-	-	-	-	-	-	50.0%	-	-	100.0%
	1.8%	-	-	-	-	-	-	100.0%	-	-	1.0%
Total	56	7	99	16	1	1	1	1	18	3	203
	27.6%	3.4%	48.8%	7.9%	0.5%	0.5%	0.5%	0.5%	8.9%	1.5%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

quartzite material classes. The small sample size for quartzite may lead to skewed distributions, and interpretation is tentative.

Chert and quartzite core flakes have similar distributions of dorsal cortex and scars (Tables 60 and 61). The four indeterminate dorsal scars in the local chert material class are the result of fracture of a flawed material along incipient fracture planes or cracks, which complicates an accurate dorsal scar count. It appears that all stages of reduction are represented by both material classes. Both appear to emphasize middle-stage reduction.

The majority of chert core flakes (64.2 percent) have single or cortical platforms, suggesting early-stage reduction (Table 62). One chert core flake has a multifaceted platform, indicating middle- to late-stage reduction. Platform breakage can occur in all stages of reduction. A substantial proportion of quartzite core flakes (36.4 percent) have single or cortical platforms, indicating early-stage reduction.

The whole-to-fragmentary core flake ratio is 1:1.7, indicating a higher frequency of fragmentary core flakes relative to whole flakes (Table 63). The most frequent fragmentary portions are lateral (35.8 percent) and proximal (16.7 percent). Generally, flake breakage increases in the later stages of reduction as flakes get thinner; however, other postreduction cultural and natural processes, such as trampling or solifluction, must be considered as well (Moore 1996:247). The high frequency of core flake breakage (63.4 percent) may indicate the later stages of reduction. Yet comparable proportions of distal and proximal portions can indicate post reduction breakage, whereas a prevalence of distal portions points to breakage during reduction (Moore 1996:254). Material flaws should also be considered when examining flake breakage distributions. A considerable proportion of core flakes (40.0 percent) are of a flawed material. Flaws are evident only in local chert core flakes. Breakage along an incipient fracture plane or other flaw can contribute to the representation of all fragmentary portions and can occur in all stages of reduction, although it seems less likely that a flawed material would be intensely reduced if a more suitable raw material were easily obtainable.

The majority of both chert (46.2 percent) and quartzite (85.7 percent) angular debris retain 10–50 percent cortex, suggesting a prevalence of middle-stage reduction debris (Table 64). A substantial proportion of chert angular debris (44.2 percent) is noncortical, reflecting middle- to late-stage reduction. A small proportion of chert angular debris (9.6 percent) retains 60–100 percent cortex, reflecting early- to middle-stage reduction.

With the exception of thickness, the larger mean statistics for quartzite core flakes, especially length, suggest that quartzite was less intensely reduced. However, size is not always a good indicator of reduction stage and may be related to parent raw-material size. In this case, the empirical data on debitage attributes indicate there is little difference in reduction stage between the chert and quartzite material classes. The recovered debitage represents an emphasis on middle-stage reduction but includes early-stage reduction debris as well (Table 65). Very limited late-stage reduction of chert is apparent in the single complex platform type and the smaller lengths, which contribute to the observed mean difference in length between chert and quartzite.

The remaining debitage reflects very limited formal tool production. Four biface flakes were recovered (Table 66). Of the two undifferentiated chert biface flakes, one has a multifaceted platform, and the other has a crushed platform. One has three dorsal scars, and the other has an indeterminate number of dorsal scars. The red or mottled red Madera chert biface flake has a retouched and abraded platform and six dorsal scars. The Pedernal chert biface flake has a crushed platform and seven dorsal scars. None retain cortex.

Informal tools: Eight pieces of utilized/retouched debitage were recovered from Area 1 (Table 67), including whole and fragmentary portions of Madera chert and undifferentiated chert core flakes and angular debris.

The majority of artifacts (7) have one utilized/retouched edge. FS 111-1 has three utilized/retouched edges. Edge location is distal and/or lateral in the four core flakes. Angular debris cannot be oriented by definition. All edge outline forms are convex (5), slightly convex (1), or sinuous (2).

Bidirectional wear is included in four edge-wear patterns, while unidirectional wear is included in three. Bidirectional scars suggest use in a longitudinal motion, such as cutting, slicing, or

Table 60. Core flake dorsal cortex by material class, Area 1, LA 61293

Number Row % Column %	Local Chert	All Quartzite	Total
Noncortical	45	5	50
	90.0%	10.0%	100.0%
	41.3%	45.5%	41.7%
10-50%	30	3	33
	90.9%	9.1%	100.0%
	27.5%	27.3%	27.5%
60-100%	34	3	37
	91.9%	8.1%	100.0%
	31.2%	27.3%	30.8%
Total	109	11	120
	90.8%	9.2%	100.0%
	100.0%	100.0%	100.0%

Table 61. Core flake dorsal scars by material class, Area 1, LA 61293

Number Row % Column %	Local Chert	All Quartzite	Total
0	25	3	28
	89.3%	10.7%	100.0%
	22.9%	27.3%	23.3%
1-2	65	6	71
	91.5%	8.5%	100.0%
	59.6%	54.5%	59.2%
3-5	15	2	17
	88.2%	11.8%	100.0%
	13.8%	18.2%	14.2%
Indeterminate	4	-	4
	100.0%	-	100.0%
	3.7%	-	3.3%
Total	109	11	120
	90.8%	9.2%	100.0%
	100.0%	100.0%	100.0%

Table 62. Core flake platform type by material class, Area 1, LA 61293

Number Row % Column %	Local Chert	All Quartzite	Total
Single-facet and cortical platforms	70	4	74
	94.6%	5.4%	100.0%
	64.2%	36.4%	61.7%
Multifacted, abraded, and retouched platforms	1	-	1
	100.0%	-	100.0%
	0.9%	-	0.8%
Absent, collapsed, crushed, and broken-in-manufacture platforms	38	7	45
	84.4%	15.6%	100.0%
	34.9%	63.6%	37.5%
Total	109	11	120
	90.8%	9.2%	100.0%
	100.0%	100.0%	100.0%

Table 63. Core flake portion by material class, Area 1, LA 61293

Number Row % Column %	Local Chert	All Quartzite	Total
Whole	40	4	44
	90.9%	9.1%	100.0%
	36.7%	36.4%	36.7%
Proximal	17	3	20
	85.0%	15.0%	100.0%
	15.6%	27.3%	16.7%
Medial	4	1	5
	80.0%	20.0%	100.0%
	3.7%	9.1%	4.2%
Distal	7	1	8
	87.5%	12.5%	100.0%
	6.4%	9.1%	6.7%
Lateral	41	2	43
	95.3%	4.7%	100.0%
	37.6%	18.2%	35.8%
Total	109	11	120
	90.8%	9.2%	100.0%
	100.0%	100.0%	100.0%

Table 64. Angular debris cortex by material class, Area 1, LA 61293

Number Row % Column %	Local Chert	All Quartzite	Total
Noncortical	23	1	24
	95.8%	4.2%	100.0%
	44.2%	14.3%	40.7%
10-50%	24	6	30
	80.0%	20.0%	100.0%
	46.2%	85.7%	50.8%
60-100%	5	-	5
	100.0%	-	100.0%
	9.6%	-	8.5%
Total	52	7	59
	88.1%	11.9%	100.0%
	100.0%	100.0%	100.0%

Table 65. Core flake mean whole measurements by material class, Area 1, LA 61293

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Local Chert					
Number	71	62	57	57	40
Mean	7	33.3	31.5	10.4	17.9
SD	2.9	14	15.1	5.2	31.3
Minimum	2	10	9	2	0.7
Maximum	15.5	84	97	26	192.7
All Quartzite					
Number	4	5	7	7	4
Mean	9.5	60.4	38.1	10.4	19.9
SD	1.9	14.2	15.1	4.2	6.8
Minimum	8	45	14	5	11.9
Maximum	12.3	75	62	17	28.6
All Materials					
Number	75	67	64	64	44
Mean	7.1	35.3	32.3	10.4	18
SD	2.9	15.6	15.1	5.1	29.9
Minimum	2	10	9	2	0.7
Maximum	15.5	84	97	26	192.7

Table 66. Biface flake mean whole measurements, Area 1, LA 61293

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Number	2	4	4	4	4
Mean	1.8	13.3	14.7	2	1.1
SD	0	9.6	6.6	1.4	1.2
Minimum	1.8	5	9	1	0.1
Maximum	1.8	27	23	4	2.3

Table 67. Utilized/retouched debitage, Area 1, LA 61293

FS No.	Material Type	Morphology	Portion	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Utilized Edge Location	Wear Pattern	Utilized Edge Outline	Utilized Edge Length (mm)	Utilized Edge Angle (degrees)
27-2	Madera chert, nonred	core flake	whole	60	39	21	30.5	distal/lateral	unidirectional retouch and wear, discontinuous step fracturing fracturing	convex	43	50
44	chert	core flake	indeterminate	30	15	4	2	indeterminate	bidirectional wear	convex	26	30
66	Madera chert, red and mottled red	angular debris	indeterminate	62	27	17	24.6	indeterminate	unidirectional retouch	convex	39	68
83-4	Madera chert, red and mottled red	angular debris	whole	32	49	14	24.1	distal/lateral	unidirectional retouch	sinuous	78	64
111-1	chert	core flake	whole	51	38	12	24.5	distal	bidirectional retouch, unidirectional wear, discontinuous step fracturing	slightly convex	32	50
								lateral	unidirectional retouch and wear	sinuous	37	34
								lateral	unidirectional retouch and wear	slightly convex	28	34
127	Madera chert, red and mottled red	core flake	whole	33	38	10	10.7	distal	bidirectional wear, discontinuous crescentic scars	convex	55	35
130-3	Madera chert, red and mottled red	angular debris	indeterminate	27	21	16	8.2	indeterminate	crushing, step fracturing	convex	10	66
157-11	chert	core flake	proximal	32	29	7	5.3	lateral	bidirectional retouch and wear	slightly convex	22	35

sawing, whereas unidirectional scars suggest use in transverse motion, such as scraping, whittling, or planing (Chapman and Schutt 1977:86–92; Odell and Odell-Vereecken 1980:98–99). One artifact (FS 27-2) displays wear scars that are restricted to a V-shaped projection, which may have served as a graver. Some use-wear analysts using 100–200 power magnification to examine experimental stone tools caution against the reliability of interpretations based solely on scarring. Patterned scarring can also be caused by natural processes such as solifluction, cryoturbation, and trampling. In experimental context, both bidirectional and unidirectional scarring have been produced by transverse and longitudinal motions (Keeley 1980:30–36; Vaughan 1985:10–12, 19–24). Two pieces of angular debris (FS 66 and FS 83-4) exhibit unidirectional retouch scars but lack wear scars. Another piece of angular debris (FS 130-3) shows battering wear in the form of crushing and step-fracturing.

Five edge angles measure under 40 degrees. The remaining five edges measure over 40 degrees. Citing experiments by Schutt (1981), Post (1996a:418) suggests that tools with edge angles of 40 degrees or less are better suited for cutting, while tools with edge angles above 40 degrees are better suited for scraping. Furthermore, tools with edge angles measuring over 60 degrees could accommodate more heavy-duty or intensive use. Three edges have angles measuring over 60 degrees, two of which show unidirectional retouch, and the third shows battering wear.

Formal tools: Two large projectile points (FS 117 and FS 126) were recovered from Feature 13, a burned structure foundation. Both are distal fragments. FS 117 is a fine-grained, mottled gray-orange chert that is actually two refittable fragments. It is proximally truncated by a crenated fracture, which is attributable to heat exposure (Johnson 1979:26; OAS 1993:20). It exhibits two small potlids on one face and two uncracked incipient fracture planes. FS 126 is obsidian. A portion appears melted and expanded. When certain obsidians, especially Cerro del Medio, are exposed to heat between 750 and 900 degrees C, they can undergo physical transformations such as expansion, discoloration, and increased buoyancy or porosity. These transformations can effectively obscure tool or flake morphology (Lentz n.d.:49). Fortunately, this point was incompletely affected. Heat-puffing is restricted to the tip. Both points are late-stage bifaces with regular facial scarring patterns and continuous marginal scars. Both have discontinuous marginal step fractures. FS 126 is proximally truncated by a lateral snap initiating along the artifact's centerline on one face and extending to the opposing face. Both lack basal morphology, rendering them unlikely temporal indicators. FS 117 measures 45 mm long by 23 mm wide by 9 mm thick and weighs 8.0 g. FS 126 measures 31 mm long by 21 mm wide by 5 mm thick and weighs 2.9 g.

FS 14 is a middle-stage biface manufactured from a fine-grained, mottled red-purple Madera chert. The facial scarring pattern is semiregular. It is subrectangular in plan view. Marginal scarring is discontinuous on all but one short axis edge, which displays continuous bidirectional scarring. No evidence of hafting was observed. It measures 38 mm long by 30 mm wide by 9 mm thick and weighs 11.6 g.

FS 71-1 is an early-stage biface manufactured from a fine-grained, flawed, mottled red Madera chert. The facial scarring pattern is irregular. Marginal scarring is discontinuous and includes step-fracturing. The artifact is roughly oval in plan. It measures 45 mm long by 43 mm wide by 19 mm thick and weighs 41.0 g.

FS 21 is an early-stage uniface manufactured from a fine-grained mottled white-tan-pink-red Madera chert. The facial scarring pattern is irregular. Marginal scarring is discontinuous. The plan view form is irregular. This artifact exhibits some crazing and possible reddening. There is no luster variation, which makes it difficult to determine heat treatment during production or heat exposure subsequent to production. It measures 51 mm long by 33 mm wide by 16 mm thick and weighs 30.2 g.

FS 100 is an early-stage uniface manufactured from a gray Madera chert. The facial scarring pattern is irregular. Marginal scarring is discontinuous, but it is bidirectional along a small portion of one long axis margin. The scarring on the opposing surface does not cover one-third of the surface area; therefore, it was not identified as a biface. The artifact retains 30 percent waterworn cortex. It measures 60 mm long by 44 mm wide by 19 mm thick and weighs 55.2 g.

Hand tools: Two hammerstones (FS 122 and FS 214) were recovered. FS 122 is a heat-fractured unworked cobble. It is a medium-grained gray chert that retains 30 percent waterworn cortex. Along a ridge it shows crushing, which is consistent with battering a hard or resistant material. It measures 100 mm by 99 mm by 63 mm and weighs 665.7 g. FS 214 is a large indeterminate fragment of a hammerstone that exhibits crushing and step-fracturing along a ridge. It is a fine-grained purple metaquartzite that retains 60 percent waterworn cortex. It measures 65 mm long by 38 mm wide by 35 mm thick and weighs 132.6 g.

Two choppers (FS 14 and FS 27) were recovered. Both are medium-grained metaquartzites. Both appear battered along a ridge created by unimarginal (FS 14) and bimarginal (FS 27) flake removal. The tools retain 30 percent waterworn cortex in areas opposing the utilized edge. The cortex probably served as a natural backing (Chapman and Schutt 1977:92). FS 27 has a utilized edge measuring 37 mm with an edge angle of 66 degrees. It measures 60 mm long by 39 mm wide by 21 mm thick and weighs 305.6 g. FS 14 has a utilized edge measuring 43 mm with an angle of 65 degrees. It measures 114 mm long by 100 mm wide by 51 thick mm and weighs 535.6 g.

Cores: Five multidirectional cores, four unidirectional cores, one tested pebble, one tested cobble, and one piece of angular debris with subsequent flake removals from multiple platforms were recovered from Area 1 (Table 68). All of these artifacts are of local materials, including undifferentiated chert, Madera chert, and metaquartzite. With the exception of the metaquartzite, which is medium grained, all materials are fine grained. A large proportion of the chert artifacts (75 percent, 9 of 12) are flawed, mainly by cracks. All cortex is waterworn. Three multidirectional cores (FS 43, FS 73, and FS 74-2) and one unidirectional core (FS 63-2) appear exhausted or nearing exhaustion. Their diminutive sizes would have made freehand reduction precarious. Rather, these cores suggest intensive reduction. The tested pebble and cobble reflect the testing of local gravel for suitable lithic raw material.

Area 3. Seven pieces of debitage were recovered from Area 3 (Table 69). Two pieces of angular debris (FS 142 and FS 146-2) are noncortical, as are two core flakes (FS 152 and FS 155). These core flakes have single-facet platforms and two dorsal scars. One (FS 152) is whole, while the other (FS 155) is a proximal portion. The remaining core flake (FS 154) is a proximal portion retaining 100 percent dorsal cortex. Of the remaining pieces of angular debris, one (FS 146-1) retains 40 percent cortex, and the other (FS 146-3) retains 20 percent cortex.

Core: Area 3 yielded one unidirectional core (FS 144). It is a medium-grained, dark gray metaquartzite exhibiting 10 flake scars but retaining 60 percent waterworn cortex. Maximum linear dimensions are 124 mm long by 79 mm wide by 77 mm thick. It weighs 739.8 g.

Area 4. Area 4 yielded five pieces of debitage, including one piece of noncortical angular debris (Table 70). One core flake (FS 137) has two dorsal scars and a crushed platform. It lacks dorsal cortex. Two core flakes (FS 138 and FS 143) retain 100 percent dorsal cortex. One (FS 202) retains 10 percent dorsal cortex. All cortical core flakes have

Table 68. Cores, Area 1, LA 61293

FS No.	Morphology	Material Type	Cortex Retention (%)	Flake Scars	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
37	Tested pebble	Madera chert, red and mottled red	80	1	55	26	26	24.1
43	Multidirectional core	Madera chert, red and mottled red	0	13	52	37	37	41.3
56	Tested cobble	Madera chert, red and mottled red	70	2	75	73	73	346.4
61	Angular debris	Madera chert, red and mottled red	30	10	53	25	35	3.6
63-1	Unidirectional core	Madera chert, red and mottled red	30	12	74	58	58	178.8
63-2	Unidirectional core	Madera chert, red and mottled red	20	10	53	32	32	45.9
67	Unidirectional core	Madera chert, yellow/red mottled	70	3	71	57	57	197.4
73	Multidirectional core	Madera chert, yellow/red mottled	30	6	55	37	37	42.3
74-1	Unidirectional core	Madera chert, red and mottled red	30	12	82	50	50	126.9
74-2	Multidirectional core	Madera chert, red and mottled red	0	13	52	37	37	44.9
80	Multidirectional core	Chert	60	6	75	46	46	234.6
215	Multidirectional core	Metaquartzite	40	5	63	57	57	125.3

Table 69. Chipped stone, Area 3, LA 61293

FS No.	Morphology	Material	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
142	Angular debris	Chert	-	12	7	2	0.2
146-1	Angular debris	Madera chert, red and mottled red	-	11	6	6	0.2
146-2	Angular debris	Madera chert, non-red	-	43	24	15	15.8
146-3	Angular debris	Madera chert, non-red	-	38	21	20	10.4
152	Core flake	Chert	8.4	20	17	10	1.8
154	Core flake	Madera chert, red and mottled red	-	19	18	5	1.8
155	Core flake	Madera chert, non-red	9.7	24	35	12	9.3

Table 70. Chipped stone, Area 4, LA 61293

FS No.	Morphology	Material	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
137-1	Core flake	Chert	-	35	31	8	11.9
137-2	Angular debris	Madera chert, red and mottled red	-	39	25	8	6.2
138	Core flake	Madera chert, yellow/red mottled	8.4	42	32	16	17.2
143	Core flake	Chert	2.7	23	23	9	4.2
202	Core flake	Chert	4.1	28	31	6	4.9

cortical platforms. All are lateral portions of core flakes.

Area 5. Six pieces of debitage were recovered from Area 5, including one piece of angular debris and five core flakes (Table 71). The angular debris retains 50 percent cortex. Three core flakes retain dorsal cortex: FS 170 has 10 percent with two dorsal scars, FS 171 has 70 percent with one dorsal scar, and FS 219 has 100 percent. Of the core flakes that lack cortex, one (FS 173-1) has one dorsal scar and the other (FS 173-2) has two dorsal scars. Three core flakes (FS 171-1, FS 173-1, and FS 219) have cortical platforms. Of those remaining, one (FS 170) has a single-facet platform, and the other (FS 173-2) has a platform that was broken in manufacture. Three (FS 170, FS 173-1, and FS 219) are lateral portions of core flakes. One (FS 171-1) is a proximal portion of a core flake, and one (FS 173-2) is a distal portion of a core flake.

Area 6. Three pieces of debitage were recovered during excavation in Area 6 (Table 72), including one piece of angular debris and two core flakes. The angular debris retains 10 percent cortex. One core flake (FS 187) retains 50 percent dorsal cortex, and the other (FS 188) retains 40 percent dorsal cortex. Both are whole and have one dorsal scar and cortical platforms.

Area 7. Area 7 produced four pieces of debitage, including one piece of angular debris and three core flakes. The angular debris retains 10 percent cortex (Table 73). Two core flakes (FS 198-1 and FS 199) lack dorsal cortex, and one (FS 201) retains 40 percent dorsal cortex. Two lateral portions of core flakes (FS 199 and FS 201) have one dorsal scar and single-facet platforms. The remaining core flake (FS 198-1) is whole and has two dorsal scars and a cortical platform.

Area 8. Area 8 yielded nine pieces of debitage, including eight core flakes and one biface flake (Table 74). With the exception of two core flakes (FS 177 and FS 179), all lack dorsal cortex. The cortical core flakes (FS 177 and FS 179) retain 80 and 20 percent dorsal cortex, respectively. The majority of core flakes (6 of 8) have one or two dorsal scars. The remaining two core flakes (FS 176 and FS 178) have five and three dorsal scars, respectively. The majority of core flakes (6 of 8) have single-facet or cortical platforms. The platform is absent and collapsed, respectively, in FS 177 and FS 200, the two other core flakes. Four (FS 180, FS 191-1, FS 191-2 and FS 200) are lateral portions of core flakes, two (FS 176 and FS 179) are whole, one (FS 177) is a distal portion, and one (FS 178) is a proximal portion. The biface flake is

Table 71. Chipped stone, Area 5, LA 61293

FS No.	Morphology	Material	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
170	Core flake	Chert	3.9	11	19	6	2.2
171-1	Core flake	Madera chert, red and mottled red	5.3	38	37	16	19.3
171-2	Angular debris	Chert	-	19	12	6	0.8
173-1	Core flake	Quartzite	13.2	21	34	14	20.9
173-2	Core flake	Madera chert, red and mottled red	-	10	8	3	0.2
219	Core flake	Madera chert, red and mottled red	5	24	11	6	1.9

Table 72. Chipped stone, Area 6, LA 61293

FS No.	Morphology	Material	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
187	Core flake	Madera chert, red and mottled red	3.6	16	10	4	0.5
188	Core flake	Madera chert, red and mottled red	7.2	29	18	8	2.6
189	Angular debris	Madera chert, red and mottled red	-	20	18	10	2.2

Table 73. Chipped stone, Area 7, LA 61293

FS No.	Morphology	Material	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
198-1	Core flake	Madera chert, red and mottled red	9	19	34	9	5.4
198-2	Angular debris	Silicified wood	-	36	26	20	1.4
199	Core flake	Chert	6.2	13	24	5	1.4
201	Core flake	Madera chert, red and mottled red	3.1	26	19	6	3.3

Table 74. Chipped stone, Area 8, LA 61293

FS No.	Morphology	Material	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
176	Core flake	Madera chert, red and mottled red	0.5	12	16	5	0.8
177	Core flake	Chert	-	27	33	9	6.5
178	Core flake	Madera chert, red and mottled red	3.4	16	16	4	0.8
179	Core flake	Quartzite	16.6	41	48	18	25.5
180	Core flake	Madera chert, red and mottled red	10	41	19	9	6.1
191-1	Core flake	Madera chert, non-red	6.3	16	24	7	2.6
191-2	Core flake	Madera chert, red and mottled red	3.6	11	6	3	0.1
192	Biface flake	Madera chert, red and mottled red	-	10	10	2	0.2
200	Core flake	Madera chert, red and mottled red	-	13	13	3	0.2

whole with a crushed platform and six dorsal scars.

Ground Stone

LA 61293 yielded three whole one-hand manos, two of which show use as a hammerstone along the edge of the short axis (Table 75). All were manufactured from flattened cobbles of medium-grained metaquartzite. All are oval in plan and biconvex in transverse cross section. All display pecking on ground surfaces, which is interpreted as ground-surface sharpening. One mano (FS 213) appears heat altered. It is reddened and fractured. Both one-hand manos/hammerstones (FS 100 and FS 210) exhibit significant investments in tool production, which implies the anticipation of intense use. Mean length equals 134.7 mm, with a standard deviation of 20.6 mm. Mean width equals 104.7 mm, with a standard deviation of 15.3 mm. Mean thickness equals 61.0 mm, with a standard deviation of 5.2 mm. Mean weight equals 1426.3 g, with a standard deviation of 403.1 g.

Site Summary

More complex and extensive occupation components were encountered at LA 61293 than were indicated by the inventory. Site limits were not expanded by the excavation, but cultural deposits reflected greater than expected time depth and range of activities. Excavation revealed a multicomponent site with four discrete occupation areas containing 34 features that date from the Late Archaic (1689–1319 BC) to the historic period. The main excavation area (Areas 1–4) had three temporal components ranging from the Late Archaic to the Ancestral Pueblo Classic period. The most substantial occupation was represented by the pit-structure foundation (Feature 13) and its intramural features. Feature 13 remained from a residential occupation dated to the Latest Archaic period (1 BC–AD 224). Spatial distribution and radiocarbon dating of the thermal features (Features 6 and 8) indicate repeated occupation by Ancestral Puebloan hunters or foragers between AD 1039 and 1494. Repeated, short-lived, but spatially extensive use of the piñon-juniper piedmont is a well-represented pattern in the Northwest Relief Route site assemblage. Late to Latest Archaic site structure and artifact data, combined with LA 61286 and LA 61290 excavation results, provide a deeper understanding of how seasonally mobile populations were organized to exploit resources in the piedmont. The Ancestral Pueblo feature data, combined with isolated and clustered features found at other Northwest Santa Fe Relief Route sites, detail a large-scale but difficult-to-isolate annual resource gathering strategy practiced by Santa Fe River village residents and more mobile segments of large Classic period villages outside the upper and middle Santa Fe River basin.

Table 75. One-hand manos, LA 61293

FS No.	Function	Production Input	Shaping	No. of Use Surfaces	Primary Wear	Secondary Wear	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
210	One-hand mano/ hammerstone	Mostly modified	pecking	2	polishing	battering	113	99	58	1047.6
100	One-hand mano/ hammerstone	Slightly modified	pecking	2	polishing	pecking	137	93	67	1381.3
213	One-hand mano	none	none	1	grinding	pecking	154	122	58	1850

LA 61299

LA 61299 was between centerline stations 714+00 and 715+50. It occurred in and extended beyond the east right-of-way. Testing identified an artifact scatter and one thermal feature (Wolfman et al. 1989:51–53). The work focused on the thermal feature (Feature 1) and three other thermal features found during excavation.

The site was on a south-southeast-facing slope of the highly dissected ridge system that divides the Arroyo Gallinas and Arroyo de los Frijoles drainage basins. It was on the middle slope of the ridge at the head of a first-order tributary of Arroyo Gallinas, which was 300 m to the south. The ridge slope was covered by a dense mantle of Ancha formation gravel. The mid and lower slopes had deep, aggraded colluvial deposits that contain buried Archaic horizons within the site boundary, but outside the project right-of-way. The transition from the upper to middle slope provided a moderately sloped occupation surface that was sheltered on the north and northwest but overlooked the Arroyo Gallinas Valley to the south. Features 2–4 were buried by surface cobble deposits, indicating that prior to occupation the slopes may have been grassier and not as rocky, making them more suitable for foraging or special-activity camps. Removal of the cobble mantle exposed deep, reworked colluvial deposits of the Pojoaque Rough Broken Land association. The A1 horizon was shallow or nonexistent, with the C1ca reddish brown loam near the surface and the thermal features excavated into it. Erosion channel formation was aided by the sparse ground cover and the loose structure of the Pojoaque Rough Broken Land association. Vegetative cover was sparse to moderate, with grasses, prickly pear, narrowleaf yucca, and a sparse to moderately dense overstory of piñon and juniper.

Preexcavation Description

LA 61299 measured 33 m north-south by 27 m east-west. It had a prehistoric component including a thermal feature, a chipped stone concentration, and a light sherd and chipped stone scatter. The artifact concentration showed no depth during testing.

Feature 1 was exposed in a 20 cm deep test pit. The feature was a cobble ring measuring 80 cm long by 70 cm wide with a mixed primary/secondary deposit 20 cm deep. A total of 70 chipped stone artifacts included 59 core flakes and 11 pieces of angular debris. The predominant material type was chert, with a few quartzite artifacts. In general, the amount of cortex on the flakes suggested that secondary stages of reduction were performed at the site. Four sherds of Galisteo Black-on-white indicated an occupation between AD 1250 and 1350, during the Late Coalition and Early Classic periods.

Excavation Methods

Feature 1 was at the west edge of the site. Three additional thermal features were identified by surface stains and fire-cracked cobbles. Examination of the deeply incised erosion channels to the east of the right-of-way revealed a buried Late Archaic occupation. No evidence of this buried deposit was found within the project corridor. Excavation focused on the four thermal features, one of which had a ladle handle fragment visible on the surface. Site dimensions were expanded to 36 m east-west by 32 m north-south, including the buried cultural deposit beyond the east right-of-way limit.

A baseline was established along the centerline, and the centerline was designated 100E (Fig. 226). Surface-strip and excavation areas encompassed the features. The feature areas were sketch-mapped and surface-stripped. A 2 by 2 m area, 49N/122E (southwest corner), encompassed Feature 1. A 4 m north-south by 5 m east-west area, 75N/136E (southwest corner), encompassed Feature 2 and exposed Feature 3 during surface stripping. A 2 by 2 m area, 77N/125E (southwest corner), encompassed Feature 4. Loose topsoil and cobbles were removed from the feature perimeters by shovel and screened. The cobbles

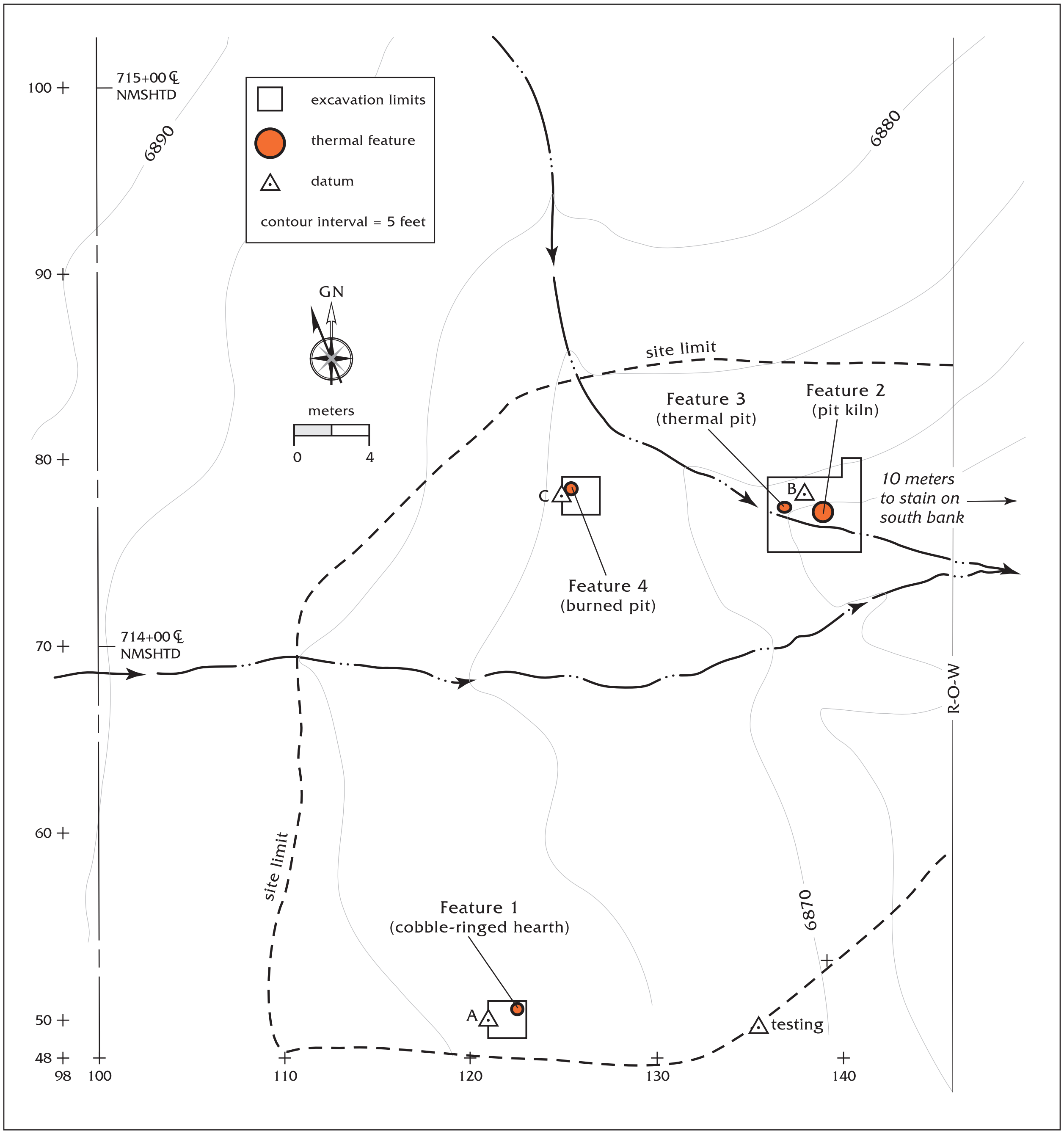


Figure 226. Excavation plan of LA 61299.

and stained soil within the probable feature limits were trowel-excavated and fine-screened (1/8-inch mesh). When the upper limit of the feature(s) were exposed, photographs were taken, and preliminary sketch maps were drawn. Each feature was excavated and recorded.

After the excavation was completed, the site area was mapped and photographed. The erosion channels were inspected for evidence of buried cultural deposits. No upslope cultural deposits were observed in the erosion channels, though a buried Archaic horizon was exposed in an erosion channel outside the right-of-way. The lack of cultural deposits in the upslope erosion channels confirmed the determination made during test excavation. Data recovery was halted after the features were excavated.

Excavation Results

Feature 1 was relocated, and three thermal features that had not been recorded during the test excavation were found (Fig. 226). Feature 2 was recognized as a light charcoal-infused soil stain associated with large, fire-cracked cobbles and a Santa Fe Black-on-white ladle handle fragment on the north side of a shallow erosion channel. Feature 3 was a charcoal-infused soil stain exposed during the removal of the colluvial sandy loam and dense cobble/gravel cobble deposit that capped and surrounded Feature 2. Feature 4 was a charcoal-infused soil stain exposed on the cobble/gravel slope west of the Feature 2 and 3 cluster. Downslope from and 10 m west of the Feature 2 and 3 cluster, within the same erosion channel but outside the right-of-way, was a 15 m long charcoal-infused soil stain. The stain was similar to buried Archaic deposits excavated at LA 61286, LA 61289, and LA 61290. The dimensions of the site were revised to 40 m east-west by 35 m north-south. Other artifact clusters or activity areas were not found on the surface of the site, so excavation focused on the feature areas.

Features

Four features were identified during excavation (Feature 1 had been partly excavated during the test excavation in 1989). Features 2 and 4 were discovered while inspecting the site surface for unrecorded or recently exposed cultural deposits. Feature 3 was revealed during the excavation of Feature 2.

Feature 1 was on the east-facing midslope, isolated from the other features. Excavation revealed an 82 cm long by 72 cm wide by 16 cm deep, circular, cobble-ringed hearth or fire pit (Figs. 227 and 228). Nine medium to large cobbles with maximum dimensions between 16 and 28 cm ringed the fire pit. The fire pit interior was dug into the native sandy loam and had moderately steep walls and a basin-shaped bottom. Thirty-five fire-cracked cobbles and very dark gray to black (10YR 3/1 to 2/1) charcoal-infused sandy loam colluvial deposit filled the pit. The rocks and fire pit walls were moderately hardened and burned. One core was recovered in association with the fire pit. No temporally diagnostic artifacts were recovered, and the feature did not yield sufficient charcoal for C-14 dating. Two flotation samples yielded pinecone scales and pine wood charcoal. It is unusual for a steep-sided thermal feature to have a cobble-ringed construction in the Northwest Santa Fe Relief Route.

Feature 2 was at the junction of the middle and lower slopes. A recent erosion channel cut through and reduced the south feature limit. The feature area was covered by a dense mantle of redeposited Ancha formation cobbles. The cobble mantle appeared to have stabilized the feature against further erosion and channel downcutting.

Removal of the cobble mantle revealed a dark charcoal stain overlaying a cobble layer. Also visible was an angular Santa Fe Black-on-white ladle handle fragment. Excavation revealed a 130 cm long by 105 cm by 12 cm deep cobble-ringed and paved thermal feature containing a misfired Santa Fe Black-on-white ladle (Figs. 229–233). The north or upslope feature perimeter was excavated into native soil and lacked a cobble rim. The downslope feature perimeter was ringed by large (greater than 20 cm maximum dimension) upright cobbles that compensated for the elevation difference. In the center of the feature was the lower one-half of a fractured, tabular cobble embedded in the paved feature floor. The upper half was lying next to it.

The feature floor was paved with tightly packed, small to medium cobbles. The rocks

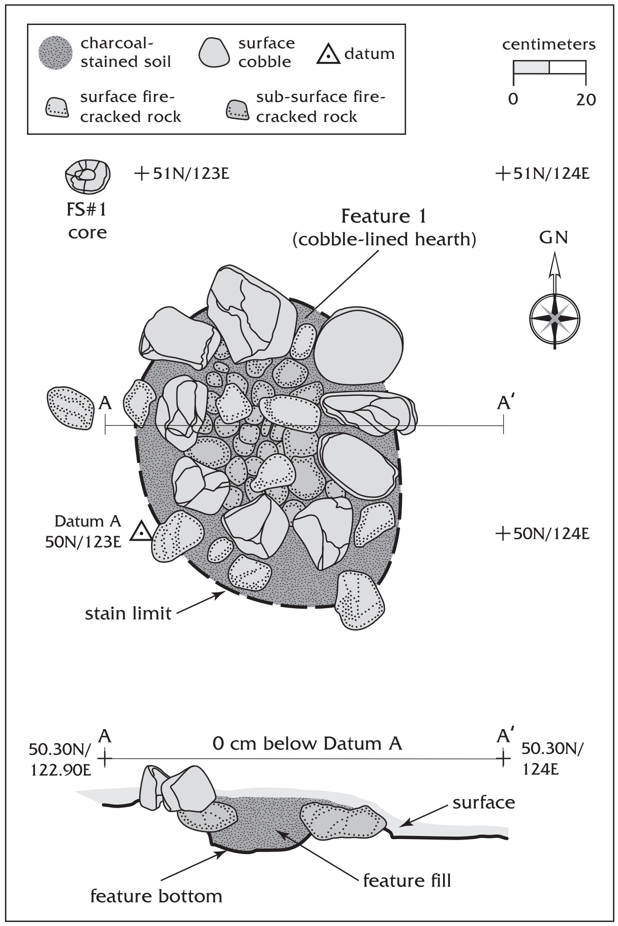


Figure 227. Plan and profile of Feature 1, LA 61299.

Figure 228. Feature 1, LA 61299.

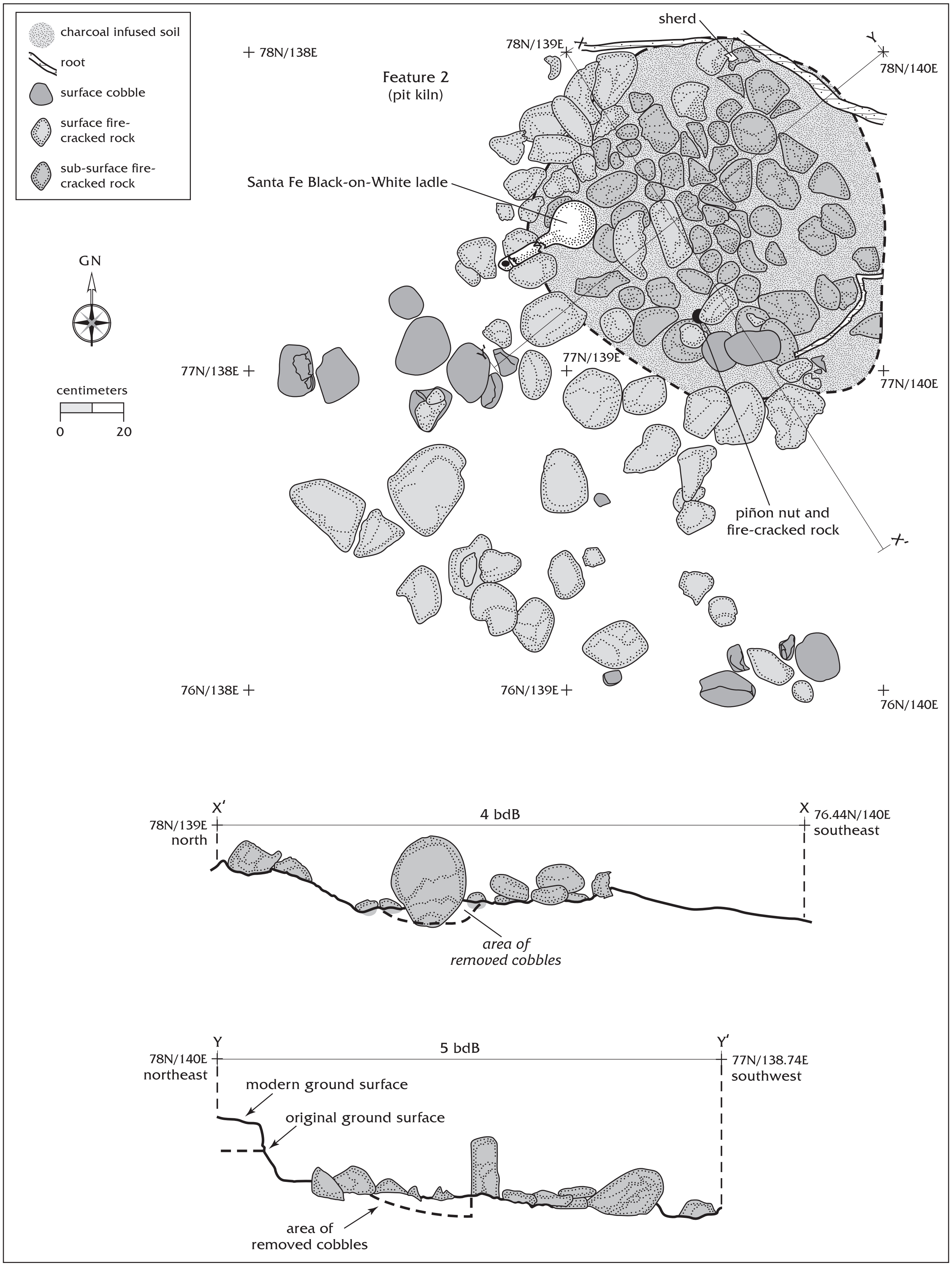


Figure 229. Plan and profile of Feature 2, LA 61299.

Figure 230. Feature 2, LA 61299.

Figure 231. Kiln excavation, Feature 2, LA 61299.

Figure 232. Kiln excavation, Feature 2, LA 61299.

Figure 233. Ladle, Feature 2, LA 61299.

were heavily burned and stained, suggesting that they had been subjected to extreme heat and/or repeated use. There was no evidence of burning or charcoal below the paved feature floor. The Feature 2 cobble pavement was covered by a very dark gray to very dark grayish brown charcoal-infused sandy loam (10YR 3/2–3/1, dry). This layer was 3 to 12 cm thick and contained few charcoal flecks, though the cobble spalls indicated that the feature had been subjected to high heat.

Few artifacts were associated with the feature. The most compelling artifact is the almost complete Santa Fe Black-on-white ladle, which was lying bowl down at the west perimeter. The bowl extended into the feature, and the handle extended to the cobble-ringed edge. The handle was spalled, and the looped end had separated from the handle and fallen next to the ladle. Spalls lay below the juncture of the handle and ladle. The handle/ladle juncture is cracked and spalled on the ladle interior, also. The interior is decorated with carbon paint that is mostly ghosted, and most of the slip and polish has burned off. All of these characteristics suggest that the ladle was misfired. Differences in surface coloration and the ghosted pigment condition argue for a sudden influx of oxygen as a major contributing factor in the misfiring.

Only one other bowl sherd, not from the ladle, was recovered from the upper level of the feature. It may have been missed during an earlier feature cleaning. This feature lacked the spalled sherds and discarded body sherds that accompanied the Northern Rio Grande kilns from the Las Campanas project (Lakatos 1996).

The morphology and content of Feature 2 suggest that it was a reused pottery-firing feature. Physical evidence includes elaborate construction and morphology, the presence of a centrally located, upright, tabular cobble that would have aided fuel placement and created predictable head space between the inverted vessels and the fuel dome, the heavy burning of the cobbles, and the strong evidence that the ladle was misfired. However, Feature 2 differs from the Northern Rio Grande pit kilns and the San Juan Anasazi trench kilns in a number of ways. The Feature 2 floor showed no evidence of burning or charcoal below the cobble pavement. San Juan Anasazi trench kilns and the Northern Rio Grande pit kilns often had a darkly stained ash layer below the slabs or rocks that served as kiln furniture or lining. Missing from the Feature 2 interior were cobbles that would have elevated vessels above the cobble pavement, allowing air to circulate. Numerous fire-cracked cobbles outside the feature may have been furniture that was redeposited by erosion. Also, cobbles laid on their edge and large cobbles embedded in the feature floor may have created high spots or stationary platforms. Feature 2 lacked evidence of a smothering layer such as those that commonly capped the San Juan Anasazi trench kilns. Evidently, erosion had removed this upper layer, which was important for preventing oxidation of the vessel surface and paste. These differences do not override the positive evidence that led us to interpret Feature 2 as a kiln, but they indicate that even within the small Northern Rio Grande pit kiln sample, there is room for structural variation.

Feature 3 was a charcoal-infused soil stain on the old ground surface that was exposed while clearing the perimeter of Feature 2. Excavation revealed a shallow, oval-outlined, basin-shaped pit that was 72 cm long by 46 cm wide by 8 cm deep (Fig. 234). The fill was a charcoal-infused, secondary deposit of black (10YR 2/1, dry) very fine sand. The fill lacked sufficient charcoal for a radiocarbon sample. The temporal or functional association of Feature 3 with Feature 2 could not be confirmed.

Feature 4 was on the southeast-facing hill slope at a slightly higher elevation and 13 m west of the Feature 2 and 3 cluster. It was exposed as a charcoal-infused soil stain on a deflated old ground surface that was covered by a dense cobble and gravel deposit. Excavation revealed a shallow, circular, basin-shaped pit, 64 cm in diameter and 8 cm deep (Fig. 235). The feature may have been ringed by rocks that were part of the original slope matrix but were left in place during the construction of the feature. The fill was a charcoal-infused secondary deposit of very dark grayish brown (10YR 3/2, dry) fine sandy loam. The feature interior was lightly burned, but the upper portion had been reduced by erosion or deflation. The age of the feature could not be determined.

The four thermal features display dissimilar structure and morphology, and probably reflect unrelated and sequential site occupation. Features 3 and 4 are shallow, unmodified

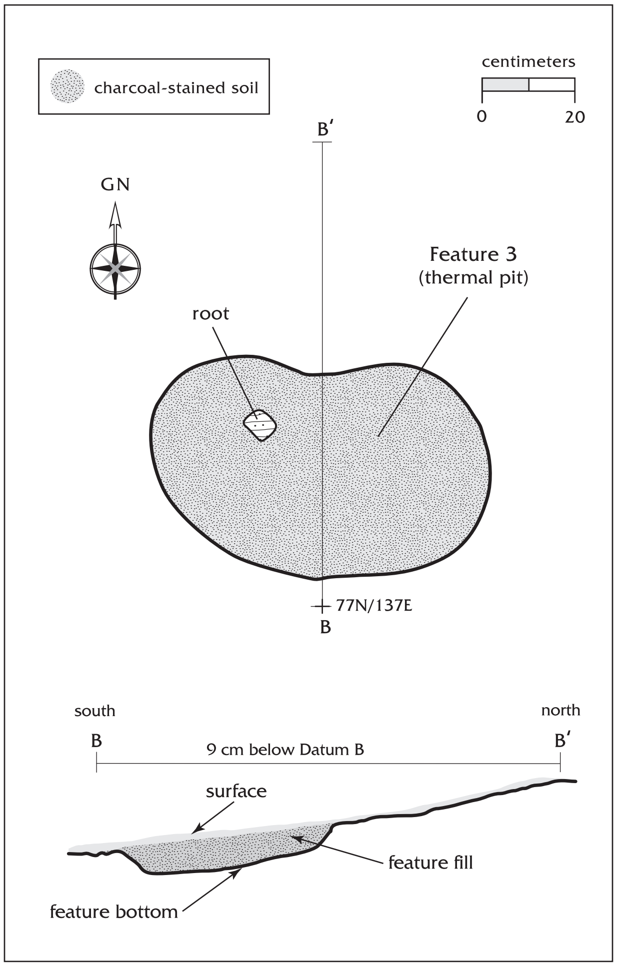


Figure 234. Plan and profile of Feature 3, LA 61299.

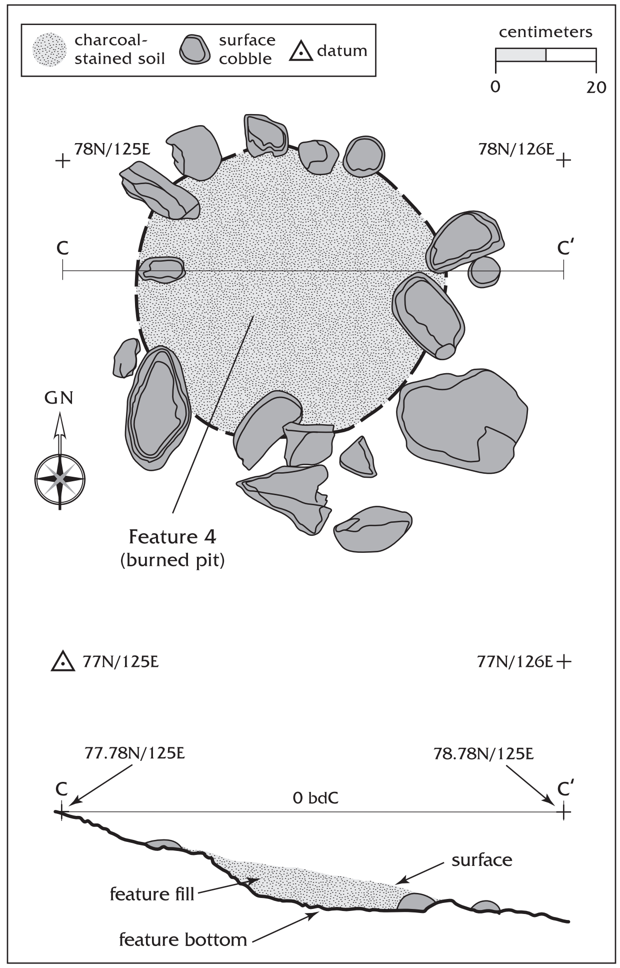


Figure 235. Plan and profile of Feature 4, LA 61299.

basins that contained a colluvial deposit stained by disintegrated charcoal. Their simple and expedient construction reflect one overnight stay. Feature 1 is more formal, since large cobbles ring the perimeter of the pit. It looks like a typical campfire, but the center was excavated into the ground, forming a catchment for coal and ash. Feature 2 is a pottery-firing feature indicative of specialized activity. The cobble pavement and upright central cobble are specifically built to retain radiant heat and allow the height of the fuel dome to be closely controlled. These features are typical of the land-use pattern in the piedmont that was maintained over 7,000 years of human occupation.

Artifacts

Artifacts were recovered from the three excavation areas. The Feature 1 area yielded one lithic core of local chert. Features 2 and 3 area yielded six pieces of core-reduction debris. The Santa Fe Black-on-white ladle, a Santa Fe Black-on-white bowl sherd, and a core flake were recovered from Feature 2. The Feature 4 area yielded one core flake of local quartzite. The ceramic artifacts are described in a separate chapter of this report.

Chipped stone. Eleven chipped stone artifacts weighing a total of 1.38 kg were recovered from LA 61299. With the exception of one core, this assemblage is comprised of core flakes and angular debris (Table 76). These artifacts reflect limited raw-material procurement and core reduction.

The assemblage is dominated by locally available materials. Chert and metaquartzite are among the typical constituents of the Santa Fe group gravel deposits. Madera chert also occurs in these deposits as residual cobbles and pebbles eroded from an earlier Pennsylvanian

Table 76. Chipped stone artifact type by material type, LA 61299

Number Row % Column %	Chert	Madera Chert, Red and Mottled Red	Obsidian	Metaquartzite	Total
Angular debris	1	-	1	-	2
	50.0%	-	50.0%	-	100.0%
	25.0%	-	100.0%	-	18.2%
Core flake	3	4	-	1	8
	37.5%	50.0%	-	12.5%	100.0%
	75.0%	100.0%	-	50.0%	72.7%
Multidirectional core	-	-	-	1	1
	-	-	-	100.0%	100.0%
	-	-	-	-	9.1%
Total	4	4	1	2	11
	36.4%	36.4%	9.1%	9.1%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%

age limestone bedding in the Sangre de Cristo foothills. Nonlocal materials such as obsidian are found in the axial gravels of the Rio Grande. However, the primary sources of this material lie in the Jemez Mountains. A small amount of obsidian can also be found scattered across Caja del Rio Mesa (Kelley 1980:11–17).

With the exception of obsidian, which has a glassy quality, material quality is fine or medium grained. A substantial proportion (36.4 percent) of the material contains flaws, mainly in the form of cracks.

Debitage: Eight core flakes and two pieces of angular debris may reflect early- to middle-stage core reduction based upon the following observations on flake attributes (Table 77). The majority of the core flakes (5) are whole. The remaining three are either proximal or lateral fragments. Five flakes have cortical or single-facet platforms. Of those remaining, two have collapsed platforms, and one platform is absent. Two flakes have 10–50 percent dorsal cortex, two have 60–100 percent cortex, and four are noncortical. All cortex is waterworn. Two flakes have 0–1 dorsal scar, five have 2–3 scars, and one has 7 scars. No biface flakes, which are indicative of formal tool production, or tool maintenance debitage was recovered. None of the debitage appears to be thermally altered.

Table 77. Debitage mean whole measurements, LA 61299

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Number	5	7	6	6	6
Mean	8.4	39.4	38.3	15.2	60
SD	4.9	27.7	29.2	11	125.6
Minimum	3	18	17	7	1.5
Maximum	16.4	97	96	37	315.8

Cores: FS1 is a fine-grained, metaquartzite multidirectional core. Seven of eleven negative scars are complete; the others are obscured by later flake removal. The core retains 50 percent waterworn cortex and was discarded prior to exhaustion. No flakes or other debris of the same parent material was recovered by excavation. Multidirectional cores of a locally abundant material which lack formal core platform preparation suggest an expedient core-reduction strategy. Maximum linear measurements are 113 mm long by 102 mm wide by 72 mm thick. The core weighs 949.5 g.

Informal tool: FS 11 was recovered from Feature 2 fill. It is a fine-grained, red Madera chert core flake which was utilized along one lateral margin and its snap-fractured distal termination. The distal edge outline is sinuous and exhibits small nibbling scars across the slightly convex portion of the snapped surface resulting from unidirectional wear. Wear is discontinuous, and the maximum linear measurement is 11 mm. In this analysis, wear scars are defined as measuring up to 2 mm., whereas retouch scars measure more than 2 mm. The lateral edge is slightly concave and shows unidirectional wear scarring across the dorsal surface. The utilized edge measures 10 mm, and wear is continuous. Edge angles measure 75 and 35 degrees, respectively. Wear patterns and edge angles are consistent with unidirectional scraping use. The steeper edge angle could have accommodated heavy-duty use, but its wear pattern is not indicative of this and points to a short use-life. This informal tool lacks hafting modification. It measures 22 mm long by 25 mm wide by 6 mm thick and weighs 3.1 g.

Comparison of testing- and excavation-phase assemblages. In addition to the assemblage described above, the testing phase yielded 70 chipped stone artifacts (Wolfman et al. 1989:122–143). The following discussion addresses assemblage level and artifact-level attributes for comparison. These attributes are limited to those considered in the testing phase.

During the excavation phase, the material type distribution was slightly expanded by the inclusion of one piece of obsidian angular debris. In the testing phase, Madera chert was not distinguished from other chert. In both assemblages, chert (including Madera chert) is the predominant type. With the exception of the single piece of obsidian recovered during the excavation phase, all materials are locally available.

During the excavation phase, the artifact type distribution was slightly expanded by the inclusion of one multidirectional core. In both assemblages, core-reduction flakes predominate. A total of 59 core flakes were recovered during the testing phase.

There are considerable differences in the testing- and excavation-phase core flake dorsal cortex distributions. In the testing phase, there is a larger proportion of core flakes that retain 10–50 percent dorsal cortex (19.1 percent more) and a smaller proportion that lack dorsal cortex (19.5 percent less). Within the 60–100 percent dorsal cortex class, the assemblages show similar proportions. The difference does not exceed 1 percent. The noncortical to cortical core flake ratios are 1:2.3 and 1:1 for the testing and excavation-phase assemblages, respectively. In the testing-phase assemblage, cortical core flakes are more than twice as frequent than noncortical core flakes.

The assemblages have comparable core flake mean whole length, width, and thickness. No difference exceeds 4 mm. Mean weight is greater (34.8 g more) in the excavation-phase assemblage. The standard deviations are dissimilar. The excavation-phase standard deviations are consistently larger (15.0, 17.8, and 6.9 mm for length, width, thickness, respectively, and 62.1 g for weight).

The most obvious difference is in the noncortical to cortical core flake ratios. This may reflect the recovery of a larger proportion of middle- to late-stage core-reduction debris in the excavation phase.

Site Summary

LA 61299 was a surface artifact scatter with a feature identified by test excavation and confirmed by excavation and three additional features that were identified during data recovery. Repeated occupations are indicated by the four thermal features. The Santa Fe Black-on-white pottery recovered from Feature 2 indicates a Coalition or Early Classic period occupation. Features 1, 3, and 4 could not be dated but reflect the highly transient and sporadic use of the piedmont hills and Santa Fe River tributaries. Feature 2 is probably a pottery-firing feature, reinforcing the interpretation that Ancestral Pueblo pottery production was integrated into seasonal foraging and firing did not always occur near the village. Clearly, foraging and resource procurement regularly extended outside a conservative 2 km radius from the Santa Fe River villages. Ancestral Pueblo foraging was land extensive and incorporated all of the productive zones of the piedmont hills and tributaries. LA 61299 and other small sites continue to provide informative and compelling perspective on Ancestral Pueblo foraging and land use.

LA 61302

LA 61302 was between centerline stations 701+50 and 703+50 on both sides of the centerline. The data recovery effort focused on the hill slope and swales to the west of the centerline. The historic period component, which was not included in the data recovery effort, was primarily to the east of the centerline. LA 61302 was test excavated in 1988 (Wolfman et al. 1989:57–59).

The site occurred on the east-southeast-facing ridge slope above and at the head of a swale that is cut by three modern erosion channels that join into one drainage 5 m east of the centerline. This drainage is a second-order tributary of the Arroyo Gallinas, which is 450 m to the southeast. The swale is bounded on the south and north by finger ridges that separate second-order drainage basins and are typical of the dissected ridge that defines the Arroyo Gallinas and Arroyo de los Frijoles drainage basins. The soil association is Pojoaque Rough Broken Land. Excavation exposed the upper soil level, which was an A1 light reddish-brown, sandy clay loam with 5 to 10 percent rounded igneous or metamorphic gravel. Excavation reached the top of the C1ca layer, similar to A1 except that it has 25 percent gravel and numerous blotches and disseminations of lime (Folks 1975:43). Erosion-channel formation is aided by the sparse ground cover and the loose structure of the Pojoaque Rough Broken Land association. Vegetative cover was sparse to moderate, with grasses, prickly pear, narrowleaf yucca, and a sparse to moderately dense overstory of piñon and juniper.

Preexcavation Description

The site measured 140 m northwest-southeast by 50 m northeast-southwest. This site contained a prehistoric component and a historic component. The historic component was described in the testing report and was not treated further (Wolfman et al. 1989:57–59). The prehistoric component consisted of a hearth (Feature 1) and two lithic concentrations, which were the focus of the data recovery effort.

Feature 1 was exposed in a 10 cm deep test pit. The feature appeared diffuse and deflated on the surface but had intact structure and a cultural deposit. It appeared to be 50 cm long by 45 cm wide, and its depth was undetermined.

Debitage at the site consisted of 102 artifacts. Also found were five cores and one tool preform. The predominant material type was chert. Smaller amounts of quartzite, obsidian, silicified wood, and quartz occur. None of the whole manufacturing flakes had cortex, and, in general, the amount of cortex on the flakes suggested that secondary stages of reduction were performed at the site. Prehistoric use of the site was mainly for the procurement and expedient reduction of locally available lithic materials.

Excavation Methods

The Feature 1 area was relocated at the west edge of the right-of-way. Also, two chipped stone concentrations were found on the east-facing ridge slope to the south. Data recovery focused on the Feature 1 area and the two chipped stone clusters.

A baseline was established on the centerline, which was designated 100E (Fig. 236). Surface-strip and excavation areas were set up, encompassing the feature area and the central portions of the artifact concentrations.

A 4 m north-south by 6 m east-west area encompassed Feature 1, which was sketch-mapped. Surface stripping removed the loose topsoil and abundant cobbles. Four chipped stone and three possible ground stone artifacts were recovered. The cobbles and stain within the probable feature limits were trowel-excavated and fine-screened (1/8-inch mesh). When the upper limit of the feature(s) were exposed, photographs were taken, and preliminary sketch maps were drawn. In the course of defining the feature, we determined that there were actually three features (Features 1–3). Each feature was excavated and recorded. In the case of Feature 1, which had multiple layers of burned and fire-

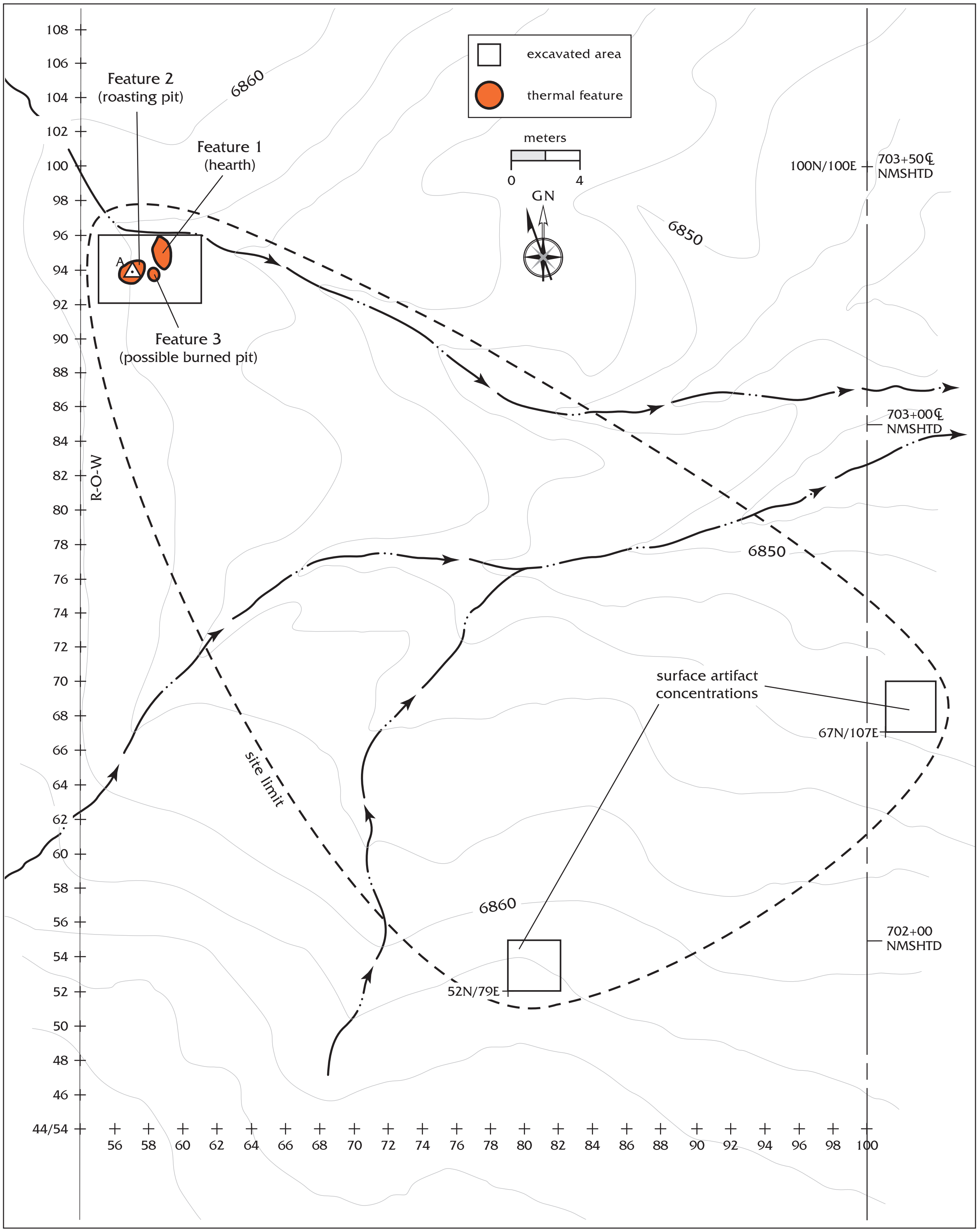


Figure 236. Excavation plan, LA 61302.

cracked rocks, each layer was exposed, mapped, photographed, and removed, until the feature interior was exposed.

Before surface stripping in the artifact concentrations, all the surface artifacts were described. A 3 by 3 m area was surface-stripped below the level of the dense cobble deposit within each cluster. The southwest corners of the excavation areas were 67N/101E and 52N/79E. Few subsurface artifacts and no other evidence of a buried cultural deposit were encountered, so excavation was halted in these areas. These clusters were typical surface artifact concentrations that comprised the majority of the cultural materials recovered during the testing project in 1988.

Excavation Results

Excavation of the Feature 1 area exposed the remains of three thermal features. Two chipped stone concentrations not identified during the testing project were found. The Feature 1 area was at the west edge of the right-of-way, near the head of the main drainage channel that bisected the site (Fig. 237). This lower slope area was heavily deflated and eroded, and the charcoal-infused soil from the feature concentration was exposed on the surface and in the shallow erosion channels. The loose deflated sandy loam was mixed with a dense cobble/gravel deposit and scattered fire-cracked rock from the thermal features. Excavation revealed Feature 1, a deflated, fire-cracked rock filled pit; Feature 2, a fire-cracked rock filled roasting pit, and Feature 3, an undifferentiated burned pit. These features were associated with three pieces of chipped stone and two ground stone artifacts. One utility ware sherd was recovered from Feature 1.

We looked for differences in the surface and subsurface artifact frequency and density during excavation of two 3 by 3 m areas within the midslope to upslope chipped stone concentrations. At both 67N/101E and 52N/79E, the surface was a dense pavement of cobbles and gravel mixed with colluvial sandy loam. Removal of 10 to 15 cm of topsoil revealed that the artifacts were primarily restricted to the surface and that a denser or more complex assemblage was not masked by the cobble matrix. From 67N/101E, 14 artifacts were collected from the surface, and 3 artifacts were recovered from surface strip. From

Figure 237. Surface-stripped area around Feature 1, LA 61302.

52N/79E, 3 artifacts were surface collected, and 1 artifact was recovered from surface strip.

Our excavation did not change the site limits defined during the testing. Instead, two additional features were identified, and more information on surface artifacts was retrieved. Based on the excavation, it is clear that the cultural deposit is shallow. Deeper excavation was not proposed in the data recovery plan and was not deemed necessary based on the excavation results and field observations.

Features

Three features were identified. Feature 1 had been partly excavated during the test excavation in 1989. Features 2 and 3 were discovered while clearing the cobbles and topsoil from the perimeter of Feature 1.

The excavation of Feature 1 revealed a deflated, fire-cracked rock filled thermal feature. The limits of the deflated pit were based on the fire-cracked rock distribution and associated darkly stained fill. The estimated feature limits were 120 cm long by 90 cm wide by 4 to 8 cm deep (Fig. 238). The feature fill was a very dark brown to black (10YR 3/2–2/0, dry) loose sandy loam with abundant water-deposited pea-sized gravel. Within the feature limits, 90 cobbles and fire-cracked rock were suspended in the primary/secondary charcoal deposit. Their position in the fill suggests that they formed a platform on a hot or ashy bed of coals. Cobbles ranged in size from 10 to 18 cm in maximum dimension. Fifteen to 20 cobbles were intact, and the remaining rocks were fragments of fire-altered cobbles. The amount of fire-cracked rock suggests reuse or repeated use of the feature. One corrugated utility ware sherd and a core flake were recovered from the feature.

Feature 2 excavation revealed a large basin-shaped pit filled with three layers of cobbles that formed a roasting platform on top of a bed of coals. Fire-cracked rock, darkly stained fill, and remnant feature outlines were used to estimate feature dimensions at 154 cm long by 84 cm wide by 16 cm deep (Figs. 239–240). The feature has an irregular outline, and the feature floor was irregular and unprepared. The upslope or south edge of the feature was relatively intact. The feature fill was a mixed primary and secondary deposit of very dark brown to black (10YR 3/2 to

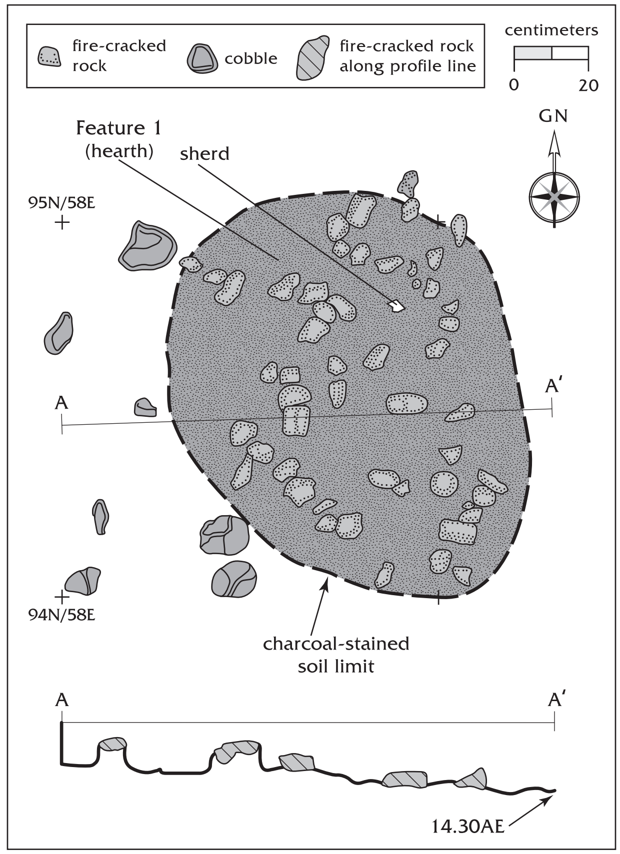


Figure 238. Excavation plan and profile, Feature 1, LA 61302.

2/1) coarse sandy loam, with 2 to 8 percent pea gravel with occasional charcoal flecks. The fill encased the cobble layers, and the lowest cobble layer was intensely burned and fire-cracked. The small to medium cobbles (10 to 20 cm, maximum dimension) numbered 207 within the feature and 48 on the feature perimeter. Cobbles outside the feature may remain from feature cleanout, or they may have been stockpiled. The majority of the cobbles were igneous, metamorphic, quartzite, or indurated sandstone of the Ancha formation. The intense burning of the lower cobbles and the abundant fire-cracked rock emanating from the feature suggest multiple use episodes. One piñon nut shell was recovered, suggesting a fall occupation.

Feature 3 was initially recognized as a charcoal-infused soil stain on the old ground surface, exposed while clearing the perimeter of Feature 1. Excavation revealed a shallow, oval-outlined, steep-walled, basin-shaped pit that was 40 cm long by 26 cm wide by 10 cm deep (Fig. 241). The feature interior shows no evidence

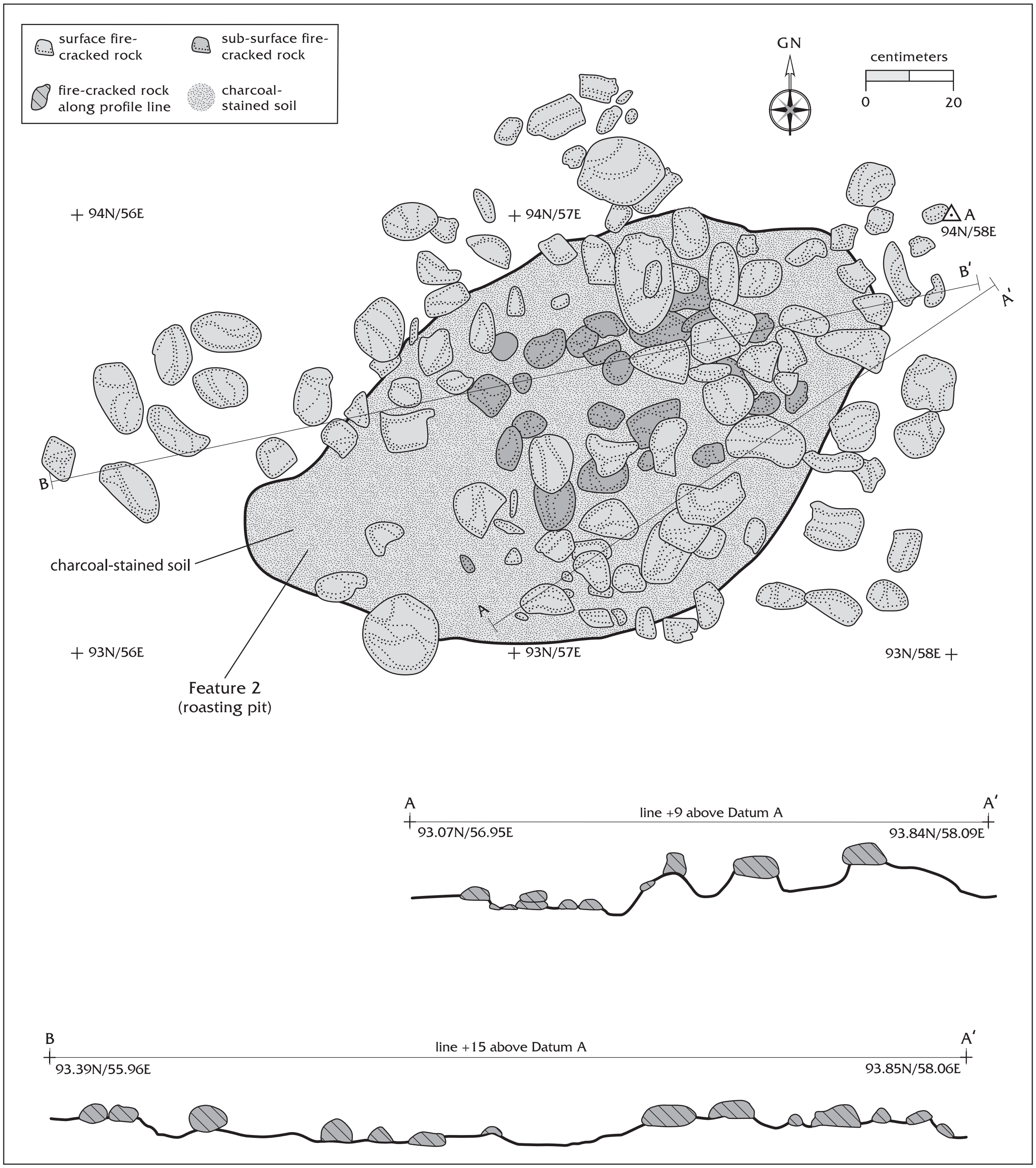


Figure 239. Plan and profile of Feature 2, LA 61302.

Figure 240. Features 1–3, LA 61302.

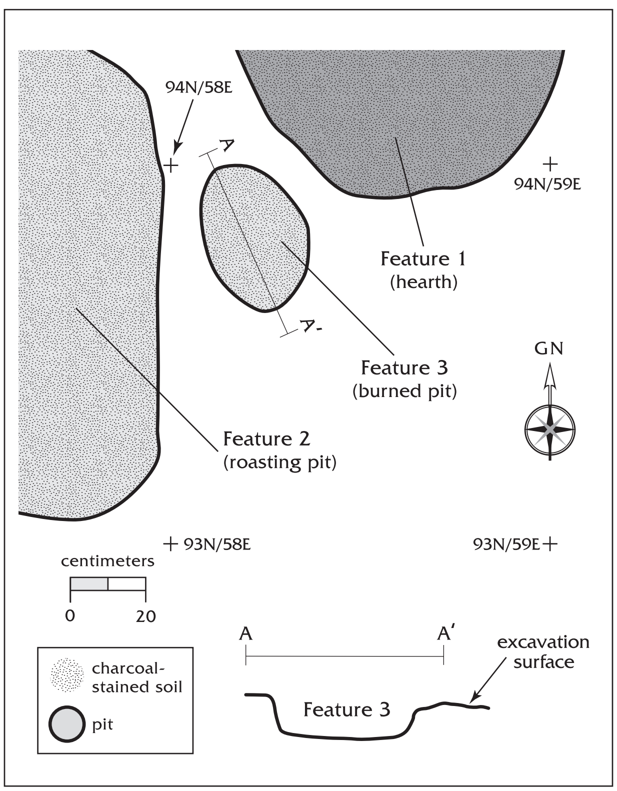


Figure 241. Plan and profile of Feature 3, LA 61302.

of burning, suggesting it was lightly used, or embers from Feature 1 or 2 were transferred into Feature 3. The fill was a very dark brown (10YR 3/2, dry) sandy loam secondary deposit that was charcoal-infused but lacked sufficient charcoal for a radiocarbon sample. Two flotation samples yielded no charred economic plan remains.

The features are surrounded on all but the south-southeast side, by gentle to moderate hill slopes that would have afforded protection from the wind. The south-southeast exposure was optimal for early morning and afternoon sun. In the summer it was hot. During the fall or late fall, the location would have been warmed but not baked by the sun. Features 1 and 2 may have been repeatedly used as indicated by the quantity and condition of the fire-cracked rock. The single utility sherd suggests that the features were used during the Coalition period.

Artifacts

Artifacts were recovered from three excavation areas. The Feature 1–3 area yielded three core flakes, two possible ground stone artifacts, and one corrugated utility jar sherd. This small assemblage suggests that piñon nut processing was the primary feature function.

Chipped stone. A total of 31 chipped stone artifacts weighing 0.68 kg were recovered from LA 61302. This assemblage is comprised of core flakes and angular debris (Table 78). These artifacts reflect core reduction.

The assemblage is comprised of locally available materials. Chert and metaquartzite are among the typical constituents of the Santa Fe group gravel deposits. The Madera chert also occurs in these deposits as residual cobbles and pebbles eroded from an earlier Pennsylvanian age limestone bedding in the Sangre de Cristo foothills. A substantial proportion (35.5 percent) of the material contains flaws, mainly in the form of cracks.

Debitage: Debitage consists of 21 core flakes and 10 pieces of angular debris. No biface flakes, which are indicative of formal tool production, or tool maintenance debitage were recovered. No debitage exhibits signs of thermal alteration. Flake attributes demonstrate early- to middle-stage core reduction.

A substantial proportion (47.6 percent) of the core flakes have cortical or single-facet platforms, which suggests early-stage reduction. Collapsed and absent platforms are represented by proportions of 28.6 percent and 23.8 percent, respectively (Table 79).

The noncortical to cortical core flake ratio is 1:2.5, indicating a predominance of cortical core flakes, which occur in the early to middle stages of core reduction. Dorsal cortex frequencies are relatively evenly distributed among noncortical (6, 28.6 percent), 100 percent (5, 23.8 percent), 10–50 percent (6, 28.6 percent), and 60–100 percent (4, 19.1 percent). Of ten pieces of angular debris, three are noncortical, five have 10–50 percent cortex, and two have over 50 percent cortex. All cortex is waterworn. Core flakes having 0–1 dorsal scars are represented by a proportion of 57.1 percent, and flakes having 2–3 scars are represented by a proportion of 42.9 percent.

The whole-to-fragmentary core flake ratio is 1:1.2. Frequently occurring fragments include distal and proximal portions, equally representing 19 percent of the core flakes.

Debitage recorded in the field: The debitage recorded in the field also appears to reflect early- to middle-stage core reduction, based on flake attributes. No biface flakes or tool maintenance debitage was recorded. None of this debitage shows thermal alteration.

The noncortical to cortical core flake ratio is 1:2.7, indicating a predominance of cortical flakes, which occur in the early to middle stages of core reduction. The majority of core flakes (43.1 percent) retains 10–50 percent dorsal cortex, while 20 percent retains 60–100 percent. Compared to the excavation assemblage, a similar percentage of core flakes (36.9 percent) lack cortex. Angular debris cortex frequencies are evenly distributed (33.3 percent) among those lacking cortex and those retaining 10–50 percent and 60–100 percent cortex. The majority of core flakes (66.2 percent) display 0–2 dorsal scars, and a smaller proportion (33.8 percent) display 3–5 dorsal scars.

The majority of core flakes (64.6 percent) have single-facet or cortical platforms. A substantial proportion of core flakes (32.3 percent) exhibit platform breakage, including absent and collapsed platforms. The remaining 3.1 percent of core flakes have multifaceted platforms. Whole flakes account for 67.7 percent of the core flakes, 29.2 percent are distal portions, and 3.1 percent are proximal portions (Table 80).

Cores recorded in the field: With the exception of a unidirectional core, which is a fine-grained undifferentiated chert, all cores are a fine-grained Madera chert. A tested cobble exhibits one negative flake scar and 80 percent cortex. It measures 50 mm long by 38 mm wide by 15 mm thick. A unidirectional core displays three negative flake scars and 10 percent cortex. It measures 92 mm long by 46 mm wide by 33 mm thick. The remaining cores are multidirectional. FS 8 displays four scars and 40 percent cortex, and measures 34 mm long by 22 mm wide by 10 mm thick. FS 47 shows six scars and 30 percent cortex, and measures 48 mm long by 40 mm wide by 17 mm thick. FS 76 exhibits four scars and 60 percent cortex, and measures 68 mm long by 42 mm wide by 33 mm thick.

Informal tools recorded in the field: Two fine-grained Madera chert core flakes are whole and have single-facet platforms. FS 18 has two dorsal scars and measures 30 mm long by 26 mm wide by 7 mm thick. The edge angle measures 40 degrees, and it displays unidirectional wear. FS 19 has four dorsal scars and measures 27 mm long by 25 mm wide by 9 mm thick. Edge angle

Table 78. Chipped stone artifact type by material type, LA 61302

Number Row % Column %	Chert	Madera Chert, Yellow/Red Mottled	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Metaquartzite	Total
Angular debris	1	3	4	1	1	10
	10.0%	0.3	40.0%	10.0%	10.0%	100.0%
	50.0%	33.3%	30.8%	20.0%	50.0%	32.3%
Core flake	1	6	9	4	1	21
	4.8%	28.6%	42.9%	19.0%	4.8%	100.0%
	50.0%	66.7%	69.2%	80.0%	50.0%	67.7%
Total	2	9	13	5	2	31
	6.5%	29.0%	41.9%	16.1%	6.5%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 79. Debitage mean whole measurements, LA 61302

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Number	10	11	14	14	10
Mean	6.5	33.2	31.6	10.2	14.2
SD	2.6	13.5	12.2	4.7	12
Minimum	4	12	17	4	1
Maximu	12	61	58	22	41.1

Table 80. Field-recorded chipped stone artifact type by material type, LA 61302

Number Row % Column %	Chert	Madera Chert	Chalcedony	Silicified Wood	Orthoquartzite	Total
Angular debris	3	6	-	-	-	9
	33.3%	66.7%	-	-	-	100.0%
	18.8%	10.3%	-	-	-	11.4%
Core flake	12	48	2	1	2	65
	18.5%	73.8%	3.1%	1.5%	3.1%	100.0%
	75.0%	82.8%	100.0%	100.0%	100.0%	82.3%
Tested cobble	-	1	-	-	-	1
	-	100.0%	-	-	-	100.0%
	-	1.7%	-	-	-	1.3%
Unidirectional core	1	-	-	-	-	1
	100.0%	-	-	-	-	100.0%
	6.3%	-	-	-	-	1.3%
Multidirectional core	-	3	-	-	-	3
	-	100.0%	-	-	-	100.0%
	-	5.2%	-	-	-	3.8%
Total	16	58	2	1	2	79
	20.3%	73.4%	2.5%	1.3%	2.5%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

and wear pattern were not recorded.

Comparison of the testing- and excavation-phase assemblages. In addition to the assemblages described above, the testing phase yielded 108 chipped stone artifacts (Wolfman et al. 1989:122–143). The following addresses assemblage-level and artifact-level attributes, limited to those considered in the testing phase. The testing-phase assemblage is compared to the excavation-phase assemblage analyzed in the laboratory.

Greater diversity is exhibited in the artifact type and material type distributions of the testing-phase assemblage. This assemblage shows limited biface production in the form of one obsidian biface flake. In addition, this assemblage contains five chert undifferentiated cores and one chert preform. No such artifact types were recovered during the excavation phase. In both assemblages, core flakes are the predominant artifact type. A total of 88 core flakes were recovered during the testing phase. Materials lacking from the excavation-phase assemblage include obsidian, silicified wood, and quartz. In the testing-phase assemblage, Madera chert was lumped with the chert. In both assemblages, chert (including Madera chert) is the predominant material type.

The assemblages differ in respect to core flake dorsal cortex distributions. In the testing-phase assemblage, a larger proportion of core flakes lack dorsal cortex (10 percent more), a larger proportion that retain 10–50 percent cortex (5.5 percent more), and a smaller proportion that retain 60–100 percent cortex (15.6 percent less). The noncortical to cortical core flake ratios are 1:1.6 and 1:2.5 for the testing and excavation-phase assemblages, respectively. In the excavation-phase assemblage, cortical core flakes are more than 1.5 times more frequent than noncortical core flakes.

In the testing-phase assemblage, the mean dimensions of whole core flakes are consistently larger. Testing-phase core flake mean length (43.3 mm), width (37.0 mm), and thickness (12.5 mm) have standard deviations that are comparable to those calculated for the excavation phase. No difference exceeds 4 mm. The testing-phase core flake mean weight (25.2 g) has a greater standard deviation (15.3 mm more) than that of the excavation phase.

Differences are obvious in all the attributes examined. The greater diversity of the testing-phase artifact and material type distributions was not unexpected, since more artifacts were recovered during this phase. The difference in the noncortical to cortical core flake ratios suggests that a larger proportion of early- to middle-stage core-reduction debris was recovered in the excavation phase. This notion is not necessarily supported by the mean size differences.

Site Summary

LA 61302 was a surface artifact scatter with a feature identified during testing and confirmed during excavation. Repeated occupations are indicated by the three thermal features and the artifact concentrations on the midslope to upslope areas. The one corrugated jar sherd suggests a Coalition or Early Classic period occupation. The artifact scatter on the hill slopes above Arroyo Gallinas reflects the expedient or daily foraging pattern that would have been employed by Santa Fe River village residents. The contents of Feature 2 suggest that a major activity at LA 61302 was piñon nut gathering and processing. This is important direct evidence supporting the hypothesis that many of the relief route sites represent foraging camps occupied for a short time and situated to exploit the plant resources of Arroyo Gallinas and its major side drainages.

LA 67959

LA 67959 was between centerline stations 627+00 and 630+00 on both sides of the centerline. Excavation focused on the features exposed in the erosion channels and the deeply buried cultural deposit exposed in the west bank of a tributary of Arroyo de las Trampas. LA 67959 was not test excavated in 1988 because the permission of the landowner could not be obtained. It was originally described in Wolfman et al. (1989:118–119).

The site was at an elevation of 2,037 m (6,680 ft) on a gentle, south-southeast-facing slope of a low, broad ridge that divides the Arroyo de las Trampas and the Arroyo de los Frijoles drainage basins. The site was bisected by a deeply incised tributary arroyo that drains into the west Arroyo de las Trampas floodplain. Numerous recent erosion channels cut through the site and drain into the tributary arroyo. Exposed on the site surface was a dense deposit of Ancha formation gravel. The subsoil was the deep alluvium of the Pojoaque-Panky Rolling association (Folks 1975:43). The topsoil is a fine sandy loam A1 horizon, which contains the majority of the artifacts. Up to 2 m of the C1ca horizon overlies tilted exposures of the Tesuque formation. A cultural deposit (Feature 3) occurred at the same level as the Tesuque formation outcrop, indicating that the outcrop was exposed when the cultural deposit was formed. This co-occurrence of deeply buried cultural deposits and Tesuque sandstone exposures suggests that the topography of the Plains surface piedmont has changed over the last 3,000 years. It appears that the local topography exhibited areas of intermittent, low sandstone breaks that were incorporated into camp locations, creating natural shelters. Vegetative cover consists of sparse grasses, prickly pear, narrowleaf yucca, and a sparse to moderately dense overstory of piñon and juniper.

Preexcavation Description

The site covered a 20 m north-south by 50 m east-west area across the hill slope. One feature consisted of a concentration of cobbles in a rough circle 60 cm in diameter that may have been the deflated remains of a hearth. The lithic artifact scatter contained primary and secondary lithic debris. An obsidian projectile point, possibly dating to the Latest Archaic period, was found on the surface and left on site during the survey. Because the composition of the lithic artifact assemblage was not evaluated, site activities and lithic reduction were not interpreted, but the hearth indicated use of the site as a temporary campsite.

Excavation Methods

The excavation focused on redefining the site limits and locating the thermal features. Reexamination of the site revealed a light artifact scatter, two near-surface thermal features, and a deeply buried cultural deposit. A baseline was established along the centerline, and the centerline was designated 100E (Fig. 242). Surface-strip and excavation areas were set up encompassing the feature areas. Surface artifacts were pinflagged, point provenienced, and collected.

The feature areas were sketch-mapped and surface-stripped. A 4 by 2 m area, 118N/150E (southwest corner), encompassed Feature 1. A 3 m north-south by 4 m east-west area, 138N/118E (southwest corner), encompassed Feature 2 at the edge of the arroyo bank. Loose topsoil and cobbles were removed from the feature perimeters by shovel and screened.

The Feature 3–6 area, which was deeply buried and exposed in the west arroyo bank, was uncovered within a 3 by 3 m area excavated into the arroyo bank. The upper 140 cm of natural fill was removed without screening because the bank exhibited no cultural deposits in the upper levels. The lower 40 cm of mixed high- and low-energy colluvial deposit were hand-excavated in 10 cm levels and screened through 1/8-inch mesh to recover small flakes associated with the exposed hearths. The features were exposed in the lower

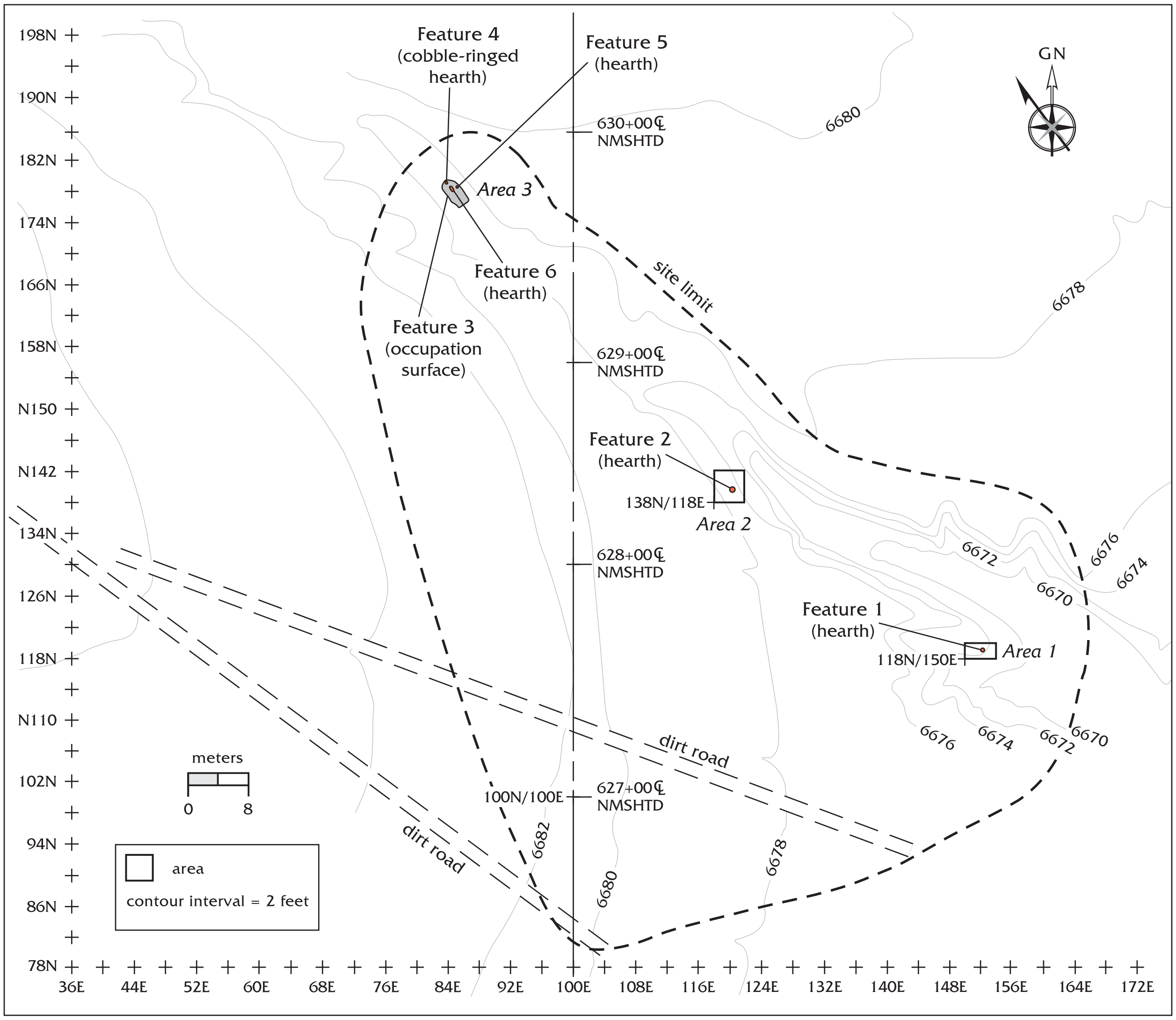


Figure 242. Excavation plan of LA 67959.

10 to 15 cm of the cultural deposit. Features 4 and 5 were exposed on the old ground surface (Feature 3), and Feature 6 was identified in cross section where excavation extended beyond the old ground surface.

The west wall of the excavation area revealed seven strata, including the cultural deposit. Pollen samples were collected from each stratum, and two samples were collected from the 50 cm thick Stratum 3.

After the excavation was completed, the site area was mapped and photographed. The erosion channels were inspected for additional evidence of buried cultural deposits. None were found, and excavation was halted.

Excavation Results

Reexamination and excavation of LA 67959 failed to relocate the cobble-ring feature identified in 1988 (Wolfman et al. 1989:118) or the obsidian projectile point that was placed beneath one of the hundreds of cobbles that occurred on the surface. Two near-surface thermal features and the deeply buried Feature 3–6 cultural deposits were found. Site limits were expanded based on the surface artifacts and feature distribution to 100 m north-south by 90 m east-west (Fig. 242).

Excavation of the 4 by 2 m Feature 1 area revealed a heavily deflated charcoal-infused soil stain that appeared to be the remains of a thermal feature. It was on a moderately steep slope that was cut by two recent erosion channels. No artifacts were recovered, and the cultural deposit had no depth below the modern topsoil.

Excavation of the 3 by 4 m Feature 2 area revealed a deflated and eroded hearth remnant. Surface stripping yielded no artifacts, and the cultural deposit had no depth below the modern topsoil. This area was partly removed by side-cutting of the main arroyo that bordered the feature on the northeast.

Excavation of the Feature 3–6 area exposed an occupation surface, Feature 3, and three thermal features (Features 4–6). The features were buried beneath a 160 cm deep layer of low- and high-energy colluvium. The stratigraphic profile revealed six noncultural layers ranging from 20 to 50 cm thick. Stratum 5, 100 to 130 cm below the modern ground surface, was a high-energy deposit that capped the Stratum 6 cultural deposit. Below the cultural deposit were colluvial deposits that reflect gradual deposition. These strata suggested relatively long-term, gradual deposit formed by creep and overland flow. Upslope surfaces were fairly stable during the period that included the occupation. A dense gravel deposit associated with chipped stone debris in the units south of the features suggested an old hill slope where camp debris was tossed. Few artifacts were recovered from the features, and a portion of the occupation area has been removed by arroyo erosion.

Stratigraphy

Seven stratigraphic layers were observed in the west wall of the Feature 3–6 area (Fig. 243). These strata primarily reflect the postoccupation depositional history at the site and on this gentle slope. The thickness of the colluvial deposit demonstrates that considerable natural deposition has occurred between occupation episodes.

Stratum 1 was a reddish brown (5YR 4/3, dry), sandy clay loam that was loosely structured, plastic when moist, contained 2 to 5 percent pea gravel, and was thoroughly root intruded. This is the modern topsoil, containing Features 1 and 2.

Stratum 2 was a reddish brown (5YR 4/3, dry), sandy clay loam that was consolidated, lacked

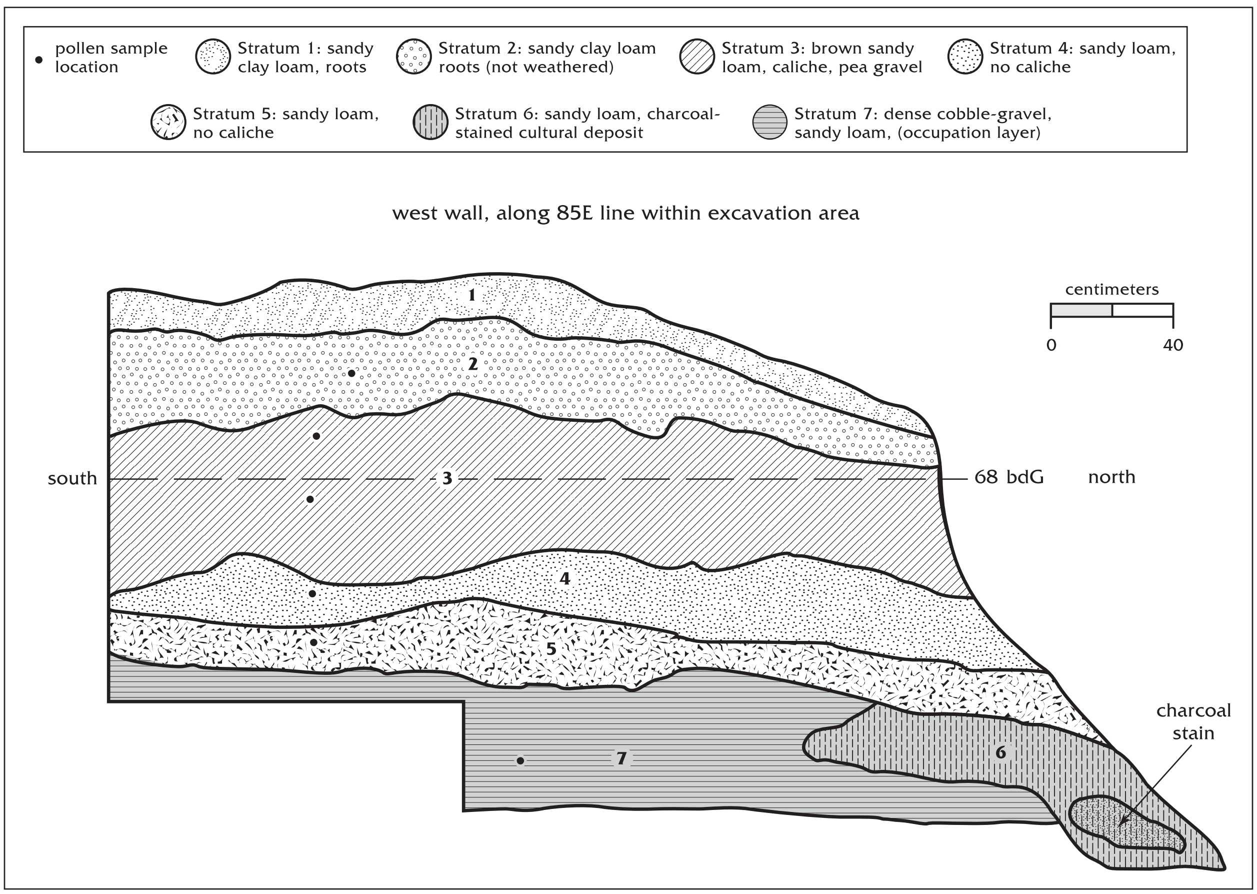


Figure 243. Stratigraphic profile of west wall, Excavation Area 3, LA 67959.

plasticity when moistened, had 2 to 5 percent pea gravel, and exhibited rootlet intrusions. It was quite similar to Stratum 1, except that it was not subject to modern weathering and erosion.

Stratum 3 was a light reddish brown (5YR 6/3, dry), nonplastic, consolidated, but loosely structured sandy loam with caliche nodes and 10 to 30 percent pea gravel. This layer was virtually undisturbed and represents the latest episode of hill-slope stabilization.

Stratum 4 was a light reddish brown (5YR 6/3, dry), nonplastic, unconsolidated, but loosely structured sandy loam that was slightly plastic was moistened. Unlike Stratum 3, it lacked calcium carbonate deposits.

Stratum 5 was a light reddish brown (5YR 6/3, dry), nonplastic, unconsolidated, but unstructured sandy loam that was slightly plastic when moistened and contained 20 to 30 percent pea gravel. Like Stratum 4, it lacked calcium carbonate deposits.

Stratum 6 was a light reddish to reddish brown (5YR 5–6/4, dry), nonplastic, unconsolidated, but unstructured sandy loam that was slightly plastic when moistened and contained 10 to 20 percent pea gravel. This stratum contained the charcoal-stained cultural deposit that was lying on top of the ancient slope. The cultural deposit was smeared or spread and diffused by gradual colluvial deposition subsequent to the occupation.

Stratum 7 was a dense, cobble-gravel layer with 40 to 80 percent clast content mixed with consolidated but unstructured sandy loam. This reddish brown (5YR 5/4, dry) layer was the old hill slope or occupation surface. Excavation halted with the discovery of this layer.

The stratigraphic sequence exposed in the west wall reflects a long-term pattern of gradual colluvial deposition. Site occupation and abandonment were followed by years of deposition, with no evidence of major changes in erosion or drainage patterns. The occurrence of chipped stone on the Stratum 7 surface indicated that this surface remained stable following abandonment and was subjected to very gradual natural deposition, which preserved the spatial relationships of the artifacts and features.

Features

Six features were identified. Features 1 and 2 were visible on top of the modern ground surface. Features 3–6 were deeply buried. Feature 3 is an occupation area. Features 4–6 are thermal features associated with the occupation surface.

Feature 1 excavation revealed a pit that was on a moderately steep colluvial slope of the north bank of a narrow, incised erosion channel. Erosion caused by channel cutting has removed most of the cultural deposit and left a shallow remnant. The hearth remnant measured 50 cm long by 31 cm wide by 4 cm deep (Fig. 244). From the uppermost to the lowermost pit limit, the original depth of the pit is estimated at a minimum of 12 cm, suggesting that up to 75 percent of the feature has been removed. The remnant outline and form suggest that it may have been an oval-shaped basin. Six cobbles within or near the pit may remain from its construction. The fill, a loose, dark brown (10 YR 3/3, dry), sandy loam, contained 1 to 2 percent pea gravel. No charcoal flecks were observed. No artifacts were recovered.

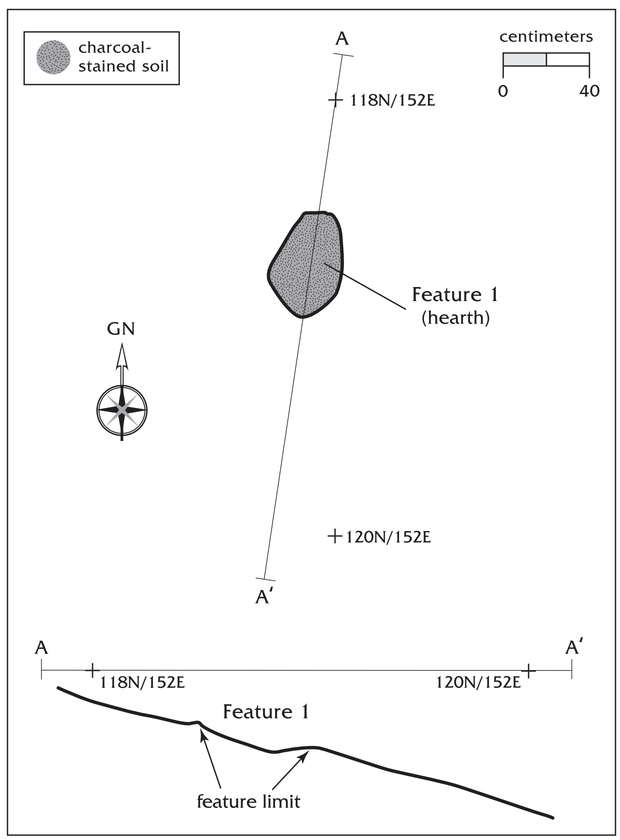


Figure 244. Plan and profile of Feature 1, LA 67959.

Two flotation samples yielded no cultural plant remains.

Feature 2 was a charcoal-infused soil stain exposed on the modern ground surface at the edge of a side cut along the west bank of the main arroyo. The feature had been partly removed by erosion and was extremely deflated. Excavation revealed a shallow, probably oval-outlined, basin-shaped pit measuring 85 cm long by 38 cm wide by 2 cm deep (Fig. 245). The charcoal-infused fill was a grayish brown (10YR 5/2, dry), coarse sandy loam with 20 to 30 percent redeposited gravel. The feature was probably the remains of a surface fire with no formal construction and therefore was always shallow. Its location on the surface and lack of formal morphology suggest that it may be of relatively recent age. Two flotation samples yielded no cultural plant remains.

Feature 3, an occupation surface, was defined at 160 cm below the modern ground surface in the 176N/84E area (Fig. 246). It was evident from a 5 to 12 cm thick smear of charcoal-infused coarse sandy loam. The charcoal-infused smear was created by the gradual deflation and erosion of the three thermal features that were excavated into the surface. The east feature limit is defined by the 3 to 4 m wide arroyo that has removed a portion of the occupation surface. On the north was a steep and short side channel that had cut through the occupation surface. No evidence of the surface was found within the erosion channel or in the bank to the north. The excavation area defined the east and south limits, but they are also marked by the upslope trend to the occupation surface that coincided with the ancient hill slope. The hearths were positioned near the base of this slope, suggesting they were in a swale. This swale would have been adjacent to the Tesuque sandstone that outcrops 3 m to the south.

Excavation of Feature 3 provided a very limited representation of the Archaic occupation surface. Its presence confirms that in certain topographic settings, colluvial deposition has thoroughly obscured evidence of the earliest land use. The fact that three thermal features remained in this small excavation area suggested that a dense occupation component had been removed by arroyo formation and downcutting.

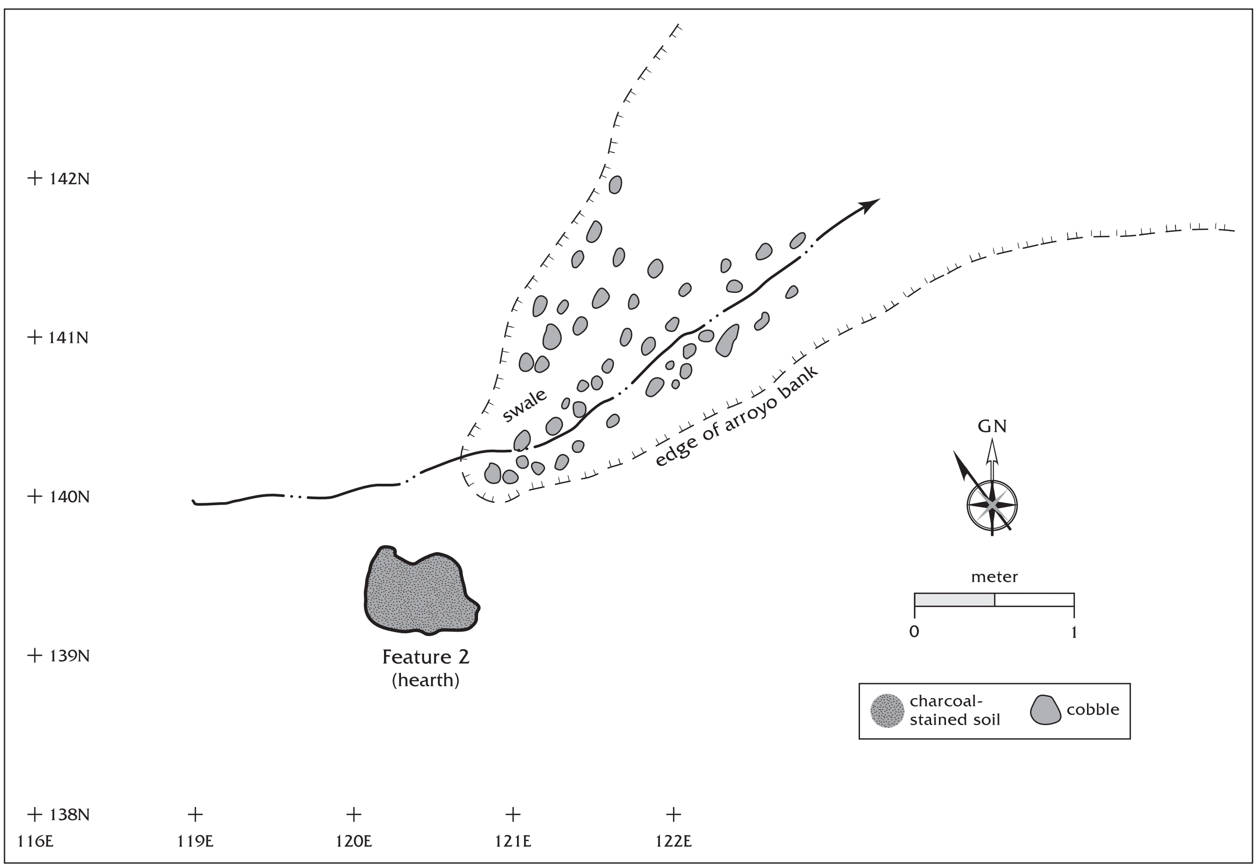


Figure 245. Plan of Feature 2, LA 67959.

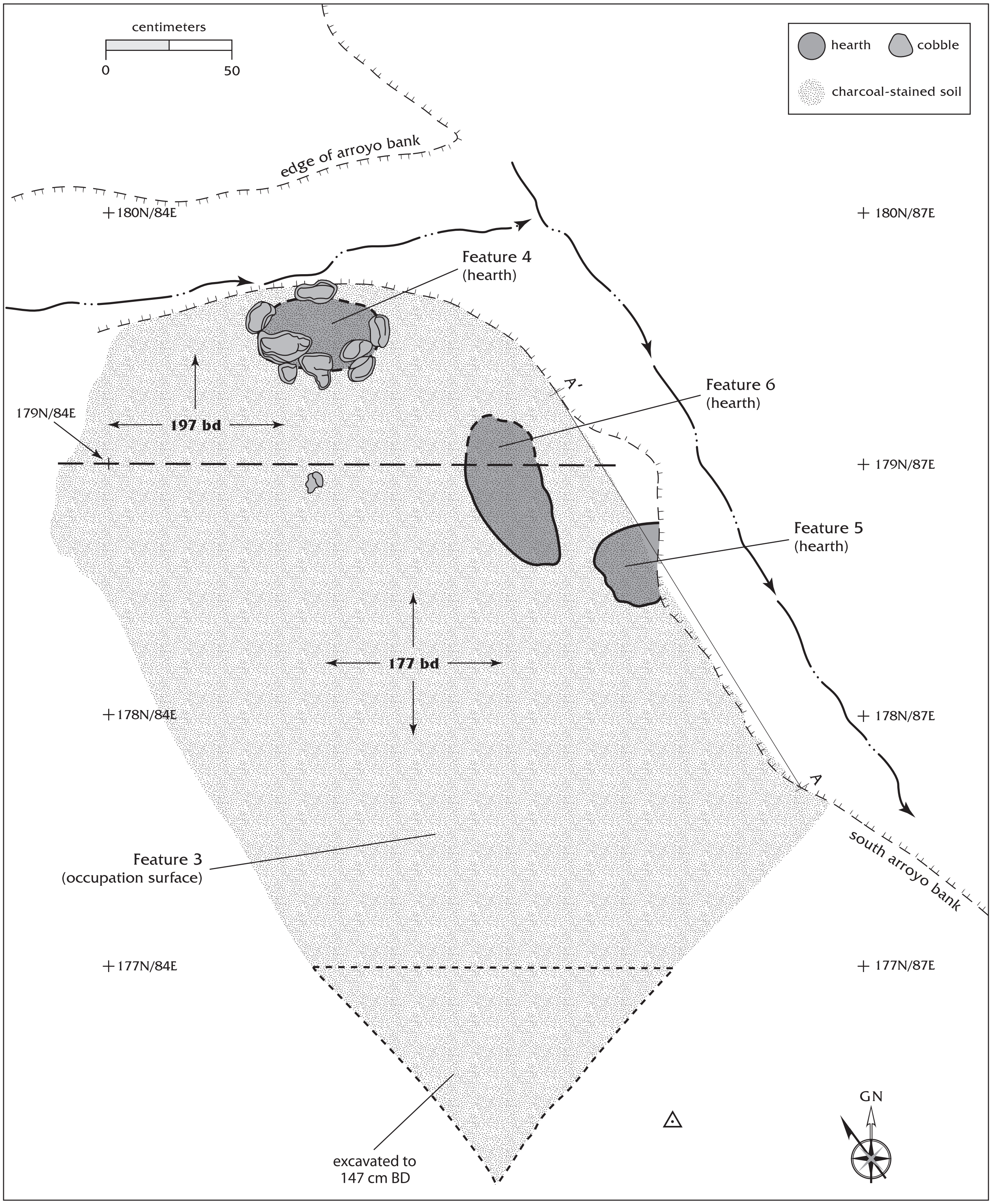


Figure 246. Plan of Excavation Area 3, LA 67959.

This roughly 3 by 4 m area yielded three thermal features (Features 4–6), a mano fragment, a chopper, and 23 pieces of core-reduction debris. No C-14 samples were recovered from this surface, but it should be dated by association with Features 5 and 6.

Feature 4 was a cobble-ringed hearth excavated into the Feature 3 ground surface. It had an oval outline and a basin shape. Eight heavily burned cobbles formed the perimeter. These locally available, metamorphic and igneous cobbles had maximum dimensions between 10 and 16 cm (Fig. 247). The cobbles were burned but unmodified. The steep-sided feature measured 60 cm long by 48 cm wide by 32 cm deep. It was deflated, partly collapsed, and exposed at the edge of the arroyo cut. The feature fill was black (5YR 3/2, dry), loose sandy loam. It yielded no artifacts, but five flotation samples were collected. These samples yielded no cultural plant remains, but they did yield piñon and juniper charcoal. A radiocarbon sample was collected but not submitted because of its low volume. Stratigraphically, Feature 3 is lower than Features 5 and 6, possibly representing an earlier component and emphasizing the pattern of reuse at many of the Archaic period camp locations.

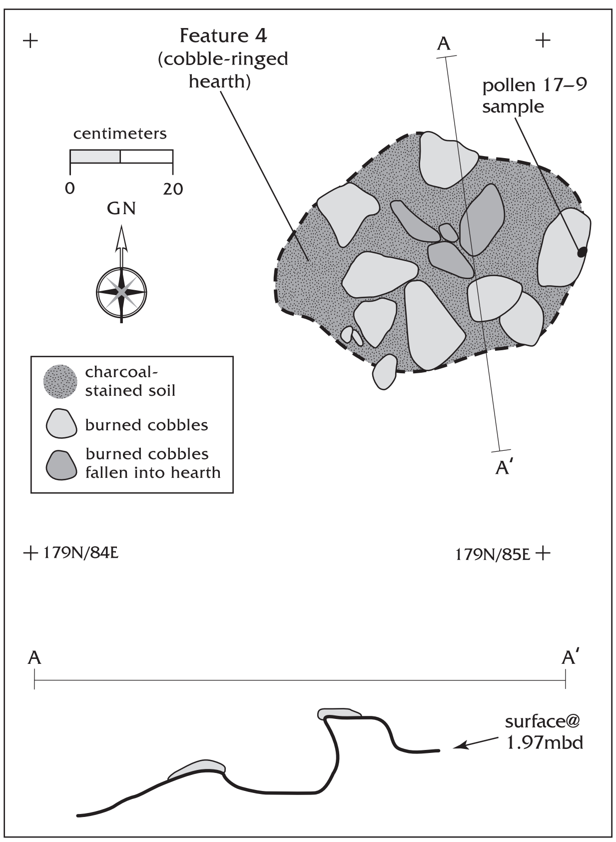


Figure 247. Plan and profile of Feature 4, LA 67959.

Feature 5 was also exposed in the arroyo bank. However, most of the feature remained intact. It had an oblong outline with steep, contracting sides. The interior was lightly burned but contained no fire-cracked rock. It measured 40 cm long by 32 cm wide by 20 cm deep (Fig. 248). The fill was a mixed primary and secondary deposit of dark brown (7.5YR 3/2, dry), sandy loam, similar to the Stratum 5 overburden that capped Stratum 6. No artifacts were recovered. Two flotation samples yielded no cultural plant remains, but they contained piñon and juniper charcoal. A radiocarbon sample yielded a cal. 2404–2140 BC two-sigma range, dating the charcoal to the end of the Middle Archaic period.

Feature 6 was revealed in cross section during excavation of the Feature 3 surface. Feature 6 had an oval outline with gradual, basin-shaped sides. It measured 64 cm long by 40 cm wide by 16 cm deep (Fig. 248). The interior was moderately burned. The fill, a mixed primary and secondary sandy loam, was charcoal-infused (reddish brown, 5YR 5/4, dry). Two flotations yielded no economic plant remains. A wood sample was identified as juniper. Other wood charcoal included piñon and *Quercus*. The occurrence of *Quercus* in the Northwest Santa Fe Relief Route is rare. A radiocarbon sample yielded a cal. 2286–1810 BC two-sigma range. This date range is statistically similar to the Feature 5 date, indicating that they may be from the same population.

Chipped Stone

A total of 43 chipped stone artifacts weighing 2.03 kg were recovered from LA 67959. Of these, 26 artifacts were recovered from the Feature 3 activity area. The chipped stone from Feature 3 is similar to the site assemblage but exhibits less variation.

The 43 artifacts consist mainly of chert core flakes and angular debris, with few cores and tools (Table 81). These artifacts reflect limited raw-material procurement and core reduction.

The assemblage is dominated by locally available materials. The Cenozoic era Santa Fe group gravels, namely the Ancha formation, contain chert (Kelley 1980:11, Post 1996a). The

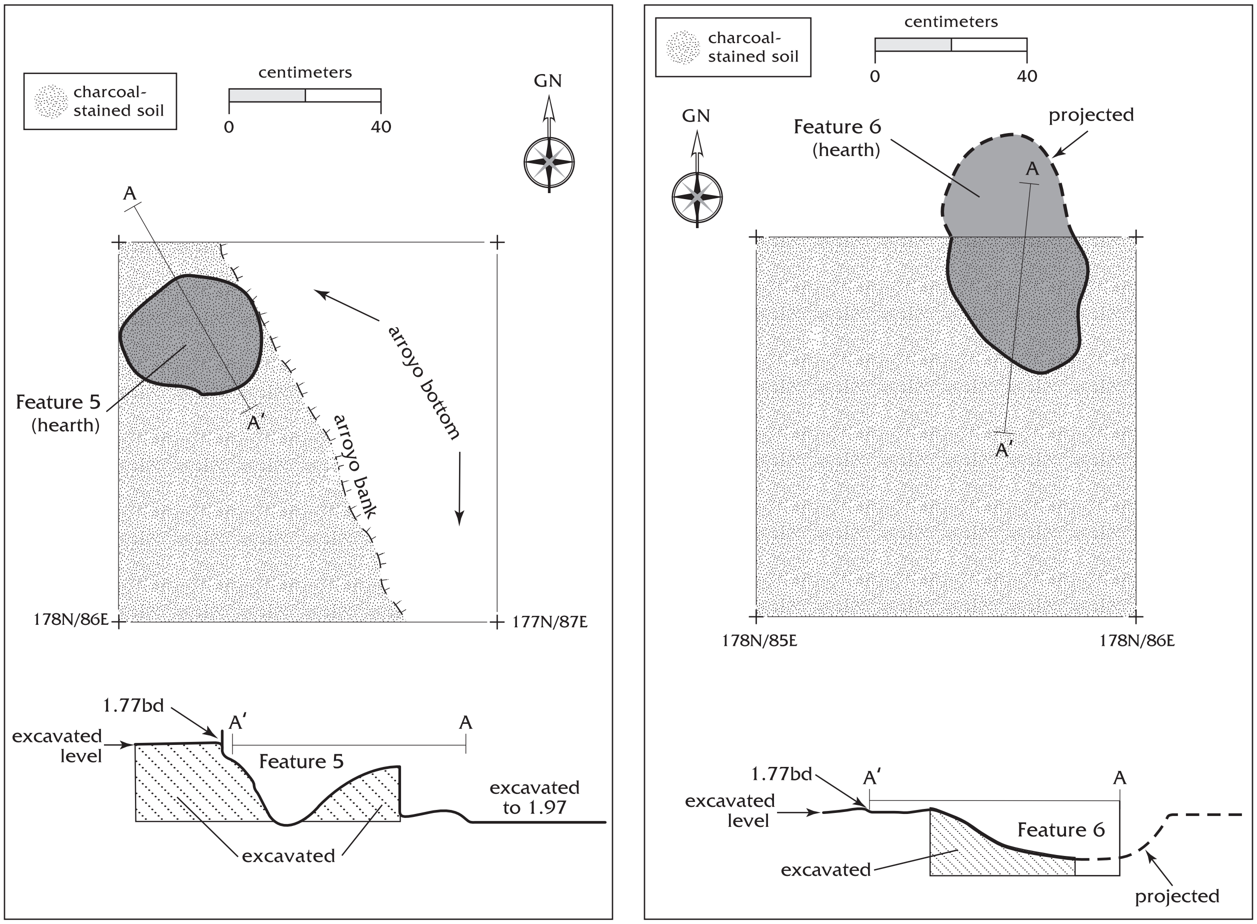


Figure 248. Plans and profiles of Features 5 and 6, LA 67959.

Sangre de Cristo foothills contain Precambrian era granite and gneiss overlain by Paleozoic era Pennsylvanian deposits of sandstone, shale, and limestone. Within some of this limestone, namely of the Madera formation, are bedded nodules and veins of chert, which were quarried prehistorically (Lang 1993:6, 13; Lang 1995:5; Viklund 1994:1, Ambler and Viklund 1995:5). Madera chert also occurs as residual cobbles and pebbles in the later Santa Fe group gravels. Nonlocal materials such as obsidian and basalt are found in the axial gravels of the Rio Grande. However, the primary sources of this material lie in the Jemez Mountains. A small amount of obsidian can also be found scattered across Caja del Rio Mesa. The closest primary source of basalt is the Caja del Rio escarpment (Kelley 1980:11–17).

A substantial proportion (44.2 percent) of the material contains flaws, mainly in the form of cracks.

Debitage. Debitage consists of 34 core-reduction flakes and 3 pieces of angular debris, making the angular debris to core flake ratio 1:11.7 (Table 82). The following summary of key flake attributes may reflect the early to late stages of a core-reduction strategy geared toward the production of informal flake and core tools. This debitage constitutes 86.1 percent of the chipped stone assemblage. No biface flakes, which are indicative of formal tool production, or tool maintenance debitage was recovered. None of the recovered debitage appears to be thermally altered.

The majority (68.6 percent) of platforms are cortical or single faceted. Other platforms are collapsed (20 percent) or absent (11.4 percent).

The noncortical to cortical core flake ratio is 1:1.9, indicating a predominance of cortical core flakes, which occur in the early to middle stages of reduction. Flakes with 10–50 percent

Table 81. Chipped stone artifact type by material type, LA 67959

Number Row % Column %	Chert	Madera Chert, Yellow/Red Mottled	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Obsidian	Basalt	Metaquartzite	Total
Angular debris	-	-	3	-	-	-	-	3
	-	-	100.0%	-	-	-	-	100.0%
	-	-	12.0%	-	-	-	-	7.0%
Core flake	3	2	20	3	-	1	5	34
	8.8%	5.9%	58.8%	8.8%	-	2.9%	14.7%	100.0%
	100.0%	100.0%	80.0%	100.0%	-	100.0%	62.5%	79.1%
Unidirectional core	-	-	-	-	-	-	2	2
	-	-	-	-	-	-	-	100.0%
	-	-	-	-	-	-	-	4.7%
Multidirectional core	-	-	2	-	-	-	1	3
	-	-	66.7%	-	-	-	33.3%	100.0%
	-	-	8.0%	-	-	-	12.5%	7.0%
Late-stage biface	-	-	-	-	1	-	-	1
	-	-	-	-	-	-	-	100.0%
	-	-	-	-	-	-	-	2.3%
Total	3	2	25	3	1	1	8	43
	7.0%	4.7%	58.1%	7.0%	2.3%	2.3%	18.6%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 82. Debitage mean whole measurements, LA 67959

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Number	23	17	23	23	12
Mean	5.6	31.8	29.2	9.6	36.7
SD	3.6	10.6	17	8.7	114.4
Minimum	1.1	16	13	2	0.5
Maximum	13.7	56	96	46	400

dorsal cortex have a slightly higher frequency, accounting for 37.1 percent of the total (35), while 34.3 percent are noncortical, and 28.6 percent are over 50 percent cortical. With the exception of one flake exhibiting nonwaterworn cortex, all cortex is waterworn. The majority (52.9 percent) has 2–3 dorsal scars, while 35.3 percent have 0–1 scar, and 14.3 percent have 4–10 scars.

The whole to fragmentary core flake ratio is 1:2.2. Factors related to breakage frequencies may include increased breakage in the later stages of reduction, postreduction breakage, and material quality. The dominant fragmentary portions are proximal and lateral fragments, which account for 32.4 percent and 23.5 percent, respectively.

Cores. Five cores representing 12.4 percent of the assemblage were recovered: two core choppers (FS 0-2 and FS 0-12), a unidirectional core (FS 0-17), and two multidirectional cores. FS 0-3, a fine-grained, flawed, mottled red Madera chert multidirectional core, appears to be exhausted. Four of seven flake scars are complete, and the core retains 20 percent waterworn cortex. It measures 37 mm long by 27 mm wide by 22 mm thick and weighs 29.1 g. FS 0-8 is a fine-grained, red Madera chert multidirectional core that retains 60 percent cortex. Six of eight scars are complete. It measures 59 mm long by 37 mm wide by 31 mm thick and weighs 82.9 g. FS 0-17 is a medium-grained metaquartzite core flake with three flakes removed from the dorsal surface using the ventral distal termination as a platform. It retains 70 percent waterworn cortex. It measures 118 mm long by 73 mm wide by 53 mm thick and weighs 473.7 g.

Informal tools. FS 0-7 is the proximal portion of a red Madera chert core flake. A projection along a lateral edge is unidirectionally retouched and utilized. The scarring occurs on the ventral surface of the flake. The utilized edge measures 41 mm and has a 40-degree angle. It measures 30 mm long by 38 mm wide by 8 mm thick and weighs 15.1 g. FS 5-1 is the proximal portion of a fine-grained chert core flake. Both lateral edges are sinuous and exhibit bidirectional wear consistent with cutting use. One utilized edge measures 33 mm and has a 33-degree angle. The other measures 26.2 mm has a 41-degree angle. Its size and lack of hafting alteration point to finger-gripped manipulation. It measures 41 mm long by 33 mm wide by 10 mm thick and weighs 11.0 g.

Formal tool. FS 0-6 is a small, triangular, corner-notched projectile point manufactured from obsidian. Notching, which is relatively broad and shallow, facilitated hafting to a shaft. The base is irregular. The transverse cross section is lenticular. Whole measurements for shoulder width, maximum thickness, neck thickness, stem width, and stem length are 16.5 mm, 5.1 mm, 3.1 mm, 9.0 mm, and 4.7 mm, respectively. Its form, including metric attributes, most closely resembles Thoms's quasitype Slight Barbed, narrow base (Thoms 1977:148) and the Trujillo Corner-notched (Turnbow 1997). These suggest a temporal range from the Late Archaic to the Developmental period. The artifact is distally truncated by an impact burination scar. An impact burination flake is initiated on impact with a resistant material and runs along a blade edge (Whittaker 1994:165). In addition, one of the small barbs created during corner notching is snapped. These breaks may have been factors contributing to its discard. The point is considered a late-stage biface exhibiting uniform bifacial and bimarginal retouch. Its lateral edge angles measure 40 degrees. The point represents the only obsidian recovered from the site; it was probably not manufactured on site and may reflect a curated technology. Maximum length and width are 28 mm and 16 mm, respectively. It weighs 2.0 g.

Hand tools. FS 0-2 is a core chopper with four complete flake scars removed from opposing surfaces along the utilized edge. Other flake scars are present but obscured by later flake removal. The utilized edge, which measures 112 mm, is restricted to two-thirds of a long-axis margin and wraps around to include one short-axis margin. Step-fracturing and crushing is apparent along the sinuous and convex utilized edge. The edge angle measures 68 degrees. Its preform morphology is discernible and can be described as an ovate, flattened cobble. This medium-grained, metaquartzite cobble measures 115 mm long by 83 mm wide by 34 mm thick. It weighs 431.4 g.

FS 0-12 is a medium-grained metaquartzite core flake with a culturally obscured distal termination. Three complete scars are present on the dorsal surface. Step-fracturing and crushing is apparent along its sinuous utilized edge. This wear pattern and an edge angle of 65 degrees are consistent with use as a core chopper. The utilized edge measures 102 mm. Waterworn cortex on the proximal dorsal surface of the flake, which permitted an easier grip, the overall size of the tool, and the absence of hafting modification suggest handheld use. With the ubiquity of metaquartzite in the local gravel deposits and the presence of recovered metaquartzite debitage, it can be postulated that this is an expedient tool that was manufactured, used, and discarded on site. It measures 102 mm long by 85 mm wide by 34 mm thick and weighs 431.4 g.

Discussion. The Feature 3 activity area assemblage, dating to the end of the Middle Archaic period, consisted of 26 artifacts recovered from a deeply buried context associated with three thermal features. Since the activity area was truncated by the modern arroyo, it is likely that an unknown portion of the assemblage was removed. However, the remaining assemblage can be briefly characterized apart from the surface assemblage.

The Feature 3 activity area assemblage is typical of middle- or late-stage core reduction. There were 23 core flakes and 3 pieces of angular debris. Material types were all locally available chert (22) and quartzite (4). The 8:1 core flake to angular debris ratio is lower than the surface assemblage ratio, reflecting the less organized character of the latter. This is true of the other technological attributes. Platform types, distal terminations, portion, and dorsal cortex all show frequency distribution consistent with middle- and late-stage core reduction. For example, dorsal cortex occurred on 14 of 26 artifacts from Feature 3 activity area, while from the site surface, dorsal cortex was present on 14 of 17 artifacts. A higher frequency of cortical debris is more common for assemblages that accumulated through situational procurement and reduction of local raw material. Higher noncortical debris frequencies result from episodic reduction such as found in an activity area or within a foraging camp (J. Moore 1994; Post 1996a).

Site Summary

LA 67959 was relocated and defined as a multicomponent artifact scatter with associated surface thermal features and a deeply buried Middle Archaic period deposit with thermal features. Excavation of the surface features revealed that upslope deposits were shallow and highly deflated. The dispersed, low-frequency artifact scatter is typical of debris left by Ancestral Pueblo foragers. The surface deposits are very similar to the majority of sites investigated along the Northwest Santa Fe Relief Route. The deeply buried cultural deposit reflects short-term, seasonal occupation, but no subsistence evidence was recovered. No temporally diagnostic artifacts were retrieved, but radiocarbon dates ranged from 2404 to 1810 BC. The Middle Archaic component is the latest identified during the project and can be compared with LA 61286, LA 61289, and LA 61290. It was the first buried deposit encountered during the project, and it indicated the potential for more buried cultural deposits at this midslope elevation along the Arroyo Gallinas and Arroyo de las Trampas.

LA 67960

LA 67960 was between centerline stations 647+00 and 649+00. It was originally identified during testing of the Northwest Santa Fe Relief Route (Wolfman et al. 1989:118–121). Permission to enter the property could not be obtained for archaeological testing. The site was considered important enough to warrant excavation, which was completed between March 19 and March 20, 1997.

LA 67960 was on a deflated, east-southeast-facing middle hill slope 150 m west of the confluence of Arroyo Gallinas and Arroyo de las Trampas. The deflated hill slope was cut by two east-draining, shallow, modern erosion channels incised through the fine sandy loam A1 horizon and into C1Ca, highly calcareous, gravelly sandy clay loam of the Pojoaque-Panky Rolling soil association (Folks 1975:40, 43). Erosion-channel formation is aided by the sparse ground cover and the loose structure of the Pojoaque-Panky soil association. Gravel and cobbles are intermittently exposed on the site surface and in the erosion channels. Vegetative cover consists of sparse grasses, prickly pear, narrowleaf yucca, and a sparse to moderately dense overstory of piñon and juniper.

Preexcavation Description

Initial recording indicated that LA 67960 measured approximately 20 m north-south by 20 m east-west, an area of 400 sq m. A low-density scatter of lithic artifacts consisted of secondary core flakes made from locally available chert and quartzite. No cultural features were observed at the site. Because the composition of the lithic artifact assemblage was not evaluated, no assessment of potential site activities related to lithic reduction could be made (Wolfman et al. 1989:118, 120, 121).

Excavation Methods

Data recovery focused on redefining the site limits and locating any thermal features. Reexamination of the site revealed a light artifact scatter and cobble concentrations of undetermined nature. Excavation followed basic small-site procedures. Surface-strip and excavation areas were set up, encompassing an artifact cluster and a cobble concentration. The 13 surface artifacts were point-provenienced and collected.

Area 1 was a 2 by 2 m unit, 152N/102E (southwest corner), encompassing a portion of a cobble concentration that had no associated artifacts or cultural deposits. Area 2 was a 2 by 2 m area, 134N/94E (southwest corner), that was placed within a cluster of four lithic artifacts. Loose topsoil and cobbles were removed from the excavation areas by shovel and screened. In Area 1, the cobbles were left in place. Auger holes in both areas reached 50 cm below the modern ground surface before encountering impenetrable soil.

After the excavation was completed, the site area was mapped and photographed. The erosion channels were inspected for additional evidence of buried cultural deposits. None were found, and the excavation was halted.

Excavation Results

During reexamination and excavation of LA 67960, 13 surface artifacts were found, but no features or buried cultural deposits. The dimensions of the site were enlarged to 50 m north-south by 35 m east-west, or 1,750 sq m (Fig. 249). Excavation within Area 1 revealed the cobble concentrations were part of a buried, unsorted cobble deposit that formed a mantle across the ridge slope. The cobbles were uplifted by root action of nearby trees and exposed by soil deflation and wind erosion. No cultural materials or deposits were encountered.

The excavation of Area 2 recovered no

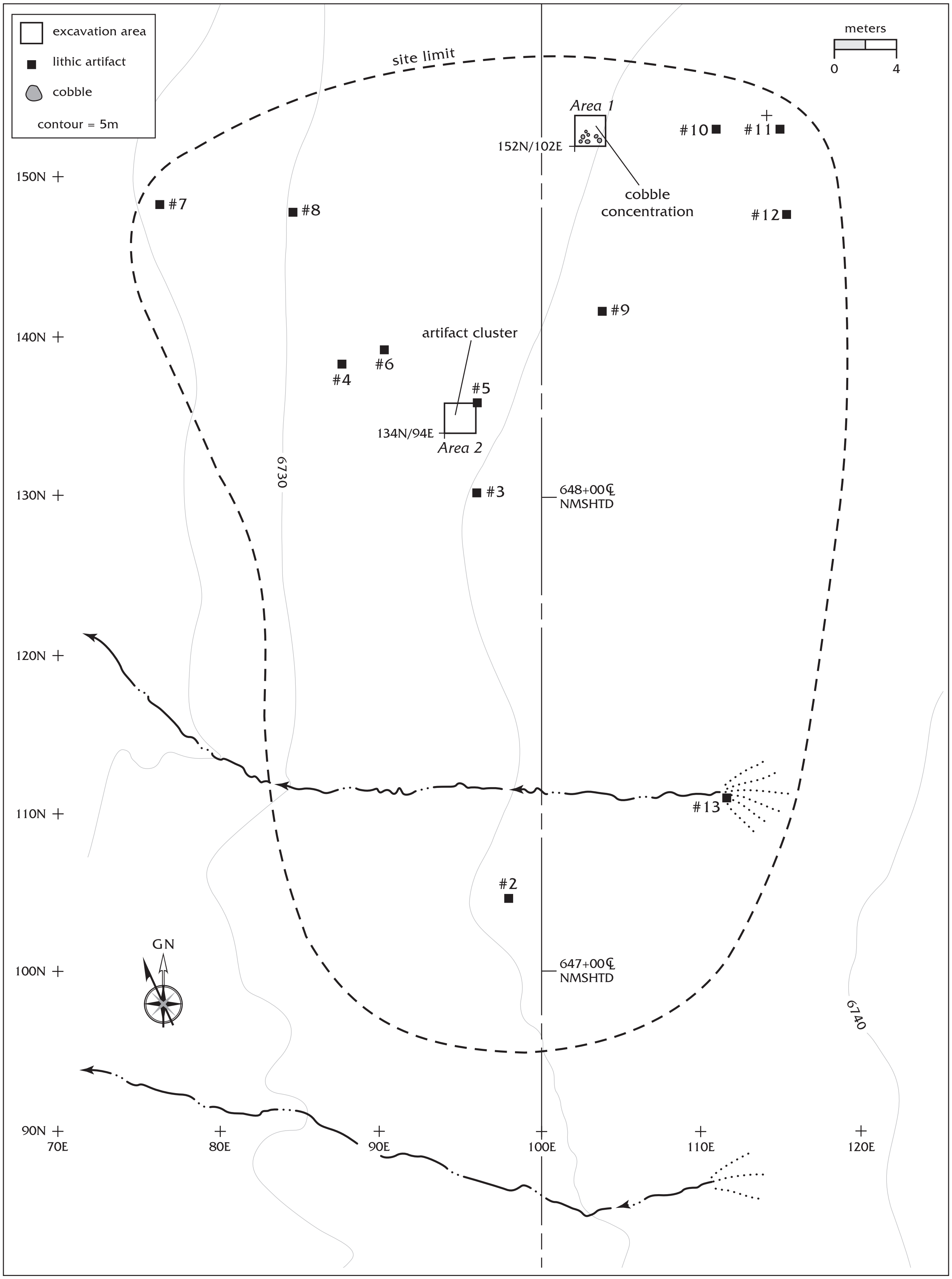


Figure 249. Excavation plan, LA 67960.

subsurface artifacts or cultural deposits. The four artifacts were dispersed within a 20 sq m area. They were typical of the site scatter and remained from many, very brief occupations during which small quantities of local raw material were reduced and discarded.

Piece-plotting of surface artifacts revealed that Area 2 was part of a highly dispersed cluster of nine lithic artifacts in the northern one-quarter of the site (Fig. 249). The artifacts were spaced 2 to 12 m apart and lacked the linear distribution that would suggest dispersion by erosion from a common source. Therefore, it is most likely that the artifacts remain from multiple site visits rather than one occupation.

Chipped Stone

A total of 11 chipped stone artifacts weighing 2.34 kg were recovered from LA 67960. They consist mainly of core flakes and angular debris with a few cores (Table 83) and reflect limited raw-material procurement and core reduction.

The assemblage is comprised of locally available materials. Chert and metaquartzite are among the typical constituents of the Santa Fe group gravel deposits. Madera chert also occurs in these deposits as residual cobbles and pebbles eroded from an earlier Pennsylvanian age limestone bedding in the Sangre de Cristo foothills. Material quality ranges from fine to coarse grained. Some (27.3 percent) of the material contains flaws, mainly in the form of cracks.

Debitage. Based upon observations of the following select flake attributes, the six core flakes and two pieces of angular debris, which constitute 72.7 percent of the chipped stone assemblage, may reflect early- to middle-stage core reduction. It appears that the reduction strategy emphasized the production of informal flake and core tools. Two core flakes have cortical platforms, and one has a single-facet platform. These platform types are associated with early-stage reduction. Two platforms are absent, and another is crushed. Three flakes are noncortical, two retain 100 percent dorsal cortex, and one retains 20 percent. Flakes that retain cortex reflect early- to middle-stage core reduction. All cortex is waterworn. Two lack dorsal scarring, and four have 2–4 scars. The whole to fragmentary core flake ratio is 1:1, indicating equal frequencies. Two core flakes are lateral fragments, and another is a medial fragment. The dimensions of all whole core flakes suggest early- to middle-stage reduction, while the whole length of the lateral flake may reflect middle- to late-stage reduction (Table 84).

Table 83. Chipped stone artifact type by material type, LA 67960

Number Row % Column %	Chert	Madera Chert, Red and Mottled Red	Metaquartzite	Total
Angular debris	1	1	-	2
	50.0%	50.0%	-	100.0%
	25.0%	25.0%	-	18.2%
Core flake	2	2	2	6
	33.3%	33.3%	33.3%	100.0%
	50.0%	50.0%	66.7%	54.5%
Tested cobble	-	1	-	1
	-	100.0%	-	100.0%
	-	25.0%	-	9.1%
Multidirectional cor	-	-	1	1
	-	-	100.0%	100.0%
	-	-	33.3%	9.1%
Tested pebble	1	-	-	1
	100.0%	-	-	100.0%
	25.0%	-	-	9.1%
Total	4	4	3	11
	36.4%	36.4%	27.3%	100.0%
	100.0%	100.0%	100.0%	100.0%

Table 84. Debitage whole measurements, LA 67960

FS No.	Portion	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
0-2	Lateral	-	13	-	-	-
0-9	Whole	10.1	32	35	11	10
0-12	Whole	6	28	35	10	11.4
0-13	Whole	21.7	79	47	17	71.5

No biface flakes, which are indicative of formal tool production, or tool maintenance debitage was recovered. None of the debitage is thermally altered.

Cores. A fine-grained, flawed, red Madera chert tested cobble (FS 0-6); a fine-grained, flawed, chert tested pebble (FS 0-8); and the previously described core chopper (FS 0-1) account for 27.3 percent of the lithic assemblage (11). Both of the tested pieces show one complete negative flake scar. The presence of the tested cobble and pebble points to at least limited procurement of raw material from an on-site gravel source. The cobble retains 80 percent waterworn cortex, and the pebble retains 30 percent. Cracking of the raw material is apparent in both scars and may have been a contributing factor in the discontinuation of reduction and discard. The cobble measures 137 mm long by 94 mm wide by 81 mm thick and weighs 1336.3 g. The pebble measures 37 mm long by 27 mm wide by 15 mm thick and weighs 15.0 g.

Informal tool. FS 0-12 is a lateral fragment of a fine-grained chert core flake showing unidirectional wear on its intact lateral margin in the form of small feathered scars. These scars occur on the ventral surface and suggest use as a scraping or whittling tool. The slightly convex utilized edge measures18 mm and has a 33-degree angle. The artifact's small size and the lack of hafting alteration suggest finger-gripped manipulation. This informal tool measures 28 mm long by 35 mm wide by 10 mm thick and weighs 11.4 g.

Hand tool. FS 0-1 is a core chopper. The tool was made from a flattened cobble of medium-grained metaquartzite. Six complete flake scars that were removed from opposing surfaces are discernible along one edge perimeter and extend across less than one-third of both surfaces. This edge perimeter is also the utilized edge. Other incomplete or obscured flake scars are also present. The utilized edge measures 162 mm. It is sinuous and has battering wear in the form of step-fracturing and crushing in both concave and convex portions. The edge angle measures 70 degrees. The opposing edge remains mostly cortical. The cortical nature of this edge combined with the tool's overall size makes it well suited for handheld use. It measures 129 mm long by 85 mm wide by 58 mm thick and weighs 680.1 g.

Site Summary

The excavation of LA 67960 revealed a shallow, dispersed artifact scatter on a broad, gentle, southeast-facing ridge slope. Surface stripping and auger holes revealed no buried artifacts or cultural deposits. The 13 scattered artifacts do not represent one occupation episode, nor can they be confidently assigned to one time period, although it is likely that they date to the Ancestral Pueblo period. The core-reduction debris and tested cobble reflect small-scale, low-intensity opportunistic procurement of raw material. The two tools, a chopper and a utilized flake, reflect gathering and processing of hard or fibrous materials like wood. Large hand tools could have been left on the landscape in prime wood-gathering areas. They would have been available for repeated uses and would not have been transported from the village as part of a wood-gathering tool kit. Sites consisting of low-frequency and low-density lithic materials tend to have higher percentages of early-stage debris, and the debris is larger. Reduction debris left on the landscape included large flakes, cores, and tested cobbles that were reused and transported short distances between gathering loci. Small-scale lithic artifact scatters formed by repeated visits are common in the piedmont.

LA 108902

LA 108902 was at the intersection of the proposed County Road 70 extension to the Northwest Santa Fe Relief Route and County Road 70 (West Alameda), mainly on the west side of the 30 m (100 ft) wide right-of-way. At an elevation of 2,043 m (6,700 ft), it was on a long, broad, gentle northwest-to-southeast-sloping ridge that separates Arroyo de las Trampas from the Santa Fe River. Arroyo de las Trampas is 670 m to the north, and the Santa Fe River is 1 km to the south. The site was at the transition from the dissected piedmont of the Plains surface and the less dissected, more rolling juniper grasslands that extend southwest to La Cienega and the edge of the La Bajada escarpment. The ridge top was covered by the deep alluvial soils of the Pojoaque-Panky Rolling association (Folks 1975:43). The topsoil was a fine sandy loam A1 horizon, which contained the majority of the artifacts. The C1ca horizon was 10 to 25 cm below the surface and lacked artifacts. Gravel and cobbles were intermittently exposed on the site surface and in the erosion channels. The vegetative cover consisted of sparse grasses, prickly pear, narrowleaf yucca, and a sparse to moderately dense overstory of piñon and juniper.

Preexcavation Description

The dimensions of the site during testing were determined to be 33 m north-south by 31 m east-west, or 1,023 sq m. A total of 83 chipped stone artifacts and two Coalition period sherds were flagged and recorded or recovered from the surface or surface strip within excavation units. Except for the sherds, no temporally diagnostic artifacts were encountered.

Test excavation determined that artifact distribution was mainly restricted to the surface or upper 5 cm of modern soil. An average of three artifacts per square meter were recovered. From the average artifact density, it was estimated that a maximum of 3,000 artifacts might be recovered by excavation. Recognizing that equal artifact distribution across the whole site was unlikely, it was estimated that the high density might occur within a 400 sq m area, which could yield 1,200 artifacts. Based on Santa Fe Relief Route test excavations (Wolfman et al. 1989) and the Las Campanas excavations (Post 1996a), a 1,200-artifact assemblage for a Coalition to Early Classic period limited activity or foraging site was considered unusual and an indication that multiple occupations had occurred. On the other hand, the same yield from an Archaic period base camp was typical based on the Las Campanas excavation results. Therefore, excavation of LA 108902 was expected to yield important assemblage and site structure data that could be compared with assemblages from the Northwest Santa Fe Relief Route and the Las Campanas area (Post 1997:14–17).

Excavation Methods

The research design called for surface stripping and artifact recovery in the densest portion of the main 15 by 15 m artifact concentration. A grid system was established at 100N/90E (southwest corner). The actual excavation covered a 17 m north by south by 14 m east-west area at 100N/94E (southwest corner; Fig. 250). Excavation was expanded as needed to define the extent of the artifact distribution.

A total of 275 units were surface-stripped, removing the loose, sandy loam colluvium. Surface-stripped soil was screened through 1/4-inch mesh. Surface stripping continued until decreasing artifact counts were encountered in all directions. Then 12 units with the highest artifact frequencies were excavated 10 to 20 cm below the ground surface. In all units, decreased artifact counts were encountered, and excavation was halted. No subsurface cultural deposit had been identified during testing, and no indications of deeply buried deposits were encountered during the excavation. After excavation was completed, the site was mapped and photographed. Feature

Figure 250. Plan of excavation and artifact frequency distribution, LA 108902.

1 was found in 107–108N/104–105E, an area of low artifact density.

Excavation Results

Excavation of 275 units within the artifact concentration revealed a thin mantle of Pojoaque-Panky Rolling association sandy loam mixed with 5 to 10 percent gravel. This soil mantle contained the artifact assemblage, primarily chipped stone debris of local chert and quartzite, and in smaller quantities, nonlocal basalt and obsidian.

Excavation of twelve 1 by 1 m units with artifact frequencies ranging from 6 to 12 showed that the majority of the cultural deposit was concentrated in the upper 5 cm of the sandy loam. Six lithic artifacts was the maximum recovered from 5 to 10 cm below the surface. The majority of the units yielded fewer than two artifacts. This indicated that the majority of the cultural deposit was at or near the surface.

A total of 475 artifacts were recovered for a mean density of between 1 and 2 artifacts per square meter. Actual counts ranged from 0 to 13 per unit with a mode of 1 per unit. The highest artifact density occurred in the northwest and far northern portion of the excavation area. Two activity or discard areas are suggested by the artifact distribution. The only feature was a deflated fire-cracked rock-filled roasting pit (Feature 1) southeast of the main concentrations; it may represent a third occupation. Five sherds were recovered from along the east limit of the excavation area and north of Feature 1, suggesting that Feature 1 dates to the Coalition period.

Feature 1

Feature 1 was an oval-outlined, moderately steep-walled pit with an uneven bottom (Figs. 251 and 252). It measured 122 cm long by 92 cm wide by 32 cm deep. Four strata were contained within the feature. Stratum A/B was in the lowest 10 to 20 cm and consisted of dark grayish brown to pale brown (10YR 6/3–4/2, dry) mottled sandy loam with sparse calcium carbonate flecks and evidence of charcoal infusion, but only a few scattered charcoal flecks. Stratum C was a dark brown to dark yellowish brown (10YR 3/3–4/4, dry) charcoal-infused and mottled sandy loam that was burned, with distinct charcoal flecks. Stratum D was a black (10YR 2/1, dry), heavily charcoal-infused sandy loam that was a primary deposit remaining from the last use of the feature. It contained burned and fire-cracked cobbles. Stratum E was a dark brown (10YR 4/5, dry), sandy loam that was a mixed primary and secondary deposit reflecting feature deflation and eolian deposition. The strata reflect multiple feature uses. Stratum A/B remained from the earliest feature use. It was charcoal infused but not darkly stained, suggesting the feature had been exposed and unused for an unknown length of time. Stratum D remained from a secondary use episode. The heavily charcoal-infused soil was capped by an eolian deposit. Reuse of Feature 1 as a thermal feature was evident from the burned and compact nature of Stratum C, which served as the secondary hearth floor. Other evidence of reuse was the surrounding fire-cracked rock halo that covered the surface beyond the feature limit. The fire-cracked rock remained from at least one cleanout episode. One lithic and one unburned animal bone were recovered from the fill. Six flotation samples yielded charred remains of *Echinocereus* and *Portulaca*. Wood charcoal was predominantly piñon, with a small amount of juniper. Based on morphology and content, this feature appears to be an Ancestral Pueblo period roasting pit.

Chipped Stone

Surface stripping, Level 1 excavations, and feature excavation yielded 475 chipped stone artifacts weighing a total of 2.47 kg and 10 sherds. The sherds are described in the ceramics section of this report.

The chipped stone artifacts consist mainly of debitage (97.9 percent), with few cores and tools. A small proportion of biface flakes (9.7 percent) reflect limited tool production, while the remaining artifacts reflect very limited raw-material procurement, core reduction, and diverse tool use.

The Cenozoic era Santa Fe group gravels, namely the Ancha formation, contain chert. These sedimentary deposits also contain metaquartzite cobbles and small amounts of silicified wood. The Sangre de Cristo foothills contain Precambrian era granite and gneiss overlain by Paleozoic era Pennsylvanian deposits of sandstone, shale, and limestone. Within some of this limestone, namely in the Madera formation, are bedded nodules and veins of chert, which were quarried prehistorically (Lang 1993:6 and 13; Lang 1995:5; Viklund 1994:1; Ambler and Viklund 1995:5). Madera chert occurs as residual cobbles and pebbles in the later Santa Fe group gravel. Nonlocal materials such as obsidian, Pedernal chert, and basalt are found in the axial gravel of the Rio Grande. However, the primary sources of the obsidian and the Pedernal chert lie in the Jemez Mountains. A small amount of obsidian can also be found scattered across Caja del Rio Mesa. Other than the Rio Grande, Caja del Rio escarpment is the closest source of basalt (Kelley 1980:11–17).

The majority of these artifacts (65.7 percent) are of nonlocal materials, including basalt, obsidian, Polvadera Peak obsidian, and Pedernal chert. The majority of the nonlocal-material artifacts (92.6 percent) lack cortex, which suggests importation in a partially reduced state. When the chert, Madera chert, silicified wood, and metaquartzite retain cortex, it appears waterworn. This suggests these materials were obtained in local gravel deposits. The basalt, Pedernal chert, and silicified wood are fine grained. The obsidian is glassy. The cherts range from fine to medium grained. The metaquartzite ranges from fine to coarse grained. A total of 10.5 percent of the material is flawed. These flaws are mainly cracks, but voids are also obvious. No artifacts appear to have been thermally altered.

Twenty-five obsidian samples were subjected

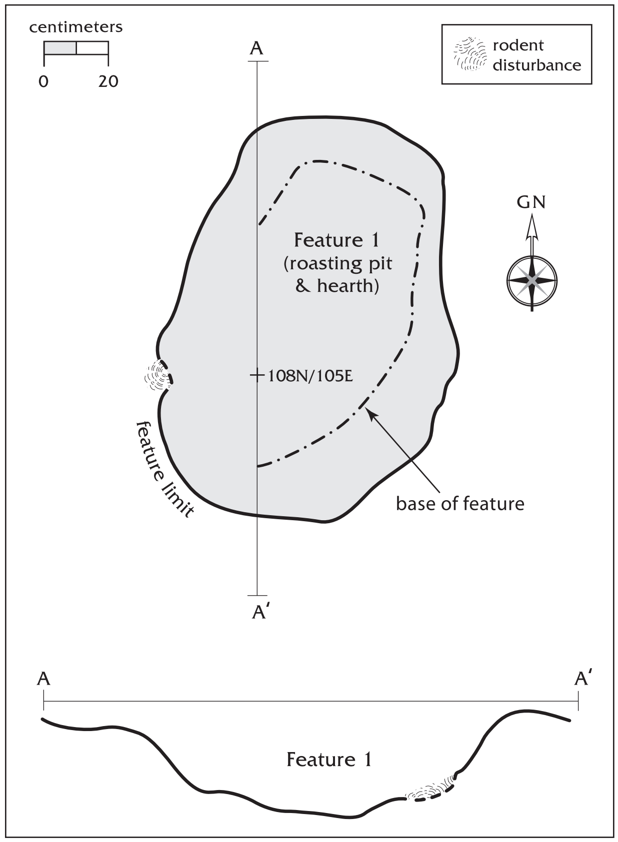


Figure 251. Plan and profile of Feature 1, LA 108902.

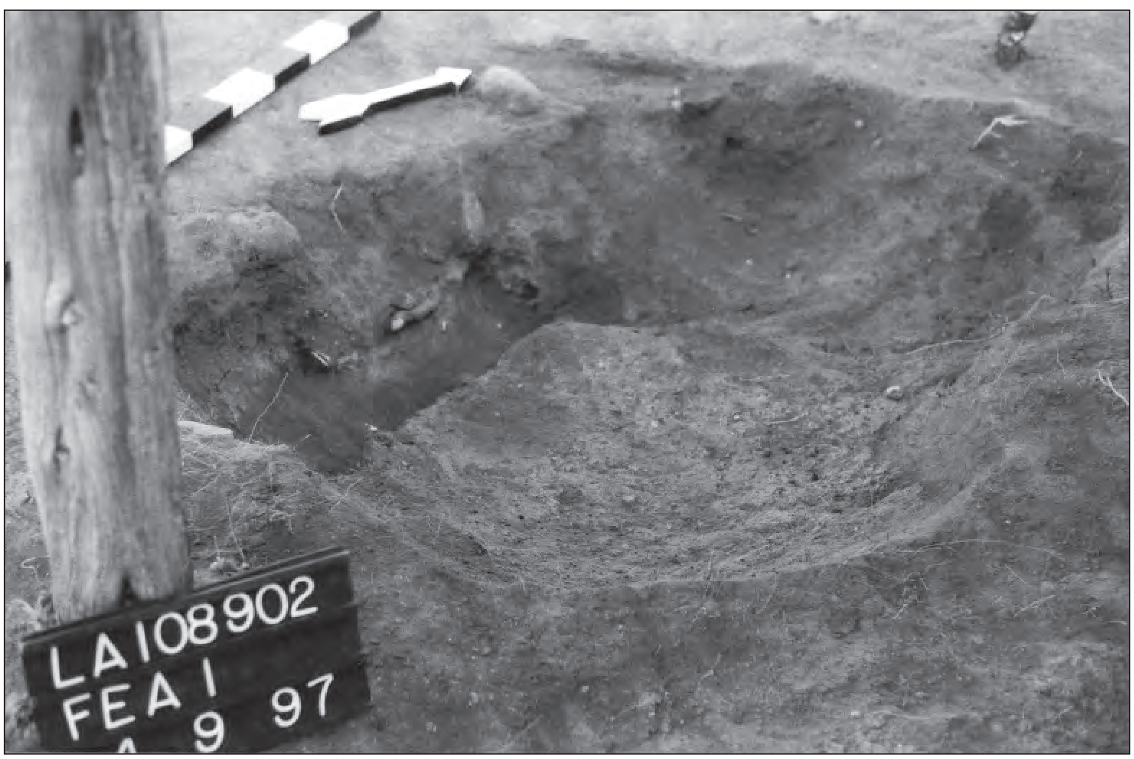


Figure 252. Feature 1, LA 108902.

to x-ray fluorescence (see Shackley, this report). Twenty-one samples sourced to the Cerro Toledo rhyolite, one to El Rechuelos, and three to Valle Grande. Cerro Toledo rhyolite could have been obtained from the Rio Grande alluvium and the Puye formation northeast of Santa Fe. El Rechuelos is the northernmost source and can be found in drainages that empty into the Rio Chama. Valle Grande obsidian comes from within the Valles Caldera. It does not occur within alluvial deposits. Its occurrence indicates direct acquisition or trade with Jemez populations.

Debitage. Debitage, including 283 core flakes, 136 pieces of angular debris, and 46 biface flakes, comprises 97.9 percent of the chipped stone assemblage (Table 85). Nonutilized debitage weighs a total of 1.77 kg, accounting for 71.2 percent of the total assemblage weight. The core flake to biface flake ratio is 1:0.16. This low ratio suggests an emphasis on core reduction rather than biface manufacture.

Material types were divided into three material classes. Local chert includes undifferentiated chert, Madera cherts, chalcedony, and silicified wood. Nonlocal material includes Pedernal chert, obsidian, Polvadera Peak obsidian, and basalt. The other material class is metaquartzite. The following discussion is geared toward clarifying core-reduction sequences and discerning if there are significant differences between the material classes.

The majority of core flakes of nonlocal material (92.2 percent) lack dorsal cortex (Table 86). This suggests middle- to late-stage reduction and importation in a partially reduced state. The distribution of cortex for local chert reflects all stages of reduction. A high proportion of metaquartzite core flakes lacking dorsal cortex (73.5 percent) reflects middle- to late-stage reduction. The noncortical to cortical core flake ratio is 1:0.29. This low ratio reflects an overall preponderance of noncortical debris, which is produced in the middle to late stages of core reduction. The majority of metaquartzite core flakes (91.2 percent) display 0–2 dorsal scars (Table 87). This reflects early- to middle-stage reduction. Substantial proportions of nonlocal materials (33.5 percent) and local chert (20 percent) have 3–5 dorsal scars, suggesting middle- to late-stage reduction. One nonlocal material core flake displays 6 or more dorsal scars, reflecting late-stage reduction. The small proportion of nonlocal material core flakes retaining 60–100 percent cortex (2.2 percent) suggests early-stage reduction and implies curation of this material, namely obsidian, in its natural state, most likely in the form of small cortical nodules from secondary nonlocal sources such as Caja del Rio.

For nonlocal material, a preponderance of late-stage reduction debris is suggested by angular debris cortex distributions (Table 88). For local chert and metaquartzite, comparable proportions of angular debris lacking cortex and retaining 10–50 percent cortex reflect middle-stage reduction. One piece of metaquartzite angular debris retains 60–100 percent cortex, suggesting early-stage reduction.

The majority of metaquartzite (70.6 percent) and local chert (51.4 percent) core flakes have cortical or single-facet platforms, suggesting early-stage core reduction (Table 89). The majority of nonlocal material core flakes (72.1 percent) have various broken platforms, which may indicate late-stage reduction. A substantial proportion of local chert core flakes (45.7 percent) have various broken platforms. This may be accounted for by the high proportion of flawed cherts, or it may reflect the later stages of reduction. The small proportions of core flakes with multifaceted and abraded platforms reflect middle- to late-stage reduction. Retouched platforms are not represented. Abraded platforms are represented by one local chert core flake.

The whole to fragmentary core flake ratio is 1:3.4, indicating a prevalence of fragmentary core flakes. The most frequent portions are lateral (44.5 percent) and proximal (12.4 percent) (Table 90). The lowest proportion of whole flakes (15.1 percent) is represented by nonlocal material, which may indicate a preponderance of later-stage reduction debris. Generally, flake breakage increases in the later stages of reduction as flakes get thinner; however, other postreduction cultural and natural processes, such as trampling or solifluction, must be considered as well (Moore 1996:247). The high frequency of core flake breakage (77.4 percent) may indicate the later stages of reduction. Comparable proportions of distal and proximal portions can indicate postreduction breakage, whereas a prevalence of distal portions points to breakage during reduction (Moore 1996:254). There are comparable proportions of core flake

Table 85. Debitage artifact type by material type, LA 108902

Number Row % Column %	Chert	Madera Chert, Yellow/Red Mottled	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Chalcedony	Pedernal Chert	Silicified Wood	Obsidian	Polvadera Peak Obsidian	Basalt	Metaquartzite	Total
Angular debris	6	1	9	7	-	3	1	13	3	67	26	136
	4.4%	0.7%	6.6%	5.1%	-	2.2%	0.7%	9.6%	2.2%	49.3%	19.1%	100.0%
	16.7%	25.0%	21.4%	46.7%	-	-	25.0%	13.8%	25.0%	35.4%	42.6%	28.6%
Core flake	26	3	31	7	1	6	2	57	7	109	34	283
	9.2%	1.1%	11.0%	2.5%	0.4%	2.1%	0.7%	20.1%	2.5%	38.5%	12.0%	100.0%
	72.2%	75.0%	73.8%	46.7%	100.0%	35.3%	50.0%	60.6%	58.3%	57.7%	55.7%	59.6%
Biface flake	4	-	1	-	-	6	-	22	2	11	-	46
	8.7%	-	2.2%	-	-	13.0%	-	47.8%	4.3%	23.9%	-	100.0%
	11.1%	-	2.4%	-	-	35.3%	-	6.4%	50.0%	3.2%	-	9.7%
Multidirectional core	-	-	-	-	-	-	-	-	-	-	1	1
	-	-	-	-	-	-	-	-	-	-	100.0%	100.0%
	-	-	-	-	-	-	-	-	-	-	1.6%	0.2%
Tested pebble	-	-	-	1	-	-	-	-	-	-	-	1
	-	-	-	100.0%	-	-	-	-	-	-	-	100.0%
	-	-	-	6.7%	-	-	-	-	-	-	-	0.2%
Uniface	-	-	-	-	-	-	-	-	-	1	-	1
	-	-	-	-	-	-	-	-	-	100.0%	-	100.0%
	-	-	-	-	-	-	-	-	-	0.5%	-	0.2%
Biface	-	-	-	-	-	-	-	1	-	-	-	1
	-	-	-	-	-	-	-	100.0%	-	-	-	100.0%
	-	-	-	-	-	-	-	1.1%	-	-	-	0.2%
Early-stage biface	-	-	-	-	-	-	-	-	-	1	-	1
	-	-	-	-	-	-	-	-	-	100.0%	-	100.0%
	-	-	-	-	-	-	-	-	-	0.5%	-	0.2%
Late-stage biface	-	-	1	-	-	2	1	1	-	-	-	5
	-	-	20.0%	-	-	40.0%	20.0%	20.0%	-	-	-	20.0%
	-	-	2.4%	-	-	11.8%	25.0%	1.1%	-	-	-	1.1%
Total	36	4	42	15	1	17	4	94	12	189	61	475
	7.6%	0.8%	8.8%	3.2%	0.2%	3.6%	0.8%	19.8%	2.5%	39.8%	12.8%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 86. Core flake dorsal cortex by material class, LA 108902

Number Row % Column %	Local Chert	Nonlocal Material	Metaquartzite	Total
Noncortical	30	165	25	220
	13.6%	75.0%	11.4%	100.0%
	42.9%	92.2%	73.5%	77.7%
10-50%	16	10	5	31
	51.6%	32.3%	16.1%	100.0%
	22.9%	5.6%	14.7%	11.0%
60-100%	24	4	4	32
	75.0%	12.5%	12.5%	100.0%
	34.3%	2.2%	11.8%	11.3%
Total	70	179	34	283
	24.7%	63.3%	12.0%	100.0%
	100.0%	100.0%	100.0%	100.0%

Table 87. Core flake dorsal scars by material class, LA 108902

Number Row % Column %	Local Chert	Nonlocal Material	Metaquartzite	Total
0-2	55	112	31	198
	27.8%	56.6%	15.7%	100.0%
	78.6%	62.6%	91.2%	70.0%
3-5	14	60	3	77
	18.2%	77.9%	3.9%	100.0%
	20.0%	33.5%	8.8%	27.2%
6 or >6	-	1	-	1
	-	1	-	100.0%
	-	0.6%	-	0.4%
Indeterminate	1	6	-	7
	14.3%	85.7%	-	100.0%
	1.4%	3.4%	-	2.5%
Total	70	179	34	283
	24.7%	63.3%	12.0%	100.0%
	100.0%	100.0%	100.0%	100.0%

Table 88. Angular debris cortex by material class, LA 108902

Number Row % Column %	Local Chert	Nonlocal Material	Metaquartzite	Total
Noncortical				
	17	82	19	118
	14.4%	69.5%	16.1%	100.0%
	70.8%	95.3%	73.1%	86.8%
10-50%	7	4	6	17
	41.2%	23.5%	35.3%	100.0%
	29.2%	4.7%	23.1%	12.5%
60-100%	-	-	1	1
	-	-	100.0%	100.0%
	-	-	3.8%	0.7%
Total	24	86	26	136
	17.6%	63.2%	19.1%	100.0%
	100.0%	100.0%	100.0%	100.0%

Table 89. Core flake platform type by material class, LA 108902

Number Row % Column %	Local Chert	Nonlocal Material	Metaquartzite	Total
Cortical and single-facet platforms	36	44	24	104
	34.6%	42.3%	23.1%	100.0%
	51.4%	24.6%	70.6%	36.7%
Multifacted, abraded, and retouched platforms	2	6	-	8
	25.0%	75.0%	-	100.0%
	2.9%	3.4%	-	2.8%
Absent, collapsed, crushed, and broken-in-manufacture platforms	32	129	10	171
	18.7%	75.4%	5.8%	100.0%
	45.7%	72.1%	29.4%	60.4%
Total	70	179	34	283
	24.7%	63.3%	12.0%	100.0%
	100.0%	100.0%	100.0%	100.0%

distal and proximal portions for both local chert and nonlocal material, which may indicate some postreduction breakage. Material flaws should also be taken into account when examining flake breakage distributions. A total of 12.7 percent of core flakes are flawed, which includes 22 local chert, 11 nonlocal material, and 3 metaquartzite core flakes. Breakage along an incipient fracture plane or other flaw can contribute to the representation of all fragmentary portions and can occur in all stages of reduction, although it seems less likely that a flawed material would be intensely reduced if a more suitable raw material is easily obtainable.

Table 90. Core flake portion by material class, LA 108902

Number Row % Column %	Local Chert	Nonlocal Material	Metaquartzite	Total
Whole	25	27	12	64
	39.1%	42.2%	18.8%	100.0%
	35.7%	15.1%	35.3%	22.6%
Proximal	8	23	4	35
	22.9%	65.7%	11.4%	100.0%
	11.4%	12.8%	11.8%	12.4%
Medial	5	16	3	24
	20.8%	66.7%	12.5%	100.0%
	7.1%	8.9%	8.8%	8.5%
Distal	7	25	2	34
	20.6%	73.5%	5.9%	100.0%
	10.0%	14.0%	5.9%	12.0%
Lateral	25	88	13	126
	19.8%	69.8%	10.3%	100.0%
	35.7%	49.2%	38.2%	44.5%
Total	70	179	34	283
	24.7%	63.3%	12.0%	100.0%
	100.0%	100.0%	100.0%	100.0%

The distribution of core flake dorsal cortex, dorsal scarring, platform type, portion, and angular debris cortex generally support the interpretation of differential core-reduction intensity by material class. Size differences between material classes may lend additional support.

Table 91 gives the impression that size is related to material class. Mean whole measurements are consistently the smallest for nonlocal material and consistently the largest for quartzite. The mean statistics for local chert core flakes consistently lie somewhere in between the other two classes. There is considerable overlap in the distributions of each measurement among the material classes, but the mean differences may reflect differential core-reduction intensity. However, size is not always a good indicator of reduction stage and may simply be related to parent raw-material size. In this case, the empirical data described above indicates that all stages of reduction are represented by each material class, but quartzite core flake emphasize early- to middle-stage reduction, local chert core flakes emphasize middle- to late-stage reduction, and nonlocal material core flakes emphasize late-stage reduction. The metric data appears to support this interpretation.

Nonlocal materials, including Pedernal chert, obsidian, and basalt, account for the majority of biface flakes (89.0 percent). The most frequent biface flake material is undifferentiated obsidian

Table 91. Core flake mean whole measurements by material class, LA 108902

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
			Local Chert		
Number	38	33	33	33	25
Mean	5.2	25.1	20.7	7	4
SD	3.4	12.6	9.6	4.3	6.6
Minimum	1.3	10	9	2	0.1
Maximu	16.1	60	53	18	30.4
			Nonlocal Material		
Number	50	51	50	50	27
Mean	3.7	18.7	19.3	5.1	2
SD	1.7	8.7	7.2	3.5	2.1
Minimum	1.1	8	8	1	0.1
Maximu	8.4	52	40	24	8.5
			Metaquartzite		
Number	24	20	16	16	12
Mean	8.6	35.7	37.1	13.4	21.8
SD	4	19.2	16.9	6.6	18.9
Minimum	2.9	9	10	5	0.4
Maximu	15.8	68	77	32	55.6
			All Materials		
Number	112	104	99	99	64
Mean	5.2	24	22.6	7.1	6.5
SD	3.5	14	11.9	5.2	11.7
Minimum	1.1	8	8	1	0.1
Maximu	16.1	68	77	32	55.6

Table 92. Biface flake mean whole measurements by material class, LA 108902*

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
			Obsidian		
Number	12	5	15	15	4
Mean	1.9	12.8	13.1	2.9	0.3
SD	0.9	2.2	3.7	0.7	0.3
Minimum	0.8	10	8	2	0.1
Maximum	3.3	16	20	4	0.7
			All Materials		
Number	20	11	31	31	8
Mean	2.2	13.3	12.5	2.7	0.4
SD	0.9	3.4	3.3	0.7	0.3
Minimum	0.8	9	7	2	0.1
Maximum	3.5	21	20	4	1

* Individual material type included if N=5 or more for one or more whole measurements.

(47.8 percent) followed by basalt (23.9 percent) and Pedernal chert (13.0 percent). The most frequent biface flake platform types are crushed (37.0 percent), abraded (19.6 percent), and retouched and abraded (17.4 percent). Whole measurements for Polvadera Peak obsidian biface flakes, which consist of width and thickness measurements from one flake, were included with the obsidian measurements summary (Table 92).

Informal tools: Eight pieces of utilized and/or retouched debitage were recovered (Table 93). These include fragmentary portions of core flakes and angular debris of Madera chert, Pedernal chert, obsidian, and basalt.

The majority of artifacts (7) have one utilized/retouched edge. FS 4 has two utilized/retouched edges. For all utilized/retouched debitage, the location of these edges is distal or lateral. By definition, angular debris cannot be oriented, and edge location cannot be determined. The most frequent edge outline form is convex (4) followed by straight (3) and concave (2). These three edge outline types show unidirectional and bidirectional wear scars.

The majority of edges (6) display unidirectional wear scars, which implies use in a transverse motion such as scraping, whittling, or planing. The remaining three edges exhibit bidirectional wear scars, which suggests use in a longitudinal motion such as cutting, slicing, or sawing (Chapman and Schutt 1977:86–92; Odell and Odell-Vereecken 1980:98–99). One artifact (FS 4) shows unidirectional rounding, which can indicate relatively extended use in a transverse motion (Vaughan 1985:26). Some use-wear analysts using high-power magnification (100–200 power) to examine experimental stone tools caution against the reliability of interpretations based solely on scarring. Patterned scarring can also be caused by natural processes such as solifluction or cryoturbation as well as by trampling. In experimental context, bidirectional and unidirectional scarring are produced by both transverse and longitudinal motions (Keeley 1980:30–36; Vaughan 1985:10–12, 19–24).

The majority of edge angles (6) measure over 40 degrees. The remaining three edges measure under 40 degrees. Post (1996:418), citing experiments by Schutt (1981), suggests that tools with edge angles of 40 degrees or below are better suited for cutting, while tools with edge angles above 40 degrees are better suited for scraping. Furthermore, he suggests that tools with edge angles over 60 degrees could accommodate more heavy-duty or intensive use. Four edges have angles measuring over 60 degrees, and all four display unidirectional retouch and wear.

Formal tools: Excavation yielded eight whole and fragmentary bifaces, including four fragmentary projectile points, manufactured from fine-grained Madera chert, Pedernal chert, silicified wood, basalt, or obsidian (Table 94).

All projectile points are late-stage bifaces, which exhibit a regular facial scarring pattern. All display continuous bimarginal scarring, and one (FS 85-1) displays step-fracturing. All points have a lenticular transverse cross section. The fragmentary condition of the three medial portions precludes temporal placement. Two medial fragments (FS 85-1 and FS 78) exhibit haft snap fractures, suggesting use breakage (Johnson 1979:26; OAS 1993:18). FS 85-1 also exhibits an impact fluting scar, which also indicates use breakage (Whittaker 1994:165). FS 78 has a snapped tip. The remaining medial biface fragment is truncated on opposing ends by lateral snap fractures, suggesting manufacture or maintenance breakage (Johnson 1979:25; OAS 1993:18).

FS 32 is the proximal portion of small projectile point. Its base is intact. Hafting modification consists of rounded shoulders with a parallel to slightly constricted stem and a slightly convex base. The whole measurements of stem width, stem length, shoulder width, neck thickness, and maximum thickness are 9.5 mm, 5.3 mm, 15.2 mm, 4.2 mm, and 5.2 mm, respectively. This point closely resembles Thoms's (1977:113) En Medio Parallel, Number 9; and the OLE project's En Medio/Armijo stemmed type (Turnbow 1997:180–182). Whole measurements fall within the ranges of each type. The point also appears fairly similar to an En Medio phase point (Irwin-Williams 1973: Fig. 6e). The rounded shoulders may be the result of reworking (Thoms 1977:113). A lateral snap fracture terminates the distal portion of the point. This type of fracture suggests breakage during manufacture or maintenance (Johnson 1979:25; OAS 1993:18). For the En Medio Parallel type, Thoms (1977:113) suggests a temporal range from the late Armijo phase to the early En Medio phase (1000 BC to AD 200). A Late Archaic range is also

Table 93. Utilized/retouched debitage, LA 108902

FS No.	Material Type	Morphology	Portion	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Utilized Edge	Wear Pattern	Utilized Edge Outline	Utilized Edge Length (mm)	Utilized Edge Angle (degrees)
4	Pedernal chert	core flake	distal	21	21	5	3.4	distal	unidirectional retouch and wear, rounding	convex	36	65
								lateral	bidirectional wear	straight	19	45
16	Madera chert, red and mottled red	angular debris	indeterminate	44	33	10	8.6	indeterminate	bidirectional wear	concave	23	38
29	Pedernal chert	core flake	lateral	28	17	4	2.4	distal	unidirectional retouch and wear	convex	32	65
45	Pedernal chert	angular debris	indeterminate	30	16	12	6.8	indeterminate	unidirectional retouch and wear	convex	46	62
73-2	Madera chert, red and mottled red	core flake	whole	22	19	6	2.2	distal	unidirectional retouch and wear	convex	27	80
83	Madera chert, red and mottled red	core flake	lateral	46	30	9	11.2	lateral	unidirectional retouch and wear	straight	32	29
85-2	Polvadera Peak obsidian	core flake	lateral	18	10	3	0.6	lateral	bidirectional wear	straight	16	30
88-1	basalt	angular debris	indeterminate	55	27	8	14.7	indeterminate	unidirectional retouch and wear	slightly concave	39	47

Table 94. Bifaces, LA 108902

FS No.	Material Type	Morphology	Function	Portion	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)	Facial Scarring Pattern	Marginal Scarring Pattern
19-1	obsidian	late-stage biface	small projectile point	medial	12	15	4	0.8	regular	continuous scalar scarring
32	Madera chert, red	late-stage biface	small projectile point	proximal	17	15	5	1.3	regular	continuous scalar scarring
50	Pedernal chert	late-stage biface	biface	distal	20	10	6	1.2	regular	continuous scalar scarring and step-fracturing, rounding
75	obsidian	biface flake	biface fragment	distal	17	29	5	1.5	indeterminate	continuous scalar scarring
78	silicified wood	late-stage biface	small projectile point	medial	18	10	3	0.7	regular	continuous scalar scarring
85-1	Pedernal chert	late-stage biface	small projectile point	medial	18	12	4	0.8	regular	continuous scalar scarring and step-fracturing
92	basalt	early-stage biface	biface	indeterminate fragment	55	41	21	37.6	irregular	discontinuous scalar scarring, step-fracturing, and crescentic scarring
131-3	obsidian	biface	biface	indeterminate fragment	14	12	6	0.8	irregular	discontinuous scalar scarring and step fracturing

suggested by similarities to the En Medio/Armijo stemmed type (Turnbow 1997:180).

One late-stage biface fragment (FS 50) resembles a drill tip fragment. Relatively even rounding is exhibited along both edges. It has a narrow ovate transverse cross section. The artifact is proximally truncated by a lateral snap.

FS 75-2 is a distal fragment of an overshoot or outrepassé flake. Outrepassé flakes, which typically occur during soft hammer percussion, are produced when the crack of a flake continues to the end of a biface and bends removing a portion of the opposing biface edge (Whittaker 1994:19 and 163). This type of flake is diagnostic of a biface production failure and has also been termed reverse fracture (Johnson 1979:25). The fragmentary condition of the biface edge included with this flake precludes a facial scarring pattern determination.

An early-stage (FS 92) and an undifferentiated (FS 131-3) biface display irregular facial scarring patterns. Flake scars are not similar in spacing or size. Both are plano-convex in cross section and are snap fractured, which can indicate manufacture breakage.

FS 44-1 is a four-edged, elongate, diamond-shaped uniface manufactured from a fine-grained basalt. It has a regular facial scarring pattern, that is, the flake scars are evenly spaced and of similar dimensions (OAS 1993). Marginal scarring consists of continuous unidirectional scars as well as discontinuous step-fracturing. The edge perimeter measures 274 mm and is relatively equally divided among four fairly straight edges. The edge angle is 69 degrees. No evidence of hafting was observed. The artifact does not retain cortex. It measures 123 mm long by 41 mm wide by 17 mm thick and weighs 94.7 g.

Hand tool: FS 80-1 is a core chopper. The tool was manufactured from a flattened cobble of medium-grained metaquartzite. Thirteen flakes were removed from opposing surfaces along the utilized edge. This convex edge measures 197 mm with an edge angle of 65 degrees. The wear pattern consists of step-fracturing and crushing. The retention of cortex along a portion of the perimeter and on portions of both surfaces provides a natural backing. This backing along with the artifact's overall size make it easily held in the hand. It measures 103 mm by 95 mm by 47 mm and weighs 510.3 g.

Core: One tested pebble was recovered. It is a fine-grained, red Madera chert with two flake scars but retaining 80 percent waterworn cortex. It measures 30 mm long by 21 mm wide by 19 mm thick and weighs 3.2 g. Due to its diminutive size, freehand reduction seems unlikely, but it lacks definitive evidence of bipolar reduction. This artifact points to limited procurement of raw material from a local gravel source.

Comparison of the testing- and excavation-phase assemblages. In addition to the assemblage described above, the testing phase yielded 83 chipped stone artifacts that were analyzed in the field or laboratory (Post 1997:12–26, 47–53). The following discussion addresses assemblage-level and artifact-level attributes for comparison.

An expanded material type distribution is evident in the excavation-phase assemblage. Material types not recorded during the testing phase include locally available silicified wood as well as nonlocal Pedernal chert and Polvadera Peak obsidian. As noted in the testing-phase report, compared to other Northwest Santa Fe Relief Route sites, LA 108902 is unique in the prevalence of basalt. In fact, in the excavation-phase assemblage, nonlocal materials including basalt are more frequent than locally available materials.

The artifact type distribution was also expanded during the excavation phase. Artifacts that were not recovered during testing include cores and formal tools. During testing, one resharpening flake was recovered, suggesting that limited tool maintenance occurred on site. No such artifact type was recovered during excavation. During the testing phase, the core flake to biface flake ratio was 1:0.22. The excavation-phase ratio of 1:0.16 suggests slightly less emphasis on biface manufacture. Overall, both ratios reflect an emphasis on core reduction rather than biface manufacture. A total of 58 core flakes are included in the testing-phase assemblage.

Core flake dorsal cortex distributions in the testing and excavation-phase assemblages are comparable. Within the noncortical, 10–50 percent, and 60–100 percent dorsal cortex classes, no difference exceeds 5 percent. The noncortical to cortical core flake ratios are 1:0.37 and 1:0.29 in the testing- and excavation-phase assemblages, respectively. Each reflects a preponderance of noncortical core flakes, which are produced in the middle to late stages of core reduction.

Testing (1:0.90) and excavation-phase assemblages (1:3.42) have disparate whole-to-fragmentary core flake ratios. Fragmentary portions are more than three times more frequent than whole flakes in the excavation-phase assemblage. Flake condition may be related to reduction sequence, post-reduction breakage, and material flaws.

There are no drastic differences between the testing- and excavation-phase core flake platform type distributions. However, there is a larger proportion of multifaceted platforms (7.4 percent more) in the testing-phase assemblage and a larger proportion of core flakes exhibiting platform breakage (5.1 percent more) in the excavation-phase assemblage. In the two assemblages, proportions of the single-facet and cortical platform class are fairly similar. The difference does not exceed 5 percent. Platform type is related to reduction sequence.

The testing-phase whole core flake length and thickness central tendency and dispersion statistics are comparable to the whole length and thickness statistics for the excavation-phase assemblage. No difference in mean or standard deviation statistics exceeds 3 mm. Size may be related to reduction sequence.

With the exception of the disparate whole-to-fragmentary core flake ratios, there are no glaring differences between the testing- and excavation-phase assemblages. The expansion of the material and artifact type distributions is to be expected during excavation.

Site Summary

LA 108902 is one of the higher density and more diverse chipped stone concentrations examined during the Northwest Santa Fe Relief Route project. Lacking the vertical extent and apparent time depth of other large sites, it has a unique artifact assemblage within the project sample. Excavation revealed a more restricted spatial distribution than was expected from the test excavations. The distribution data show elements of site structure that may relate to more logistically organized hunting strategies.

More chipped stone artifacts (470) were recovered than at any of the other sites. There were higher numbers of obsidian, noncortical core flakes, and biface flakes, and a relatively high number of formal tools. Artifact dimensions are small along with the low number of cortical debris and cores, indicating that raw material was intensively reduced. This may have resulted from repeated occupations and the use of surface materials with curated or transported raw materials.

The fire-cracked, rock-filled Feature 1 is similar to features found on Late Archaic and Ancestral Pueblo sites on the piedmont (see Badner and McBride, this volume). It yielded medium to large mammal bone, suggesting the roasting of meat. Two projectile point fragments (one Ancestral Pueblo and one of Late Archaic age) occur within 2 m of Feature 1, and the majority of the sherds are from the grids to the northwest. Therefore, the temporally diagnostic artifacts do not help in assigning an occupation date to the feature. Interestingly, the majority of the temporally diagnostic artifacts occur away from the main artifact clusters, which form three lesser concentrations, possibly indicating three distinct components.

Undoubtedly, this ridge was a major route between the villages along the Santa Fe River and its northern tributaries. While it is tempting to attribute the bulk of the occupations to the Coalition and Early Classic periods, it is also possible that the some of the surface artifacts are from later, more transient Classic period occupations, as was evident at LA 111364 during this project and LA 98688, in the Las Campanas area (Post 1996a). The excavation of LA 108902 has provided an invaluable benchmark in lithic technology and manufacture that can be used to compare the full range of temporal and functional components investigated during this project.

LA 111364

LA 111364 was at the intersection of the north exit ramp and the connector road between Camino La Tierra and the Northwest Santa Fe Relief Route. It was the easternmost site investigated during the project. It was north of LA 61308, which was investigated during the 1988 testing project (Wolfman 1989 et al.:69–71). LA 111364 was test excavated in 1996 (Post 1997:22–27).

The site was near the headwaters of a primary tributary of the Arroyo de los Frijoles at an elevation of 2,104 m (6,900 ft). Topographically, the site was at a break in the piedmont ridges that forms a low-resistance route to Arroyo de los Frijoles, Arroyo Calabasas, and Alamo Creek, which are all to the north. Adjacent to the site is the tributary head cut where numerous, short, modern channels cut deeply into alluvium of the Pojoaque Rough Broken Land complex. The arroyo channel quickly widens as it crosses the southern edge of the site. The artifacts occur on a gentle to moderately steep, southwest-facing middle and lower ridge slope The deflated and cobbly hill slope is cut by one modern erosion channel that drains south into the tributary arroyo. Excavations exposed the upper soil level, which was an A1 light reddish-brown, sandy clay loam with 5 to 10 percent rounded igneous or metamorphic gravel. Excavation reached the top of the C1ca layer, which was similar to the A1 except that it had 25 percent gravel and numerous blotches and disseminations of lime (Folks 1975:43). Erosion channel formation is aided by the sparse ground cover and the loose structure of the Pojoaque Rough Broken Land association. Vegetative cover is sparse to moderate with grasses, prickly pear, narrowleaf yucca, and a sparse to moderately dense overstory of piñon and juniper.

Preexcavation Description

LA 111364 was a spatially extensive sherd and lithic artifact scatter with two concentrations that may have greater artifact frequency or diversity than was visible on the surface. Site dimensions were 54 m east-west by 47 m north-south, or 2,538 sq m. Artifact classes included at least 100 chipped stone artifacts and 24 sherds, including Kwahe'e and Santa Fe Black-on-white, Biscuit A, Biscuit B, Sankawi Black-on-cream, and smeared indented corrugated pottery. The pottery indicated sporadic occupations between AD 1000 and 1650. This long occupation span resulted in a spatially expansive artifact scatter reflecting all stages of expedient stone tool production and limited evidence of formal tool production. Local raw materials were available on the ridge slopes during all periods. Test excavation revealed that cultural materials were present at a shallow depth, but that subsurface artifacts outnumbered surface artifacts in the middle and upper slope excavation units.

Excavation Methods

Data recovery focused on two artifact concentrations on the slope above the arroyo bottom. The baseline used during the testing project was reestablished, and the centerline was designated 100E. Surface-strip and excavation areas were set up encompassing the densest portions of the artifact concentrations.

A 5 by 5 m area, 94N/124E (southwest corner), or Area 1, and a 6 by 4 m area, 89N/106E southwest corner, or Area 2, were surface-stripped below the level of the dense cobble deposit within each cluster (Fig. 253). These excavation areas incorporated the 2 by 2 m test excavation units. Few subsurface artifacts and no other evidence of buried cultural deposits were encountered. The erosion channels were inspected for buried cultural deposits. None were found, even though the channels were as much as 1.75 m deep, and excavation was halted. These clusters were typical surface artifact concentrations that comprise the majority of the cultural materials investigated during the testing project in 1989.

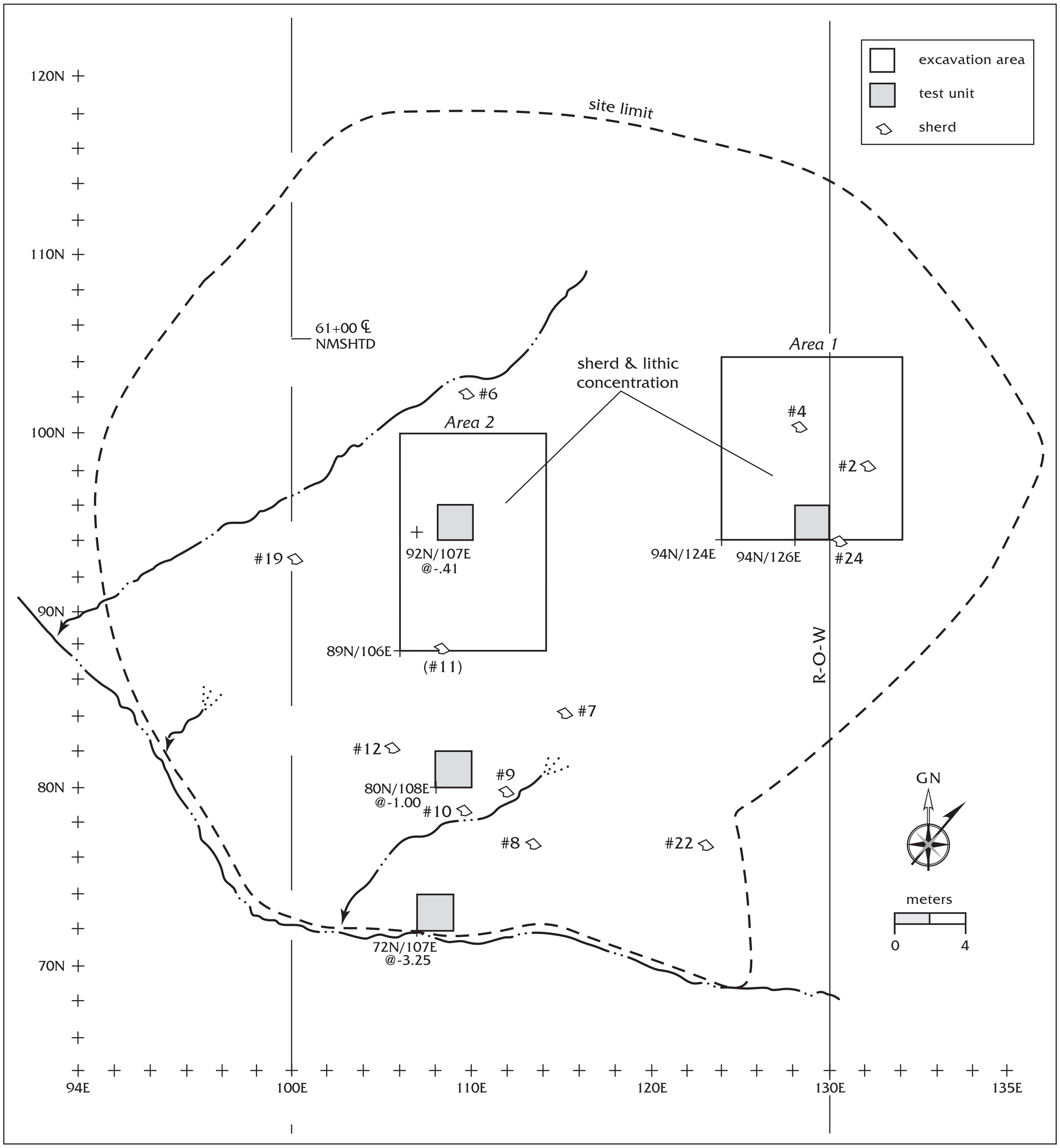


Figure 253. Plan of LA 111364.

Excavation Results

Excavations focused on Areas 1 and 2. The results were less dramatic than expected, and little was added to interpretations of the testing data.

Excavation of Area 1 area focused on a sherd and lithic concentration. The surface sherds identified during test excavations were primarily Bandelier Black-on-gray (Biscuit B) pottery, which was manufactured between AD 1450 and 1550 (Habicht-Mauche 1993; Warren 1977). The cluster of pottery and early-stage core-reduction lithic artifacts were thought to represent a late Classic period foraging camp. This hypothesis was strengthened by the fact that LA 61308, to the south and across the main tributary arroyo, also had Bandelier Black-on-gray pottery. Excavation was expected to reveal more site structural and assemblage data on late Classic period foraging.

At Area 1 the surface was covered by a dense pavement of cobbles and gravel mixed with a thin layer of Pojoaque Rough Broken Land association A1 soil. Removal of 10 to 15 cm of topsoil exposed C1Ca sandy loam, which contained fewer artifacts than were recovered during testing. No sherds were recovered that would have indicated a more intact or intensively used late Classic period foraging camp. An artifact density of one artifact per 2 sq m was not considered sufficient to extend the excavation area beyond the 5 by 5 m limit.

At Area 2, the lithic artifacts were clustered at the lower and middle slope junction. Surface artifact and subsurface artifact frequencies revealed by test excavation indicated that substantial evidence of lithic raw-material procurement might be present. Soils similar to those in Area 1 were encountered, and artifacts were recovered at a one artifact per square meter. The artifact diversity and counts were less than what had been recovered during testing. Because of the low artifact frequency and limited potential for new information, excavation was halted.

Excavation of the two artifact concentrations and reexamination of the site surface did not result in a change in the site boundaries or an increase in artifact concentrations. It became obvious that LA 61308 and LA 111364 were in fact the same site divided into two components and separated by the tributary arroyo.

Chipped Stone Artifacts

Based on the results of testing, fewer artifacts were recovered during the excavation of LA 111364 than expected. Only 27 chipped stone artifacts and one sherd were recovered. The sherd is described in the ceramics section of this report.

A total of 27 chipped stone artifacts weighing 0.88 kg were recovered from LA 111364. This total consists mainly of core flakes and angular debris, and includes one core (Table 95). These artifacts reflect limited raw-material procurement and core reduction.

A substantial proportion (48.1 percent) of these artifacts are red and mottled red. Nonred Madera chert was also present. A total of 23 out of 24 artifacts that retain cortex have waterworn

Table 95. Chipped stone artifact type by material type, LA 111364

Number Row % Column %	Chert	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Silicified Wood	Metaquartzite	Total
Angular debris	1	3	-	-	3	7
	14.3%	42.9%	-	-	42.9%	100.0%
	20.0%	27.3%	-	-	37.5%	25.9%
Core flake	4	7	2	1	5	19
	21.1%	36.8%	10.5%	5.3%	26.3%	100.0%
	80.0%	63.6%	100.0%	100.0%	62.5%	70.4%
Multidirectional core	-	1	-	-	-	1
	-	100.0%	-	-	-	100.0%
	-	9.1%	-	-	-	3.7%
Total	5	11	2	1	8	27
	18.5%	40.7%	7.4%	3.7%	29.6%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

cortex. It is believed that these materials were obtained from local gravel deposits rather than an in-situ bedded source.

The Cenozoic era Santa Fe group gravels, namely the Ancha formation, contain chert. These sedimentary deposits also contain metaquartzite cobbles and small amounts of silicified wood. The Sangre de Cristo foothills contain Precambrian era granite and gneiss overlain by Paleozoic era Pennsylvanian deposits of sandstone, shale, and limestone (Kelley 1980:11–17). Within some of this limestone, namely of the Madera formation, are bedded nodules and veins of chert, which were quarried prehistorically (Lang 1993:6, 13; Lang 1995:5; Viklund 1994:1; Ambler and Viklund 1995:5). Madera chert also occurs as residual cobbles and pebbles in the later Santa Fe group gravel.

Material quality ranges from fine to coarse grained. A relatively small proportion (14.8 percent) of the material contains flaws, mainly cracks.

Debitage. Debitage with an angular debris to core flake ratio of 1:2.7 comprises 96.3 percent of the lithic assemblage. The early to middle stages of core reduction are reflected in the 19 core flakes and 7 pieces of angular debris.

The noncortical to cortical core flake ratio is 1:3.8, indicating a predominance of cortical core flakes, which are produced during early- to middle-stage reduction. Noncortical flakes account for 21.1 percent, flakes with 10–50 percent dorsal cortex account for 42.1 percent, and flakes with over 50 percent account for 36.8 percent. Flakes with 0–1 dorsal scar are represented by a proportion of 47.4 percent, while 42.1 percent have 2–3 dorsal scars and 10.5 percent have 4–5 scars.

The majority (63.2 percent) of core flakes have cortical or single-facet platforms, which reflect the earlier stages of core reduction. The remaining 36.8 percent are relatively equally distributed among collapsed, crushed, and absent platforms.

The whole-to-fragmentary core flake ratio is 1:1.4. Proximal and lateral fragments are represented by equal proportions (26.3 percent). One distal fragment was recovered. See Table 96 for a summary of mean whole measurements.

No biface flakes, which are indicative of formal tool production, or tool maintenance debitage were recovered. None of the debitage appears to be thermally altered.

Table 96. Debitage mean whole measurements, LA 111364

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Number	12	12	13	13	8
Mean	7	39	33.3	10	24.3
SD	3.5	20.6	18.1	6.2	38.5
Minimum	1.6	14	15	4	0.7
Maximu	12	81	78	22	111.4

Core. FS 13-1 is a fine-grained, flawed, mottled red Madera chert multidirectional core with four complete negative flake scars. The core is not exhausted and retains 40 percent waterworn cortex. It represents an expedient core-reduction strategy, judging from its informal core platform preparation and discard prior to exhaustion. It measures 88 mm long by 72 mm wide by 42 mm thick and weighs 339.1 g.

Informal tool. FS 14-2 is a lateral fragment of a medium-grained, flawed, mottled red Madera chert core flake with a culturally obscured distal termination. The tool edge is fragmentary, and breakage during use cannot be discounted. The presence of this raw material in local gravel deposits and of recovered debitage of this same material may indicate that this expedient tool's manufacture, use, and discard occurred on site. The edge outline is slightly convex and exhibits unidirectional retouch and wear scars on the dorsal surface. The utilized edge has a maximum liner measurement of 28 mm and the edge angle measures 45 degrees. Wear pattern, morphology, and edge angle are consistent with that of a scraper that could have accommodated moderately heavy-duty use. It measures 48 mm long by 91 mm wide by 13 mm thick and weighs 70.8 g.

Comparison of the testing- and excavation-phase assemblages. In addition to the assemblage described above, the testing phase yielded 100 chipped stone artifacts that were analyzed in the field or laboratory (Post 1997:12–26, 47–53). The following discussion addresses assemblage-level and artifact-level attributes for comparison.

There are minor differences in the material type distributions of the testing- and excavation-phase assemblages. The testing-phase assemblage includes two chalcedony and one obsidian, while these materials are lacking in the excavation-phase assemblage. The excavation-phase assemblage includes silicified wood, which is not included in the testing-phase assemblage material type distribution. In the testing-phase assemblage, quartzite (38.0 percent) predominates but is closely followed by Madera chert (32.0 percent), whereas in the excavation phase, Madera chert (48.1 percent) predominates, followed quartzite (29.6 percent). With the exception of one obsidian core flake, all materials are available in the local gravel deposits.

There is more diversity in the artifact type distribution of the testing-phase assemblage. This may be related to the fact that more artifacts were recovered during this phase. Types not present in the excavation-phase assemblage include biface flake (1), tested cobble (1), multidirectional core (2), and early-stage biface (1). The biface flake and the early-stage biface point to limited tool production. There is no evidence of tool production in the excavation-phase assemblage. As noted in the testing report, the tested cobble reflects raw-material procurement. A total of 85 core flakes were in the testing-phase assemblage.

There are minor differences in the testing- and excavation-phase core flake dorsal cortex distributions. In the testing-phase assemblage, there is a larger proportion of core flakes that lack dorsal cortex (6.2 percent more) and a smaller proportion with 60–100 percent dorsal cortex (6.6 percent less). Within the 10–50 percent dorsal cortex class, the assemblages are comparable. The difference does not exceed 5 percent. The noncortical to cortical core flake ratios are 1:1.8 and 1:3.8 for the testing- and excavation-phase assemblages, respectively. Cortical core flakes are slightly more than twice as frequent than noncortical core flakes in the excavation-phase assemblage. However, each ratio reflects a predominance of early- to middle-stage core reduction.

Testing- (1:0.5) and excavation-phase assemblages (1:1.4) have disparate whole-to-fragmentary core flake ratios. Fragmentary portions are nearly three times more frequent than whole flakes in the excavation-phase assemblage. Flake condition may be related to reduction sequence, postreduction breakage, and material flaws.

Between assemblages, the main difference in the core flake platform type distributions is the presence of a small proportion of core flakes with multifaceted platforms (4.7 percent). The excavation-phase assemblage lacks core flakes with multifaceted platforms. Between assemblages, there are comparable proportions of core flakes with single-facet or cortical platforms. The difference is only 1.5 percent. In the excavation-phase assemblage, there is a larger proportion of core flakes that exhibit platform breakage (6.2 percent more). Platform type is related to reduction sequence.

The testing-phase whole core flake length and thickness central tendency and dispersion statistics are fairly comparable to the whole length and thickness statistics for the excavation-phase assemblage. In the excavation-phase assemblage, mean whole length and standard deviation statistics are 4 mm and 5.6 mm greater, respectively. The whole thickness statistics of each assemblage are equivalent. Size may be related to reduction sequence.

The disparate noncortical to cortical and whole-to-fragmentary core flake ratios along with the differences in the diversity of artifact types are the most glaring differences observed in the testing and excavation-phase assemblages.

Site Summary

The excavation of LA 111364 focused on two hillslope artifact concentrations. The chipped stone concentrations are associated with a general site ceramic assemblage that reflects occupation from AD 1000 to 1600. The 94N/124E area was most closely associated with Classic period (AD 1350 to 1450) pottery types. The 89N/106E area was more closely associated with Coalition to Early Classic period ceramics (AD 1200 to 1350). These areas yielded 9 and 17 chipped stone artifacts that can be combined with the test excavation assemblages for intrasite comparison and comparison with the other Northwest Santa Fe Relief Route sites. Excavation revealed no difference between the surface and subsurface assemblages nor any evidence of buried cultural deposits. The assemblage reflects long-term, highly transient use of the northern tributaries of the Santa Fe River.

LA 113946

LA 113946 was between centerline stations 689+00 and 691+00. Artifacts were scattered on both sides of the centerline, but excavation focused on the west right-of-way. LA 113946 was identified during the College Hills inventory (Anschuetz and Viklund 1997) and test excavated in 1996 (Post 1997:27–30).

The site is on a south-southeast-facing slope above an unnamed primary tributary of the Arroyo Gallinas. The tributary drains to the south out a southwest-trending, highly dissected broad ridge that divides the Arroyo Gallinas and Arroyo de los Frijoles drainage system, which is to the north. The tributary arroyo exposes deep ancient alluvial deposits of the piedmont surface, which overlies the Tesuque formation sandstone, which is also intermittently exposed. The piedmont soil is capped by lenses of gravel and cobble that are an Ancha formation remnant. The site surface is deflated by wind and water erosion, processes that are evident in the two shallow drainages that cut through the site center. An interrupted erosion channel bounds the Area 2 excavation area on the west, reflecting changes in soil aggradation and slope erosion. The soil association is Pojoaque Rough Broken Land. Excavation exposed the upper soil level, which was an A1 light reddish-brown, sandy clay loam with 5 to 10 percent rounded igneous or metamorphic gravel. Excavation reached the top of the C1ca layer, which was similar to the A1 except that it had 25 percent gravel and numerous blotches and disseminations of lime (Folks 1975:43). Erosion-channel formation is aided by the sparse ground cover and the loose structure of the Pojoaque Rough Broken Land association. Vegetative cover is sparse to moderate, with grasses, prickly pear, narrowleaf yucca, and a sparse to moderately dense overstory of piñon and juniper.

Preexcavation Description

LA 113946 was a multicomponent artifact scatter and thermal feature measuring 48 m northeast-southwest by 36 m northwest-southeast, or 1,728 sq m. Test excavation demonstrated that the majority of the cultural materials and a thermal feature clustered within a 17 by10 m area. This portion of the site contained a high-density core-reduction area that was thought to have 100 to 200 surface artifacts within a 3 by 3 m area. The remaining site area was covered by a very dispersed artifact scatter consisting of chipped stone.

Excavation Methods

The research design called for excavation of the artifact concentration and excavation of Feature 1 and its adjacent activity space. The test excavation baseline and grid system were reestablished, and the excavation areas were expanded to accommodate the goals of the research design.

In the 101N/100E area, 26 1 by 1 m units were excavated within a 6 by 7 m area (Fig. 254). The extent of the excavation was determined by the artifact distribution. Surface-stripped soil was screened through 1/4-inch mesh. Excavation was halted as peripheral unit artifact counts decreased below 10 artifacts per unit.

In the 90N/101E, Feature 1 area, 38 1 by 1 m units were excavated within an 8 by 10 m area. The irregular outline of the excavation area reflected the site topography. There was an erosion channel on the north side, and two erosion channels cut through the middle of the excavation area. Surface stripping of the deflated sandy loam exposed the remainder of Feature 1 and previously unknown Feature 2. The features were excavated and recorded.

No other buried cultural deposits were observed in the shallow erosion channels or the deeply incised arroyos that drain the site. After excavation, the site was mapped and photographed. Deep excavation was not proposed in the data recovery plan, nor was it carried out.

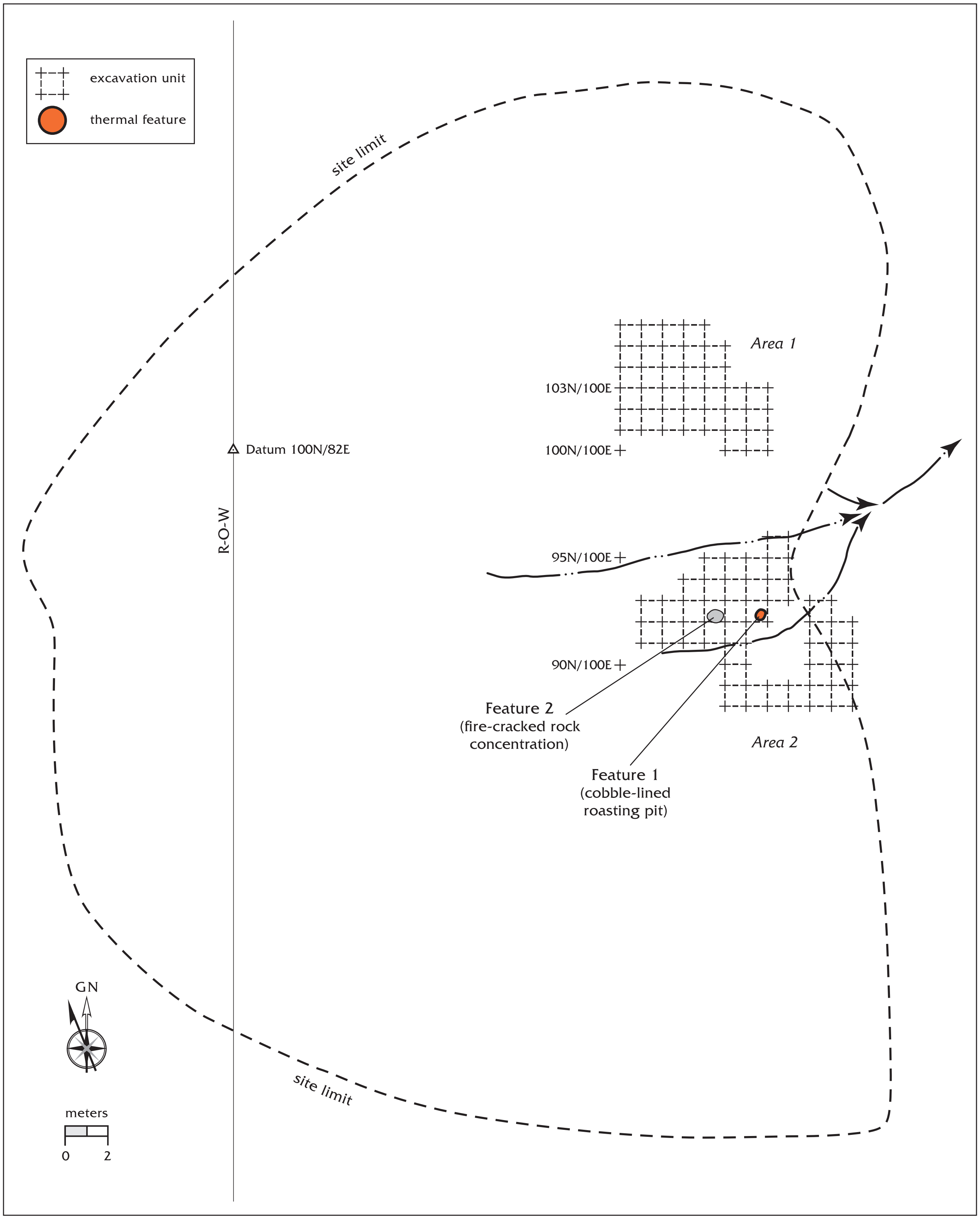


Figure 254. Plan of LA 113946.

Excavation Results

Excavation of the artifact concentration and the Feature 1 area focused on defining the limits of the artifact concentration and collecting a sample of the single-episode core-reduction debris that could be used as a benchmark for comparisons with assemblages reflecting less intensive core reduction. Feature 1 was excavated to expose the feature, collect samples for paleobotanical analysis and C-14 dating, and define the structure of the adjacent activity space.

During the excavation of the artifact concentration, 139 pieces of chipped stone and 1 metate fragment were recovered. Including the testing phase, 271 chipped stone artifacts were recovered. The concentration was primarily in the upslope portion of the excavation area. Artifact counts were 1 to 80, with a mean artifact frequency of 4 artifacts per unit. The artifact density from the combined testing and excavation is much lower than the 30.7 artifacts recovered from the four test excavation units. As shown in Figure 255, the artifact density is spread to the southeast from a reduction epicenter. This distribution pattern confirms that the artifacts remain from one episode of core reduction. The limited artifact spread suggests that the surface has been relatively stable since the core-reduction episode, except for low-impact cycles of deflation and limited colluvial accumulation.

Excavation of Area 2 further defined Feature 1 and exposed Feature 2, a fire-cracked rock concentration, but few associated artifacts were found. The features occurred on and were excavated into an older occupation surface that had been subjected to numerous erosion and aggradation episodes. These processes had spread the artifacts and reworked the occupation surface but left the features as markers of the occupation focus. Fifteen chipped stone artifacts were recovered from the Feature 1 and 2 area. Nine of them cluster to the north of Feature 2, suggesting a low-intensity discard event. The remaining artifacts occurred as one per unit and may not be associated with the features. The side-by-side placement of features also occurred at other Northwest Santa Fe Relief Route sites (LA 61302, for example). Proximity does not necessarily mean contemporaneity, but adjacent and functionally complementary features may be a common characteristic of short-term processing camps in the piedmont.

Features

Two features were excavated during the data recovery effort. Feature 1 was partly excavated during the test excavation in 1996. Feature 2 was found by surface stripping the area adjacent to Feature 1.

The excavation of Feature 1 revealed a partly cobble-lined roasting pit measuring 80 cm long by 76 cm wide by 26 cm deep (Figs. 256 and 257). The oval pit had steep sides and an irregular, partly cobble-lined bottom. The fill was a black (2.5Y 2/0, dry), fine, sandy loam with 1 to 2 percent pea gravel. The dark soil color remained from charcoal that had disintegrated. The sides and bottom are not oxidized or hardened, suggesting low heat and no reuse of the feature. A flotation sample yielded no cultural plant remains. Only a trace of piñon charcoal was identified.

Feature 2 was a fire-cracked rock concentration that may be discard from Feature 1 (Figs. 258 and 259). The 44 rocks sat on top of a deflated old ground surface that had a very ephemeral charcoal-infused soil stain. The concentration was 110 cm long by 70 cm wide, with no depth. The fire-cracked rocks had maximum dimensions between 15 and 20 cm. No artifacts were recovered from within the concentration, but chipped stone debris clustered to the north.

Chipped Stone Artifacts

A total of 286 chipped stone artifacts weighing 2.87 kg were recovered from LA 113946. This assemblage is comprised of core flakes and angular debris and reflects core reduction.

The assemblage is dominated by locally available materials. The Cenozoic era Santa Fe group gravels, namely the Ancha formation, contain chert. These sedimentary deposits also contain metaquartzite cobbles. The Sangre de Cristo foothills contain Precambrian era granite and gneiss overlain by Paleozoic era Pennsylvanian deposits of sandstone, shale, and limestone. Within some of this limestone, namely of the Madera formation, are bedded nodules and veins of chert, which were quarried prehistorically (Lang 1993:6, 13; Lang 1995:5; Viklund 1994:1;

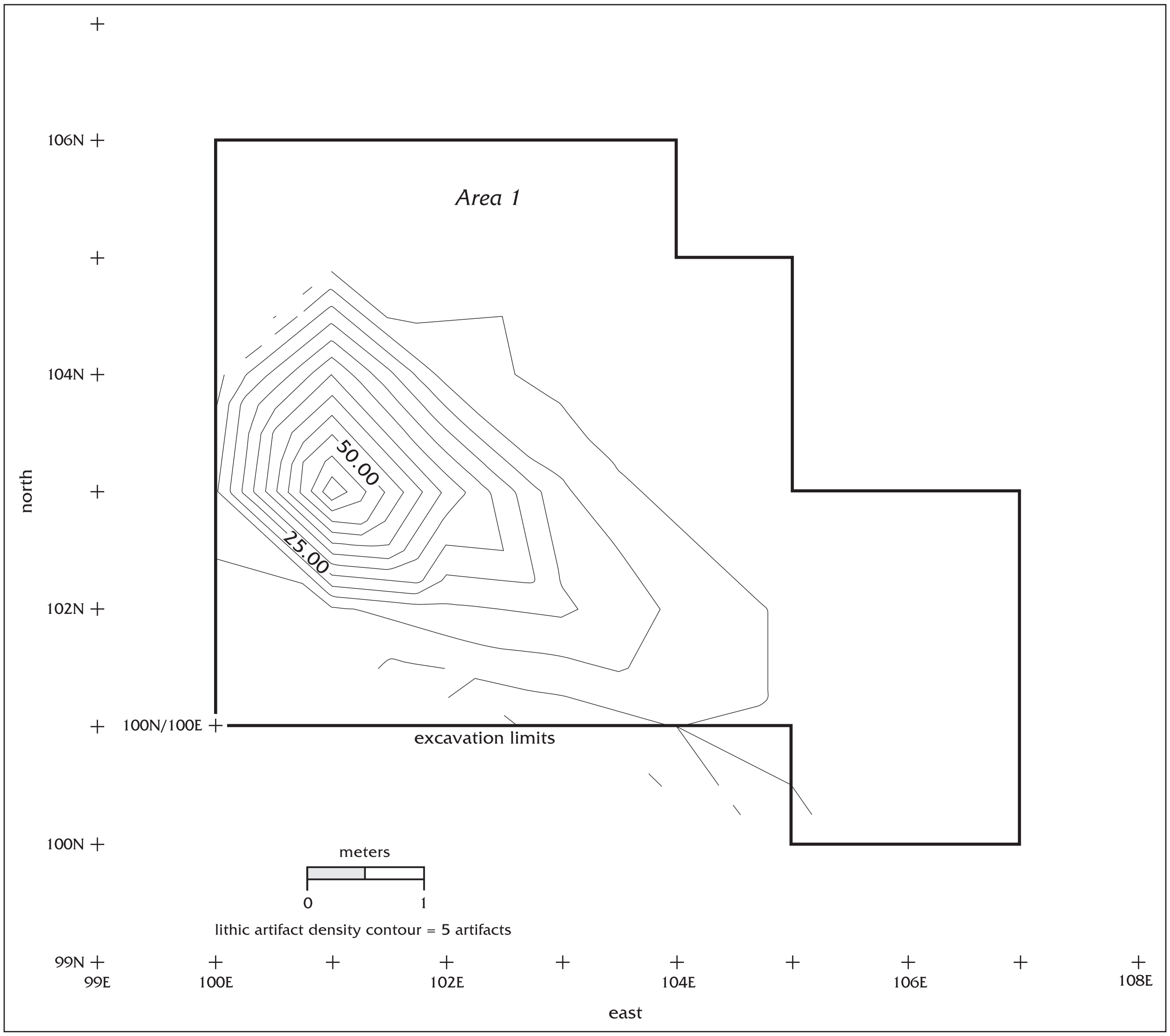


Figure 255. Plan of artifact concentration distribution, LA 113946.

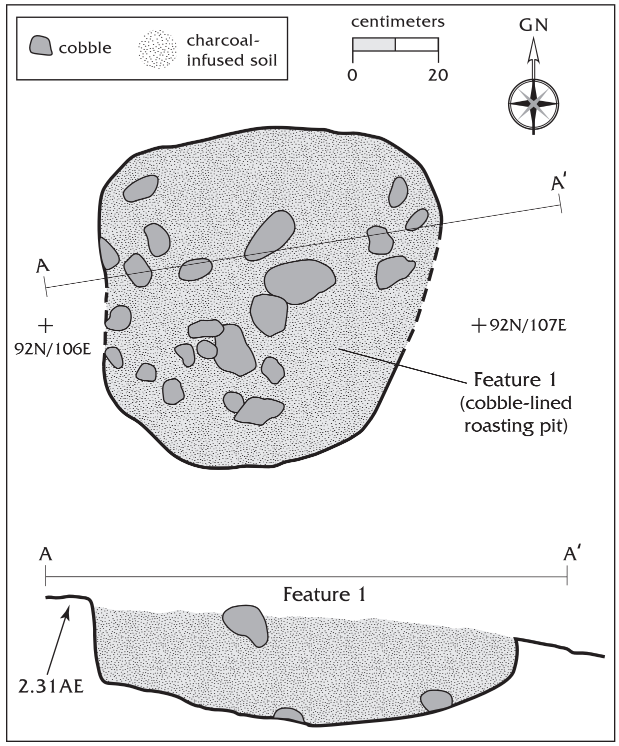


Figure 256. Plan and profile of Feature 1, LA 113946.

Figure 257. Feature 1, LA 113946.

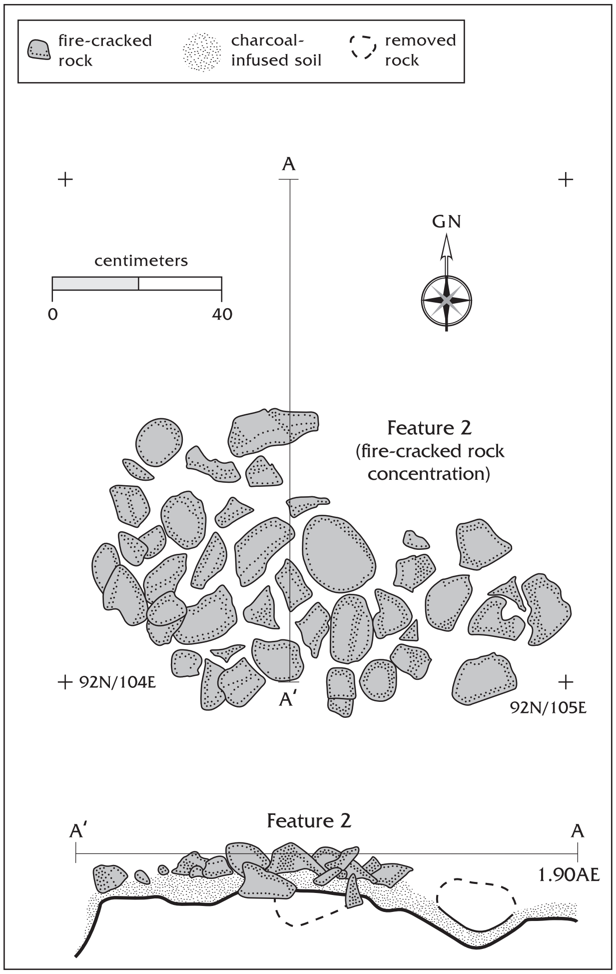


Figure 258. Plan and profile of Feature 2, LA 113946.

Figure 259. Feature 2, LA 113946.

Ambler and Viklund 1995:5). Madera chert also occurs as residual cobbles and pebbles in the later Santa Fe group gravels. Nonlocal materials such as obsidian are found in the axial gravels of the Rio Grande. However, the primary sources of this material lie in the Jemez Mountains. A small amount of obsidian can also be found scattered across Caja del Rio Mesa (Kelley 1980:11–17). The single piece of obsidian is grayish and semitranslucent. It is partially clouded by profuse ash flecks, which is diagnostic of the Polvadera Peak source area.

With the exception of obsidian, which has a glassy and flawed quality, material quality is fine to coarse grained. A substantial proportion (69.1 percent) of the material contains flaws, mainly in the form of cracks.

Area 1. A total of 271 chipped stone artifacts were recovered from Area 1. All are debitage, including 144 core flakes and 127 pieces of angular debris (Table 97). No biface flakes, which are indicative of formal tool production, or tool maintenance debitage were recovered. None of the debitage appears thermally altered. The flake attributes reflect early- to late-stage core reduction.

The majority of core flakes (71.5 percent) lack dorsal cortex, but a substantial proportion retain dorsal cortex, including 15.3 percent that retain 10–50 percent and 13.2 percent that retain 60 to 100 percent. The majority of angular debris (63.0 percent) also lacks cortex, but 33.9 percent retain 10–50 percent cortex, and 3.1 percent retain 60 to 100 percent. Cortical core-reduction debris reflects the early to middle stages of reduction, while noncortical debris reflects the middle to late stages of reduction. All cortex is waterworn.

Most core flakes (72.9 percent) have 0–2 dorsal scars, reflecting the early to middle stages of reduction. A considerable proportion (22.2 percent) display 3–5 dorsal scars, which is reflective of the middle to late stages of reduction. A small proportion (2.1 percent) have six or more dorsal scars. The remaining 2.8 percent have an indeterminate number of dorsal scars due to fracture along flaws, such as incipient fracture planes, which complicates an accurate dorsal scar count.

The majority of core flakes (56.3 percent) have single-facet or cortical platforms, which reflect the earlier stages of reduction. There is a high frequency of core flakes (43.1 percent) that exhibit various forms of platform breakage, such as absent, collapsed, or crushed platforms. One core flake that displays a multifaceted platform constitutes the remaining proportion (0.7 percent).

Whole flakes account for 24.3 percent of the core flakes. The more frequent fragmentary portions include lateral (47.9 percent), proximal (16.7 percent), and distal (6.3 percent) (Table 98).

Core: FS 6-7 is a fine-grained, flawed, mottled red Madera chert core flake with four flakes removed from the dorsal surface using the ventral lateral margin as a platform. It is noncortical. It measures 52 mm long by 62 mm wide by 23 mm thick and weighs 49.0 g.

Comparison of the testing- and excavation-phase assemblages. During the analysis of the excavation-phase chipped stone assemblage, 137 testing-phase chipped stone artifacts were reanalyzed and incorporated into the excavation-phase results. These artifacts were recovered from a concentration that may represent one episode

Table 97. Chipped stone artifact type by material type, LA 113946

Number Row % Column %	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Chalcedony	Metaquartzite	Total
Angular debris	117	4	4	2	127
	92.1%	3.1%	3.1%	1.6%	100.0%
	48.0%	28.6%	66.7%	28.6%	46.9%
Core flake	127	10	2	5	144
	88.2%	6.9%	1.4%	3.5%	100.0%
	52.0%	71.4%	33.3%	71.4%	53.1%
Total	244	14	6	7	271
	90.0%	5.2%	2.2%	2.6%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%

Table 98. Chipped stone mean whole measurements, Area 1, LA 113946

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Number	82	51	59	59	35
Mean	7.9	32.6	29.6	10.2	17.3
SD	4.5	14.4	16.2	6.1	57.9
Minimum	1	8	8	2	0.1
Maximu	29.4	93	114	32	347.1

of core reduction. During the testing phase, an additional 26 chipped stone artifacts from Area 1 were analyzed in the field or laboratory (Post 1997:12–26, 47–53). These artifacts, which are from the general site scatter in Area 1, were not incorporated into the excavation-phase results. Therefore, these artifacts will be compared to the Area 1 excavation-phase assemblage. The following comparative discussion addresses assemblage-level and artifact-level attributes.

Between the testing- and excavation-phase assemblages, there are differences in the material type distributions. In the testing-phase assemblage, undifferentiated chert (1) and obsidian (1) are present. The excavation-phase assemblage lacks these materials, but chalcedony (6) is present and lacking in the testing-phase assemblage. Madera chert is much more predominant (28.5 percent more) in the excavation-phase assemblage. With the exception of one obsidian core flake in the testing-phase assemblage, all materials are available in the local gravel deposits.

There is greater diversity in the artifact type distribution of the testing-phase assemblage, which includes unidirectional (1), bidirectional (1), and multidirectional (3) cores. Both assemblages reflect core reduction and lack evidence of formal tool production. A total of 17 core flakes are included in the testing-phase assemblage.

Considerable difference is evident in the core flake dorsal cortex distributions. In the testing-phase assemblage, there is a much smaller proportion of core flakes that lack dorsal cortex (36.2 percent less) and a larger proportion of core flakes with 10–50 percent cortex (31.8 percent more). Within the 60–100 percent dorsal cortex class, the assemblages are comparable. The difference does not exceed 5 percent. The noncortical to cortical core flake ratios are 1:1.8 and 1:0.4 for the testing- and excavation-phase assemblages, respectively. Core flakes with dorsal cortex are more than four times more frequent than noncortical core flakes in the testing-phase assemblage. This reflects more middle- to late-stage reduction debris in the excavation-phase assemblage.

Between the assemblages, there are considerable differences in the core flake platform type distributions. In the testing-phase assemblage, there is a larger proportion of core flakes with single-facet or cortical platforms (8.4 percent more), a larger proportion with multifaceted platforms (16.9 percent more), and a smaller proportion exhibiting platform breakage (25.5 percent less). Platform type is related to reduction sequence.

There is a considerable difference in core flake mean whole length between assemblages. The testing-phase assemblage mean is 8 mm greater. The difference in mean thickness and in the standard deviations of length and thickness do not exceed 3 mm. Size may be related to reduction sequence.

It appears that in the testing-phase assemblage, there is more evidence of early- to middle-stage reduction, and in the excavation-phase assemblage, there is more evidence of middle- to late-stage reduction. Together, the assemblages appear to represent an expedient core-reduction strategy geared toward flake production.

Area 2. Area 2 yielded 15 chipped stone artifacts, including 9 core flakes and 6 pieces of angular debris (Table 99). No biface flakes, which are indicative of formal tool production, or tool maintenance debitage was recovered. None of the debitage appears thermally altered.

Flake attributes reflect early- to middle-stage core reduction. Most core flakes (7) lack cortex, but two have 10–50 percent dorsal cortex. Most angular debris (5) retains 10–percent cortex, but

Table 99. Chipped stone artifact type by material type, LA 113946

Number Row % Column %	Chert	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Polvadera Peak Obsidian	Metaquartzite	Total
Angular debris	1	4	-	-	1	6
	16.7%	66.7%	-	-	16.7%	100.0%
	33.3%	50.0%	-	-	100.0%	40.0%
Core flake	2	4	2	1	-	9
	22.2%	44.4%	22.2%	11.1%	-	100.0%
	66.7%	50.0%	100.0%	100.0%	-	60.0%
Total	3	8	2	1	1	15
	20.0%	53.3%	13.3%	6.7%	6.7%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

one piece lacks cortex. All cortex is waterworn. Most core flakes (8) have 0–2 dorsal scars, while one core flake exhibits three dorsal scars. Five core flakes have single-facet or cortical platforms, while the remaining four display various types of platform breakage, including absent, collapsed, and crushed platforms. There are two whole flakes. Fragmentary portions include four lateral, two proximal, and one medial (Table 100).

Informal tools: FS 105 is a Polvadera Peak obsidian core flake with a culturally obscured distal termination. Unidirectional retouch and wear scars are present on the dorsal surface along this convex edge. This wear pattern and its 55-degree edge angle suggest a scraper. The maximum linear measurement of this utilized edge is 36 mm. A triangular projection may have been used as a graver, although the snapped tip precludes a definitive determination. There are small feathered scars on the ventral surface along one lateral margin of this projection. Designation as a multipurpose tool is tentative. There is differential luster exhibited in marginal scars. It seems a thin waxy patina has formed over the artifact, including the scarring. More recent scars appear glassier. These scars are probably the product of trampling and may obscure some prehistoric use-wear. This is the only piece of obsidian recovered from the site which points to off-site manufacture and possible curation. It is estimated that the tool was finger held due to its small size and lack of hafting modification. It measures 41 mm long by 22 mm wide by 8 mm thick and weighs 6.4 g.

Ground Stone Artifact

One ground stone artifact (FS 46) was recovered from LA 113946. It is an edge fragment of a shallow basin metate. This flattened cobble of medium-grained metaquartzite was utilized in its natural form. The one use surface exhibits linear furrow striations parallel to its long axis. This wear pattern suggests that it was used with a mano that was moved in a reciprocal rather than rotary motion. Pecking wear is also evident across

Table 100. Chipped stone whole measurements, Area 2, LA 113946

FS No.	Portion	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
50	proximal	6	-	11	5	-
51-1	proximal	3.1	-	24	5	-
51-2	lateral	-	20	.	.	-
102	whole	5.8	42	18	9	6.6
104	lateral	3.8	-	-	-	-
105	whole	-	41	22	8	6.4
108	lateral	10.6	-	-	-	-

the ground surface. This wear and its location indicate ground surface sharpening, a form of ground stone maintenance. The artifact measures 259 mm by 109 mm by 69 mm and weighs 1.9 kg.

Site Summary

The excavation of LA 113946 confirmed and expanded the testing results. The excavation of Area 1 revealed a single-episode core-reduction event. The ground surface remained relatively stable over at least 500 years since the event. This observation is supported by the oval artifact-distribution pattern, which was punctuated by a high-density concentration in the northwest and decreasing density to the southeast. This distribution follows the slope grade rather than reflecting a fossil-distribution pattern. Core reduction reflects the procurement of raw material in the form of flakes that were in the medium to large range (maximum dimension greater than 30 mm). The two cores had flake scars that were in this range, and most of the debris also falls within this range. Late-stage reduction is contraindicated by the low frequency of small flakes recovered. No datable artifacts were recovered with this concentration. Long-term surface stability on colluvial slopes is the suggested geomorphological pattern for the piedmont environment. This stability occurs after AD 1000 or 1200, suggesting that the core-reduction event occurred during the Ancestral Pueblo period.

Features 1 and 2 were defined during the excavation of Area 2. These closely spaced features may represent one processing facility. Feature 1 was a deep, open thermal feature in which fire and fire-heated rock may have been produced. Feature 2 was a discard pile or heated rock concentration that may have been used with coals for light roasting or parching of gathered wild plants. Unfortunately, no archaeobotanical remains were recovered from these features. Functional inferences are seriously hampered by their absence. The artifact assemblage is small but relatively diverse in material and artifact types. This may reflect long-term accumulation of artifacts in the area without temporal-functional association with the features. On the other hand, these artifacts may represent the limited tool kit needed by plant foragers working as individuals or in a small group. The obsidian tool was brought from a residence, while other debris consists of locally available material. This expedient assemblage may be diagnostic of women's gathering or foraging in the piedmont (Sassaman 1998).

The excavation added to the small-site database from this and the Las Campanas project. This small-site data can be classified and compared to construct models of Ancestral Pueblo foraging. Individually, they yielded mixed results, but as an assemblage, small sites are the most powerful tool available for understanding long-term land use patterns by Ancestral Pueblo villagers.

LA 113954

LA 113954 was between centerline stations 678+00 and 679+00. Only one-third of the site was within the western half of the right-of-way. This site was originally described by Anschuetz and Viklund (1997). Test excavations were conducted in 1996 (Post 1997:33–37).

The site was on the easternmost slope of a digitate southwest- to northeast-trending ridge formed by the piedmont surface that separates Arroyo Gallinas from Arroyo de los Frijoles to the north. LA 113954 was at an elevation of 2,092 m (6,860 ft). Artifacts and features were distributed across the gentle, south-facing, dissected ridge slope that is bounded on the south by the Arroyo Gallinas and on the east and west by two of its primary tributaries. The site surface was in deflated condition, and artifacts were scattered across a thin mantle of eolian sand that caps the dense gravel/cobble lens. Recent erosion was evident in moderately incised to deeply cut erosion channels that drain west into the tributary arroyo. The main chipped stone cluster was in a swale that was drained by a recent erosion channel. The artifacts probably remained from one occupation and have been spread downslope by deflation and erosion.

Excavations exposed the upper soil level, an A1 light reddish-brown, sandy clay loam with 5 to 10 percent rounded igneous or metamorphic gravel. Excavation reached the top of the C1ca layer, which was similar to the A1 except that it has 25 percent gravel and numerous blotches and disseminations of lime (Folks 1975:43). Erosion channel formation has been aided by the sparse ground cover and the loose structure of the Pojoaque Rough Broken Land association. Vegetative cover is sparse to moderate with grasses, prickly pear, narrowleaf yucca, and a sparse to moderately dense overstory of piñon and juniper.

Preexcavation Description

As described in Anschuetz and Viklund (1997:167–170), LA 113954 included four charcoal stains that might be one to three shallow pit structures and a scatter of Coalition period pottery and chipped stone artifacts made from local raw material. The features and artifacts occurred within a 35 by 35 m area. The site limits were subsequently enlarged to 64 m north-south by 67 m east-west, or 2,688 sq m, including an area of 64 by 42 m within the right-of-way. Except for an artifact cluster in Area 1, the artifacts are dispersed across the site with an average density of one artifact per 5 sq m. Test excavation yielded a substantial quantity of chipped stone in Area 1 with a potential density of five artifacts per square meter. Feature 1 was associated with Santa Fe Black-on-white pottery, suggesting the site was occupied between AD 1200 and 1425.

Excavation Methods

The research design called for excavation of the 98N/103E artifact concentration (Area 1), Feature 1, and its adjacent activity space (Area 2). The test-excavation baseline and grid system were reestablished, and the excavation areas were expanded following procedures outlined in the data recovery plan (Post 1997).

In Area 1, 32 1 by 1 m units were excavated within a 6 by 6 m area that encompassed the majority of the artifact concentration. No deeper excavation was conducted because test excavation had determined that the cultural deposit was shallow.

In Area 2, a 6 by 6 m excavation area exposed Feature 1 and the adjoining activity area. Fire-cracked rocks were recorded for each unit, and cobbles within or at the periphery of Feature 1 were left in situ and piece-plotted.

Excavation Results

The excavation focused on the chipped stone concentration in Areas 1 and 2, which covered Feature 1 and its associated low-density artifact assemblage (Fig. 260). Two spatially separate components are represented by these areas.

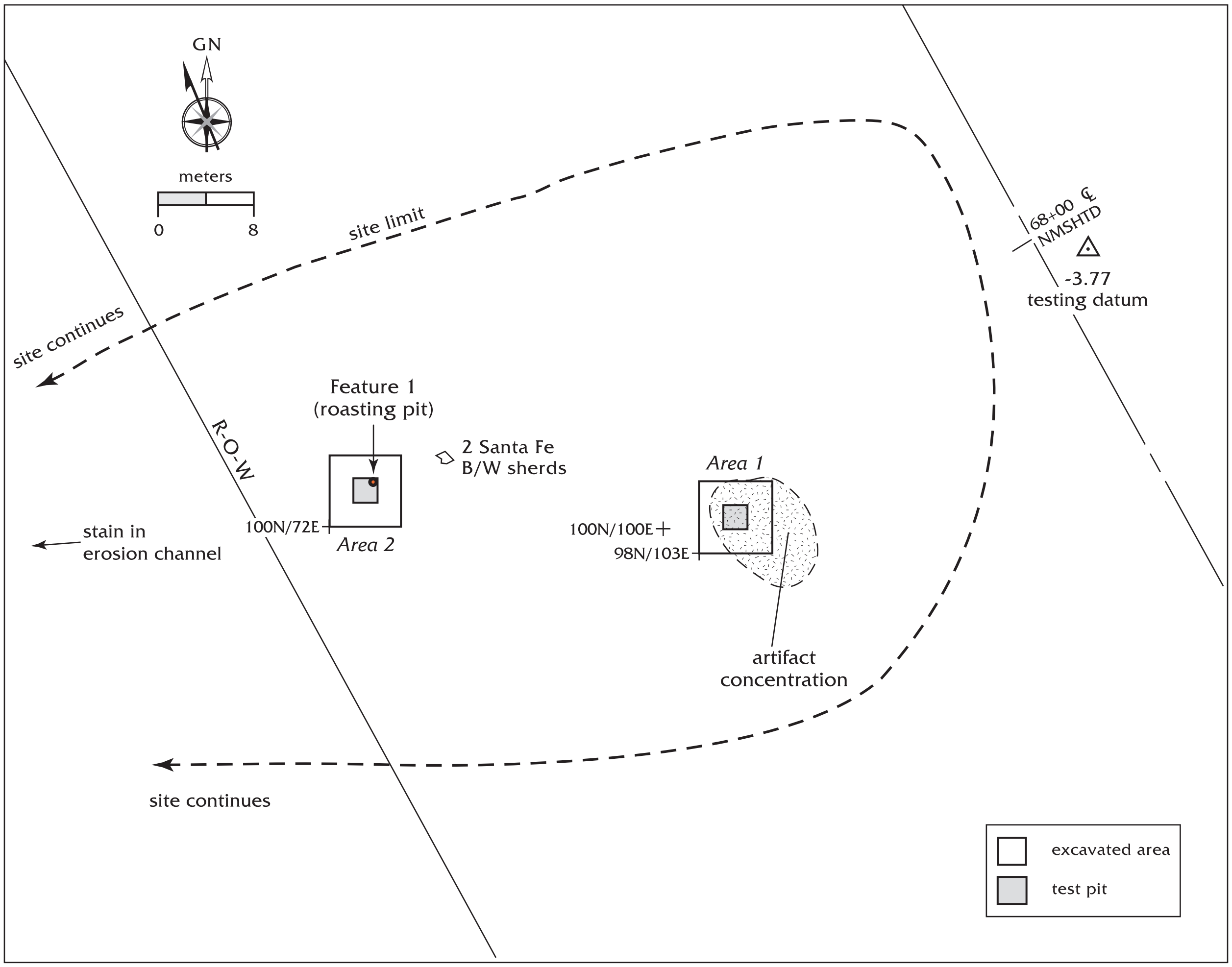


Figure 260. Plan of LA 113954.

During the excavation of Area 1, 70 chipped stone artifacts were recovered from the shallow colluvial deposit. Artifact counts were zero to eight per unit with a mean artifact frequency of 2.5. This artifact density is much lower than the 5.2 artifact mean found within the four test units. Figure 261 combines the testing and data recovery artifact counts and shows that the densest artifact concentration extends across the slope within the 100E and 101E grids, a 2 by 5 m area. The artifact counts decrease to the south and southeast, indicating that the concentration migrated downslope as a result of slope erosion. The clustered distribution strongly indicates that the 96 artifacts recovered during testing and data recovery remain from one occupation. However, the extent of the distribution suggests that more than core-reduction episode may have occurred.

The excavation of Feature 1 yielded 16 artifacts and a fire-cracked rock discard area. The low-density artifact scatter associated with the feature is similar to pattern observed in Feature 1, LA 113946. The fire-cracked halo surrounding the feature is densest to the north and east (Fig. 262). This distribution suggests activity organization in which the hearth seat was located and food was processed west of the feature. Feature cleanout was concentrated to the northeast of the feature. The halo of fire-cracked rock also suggests that Feature 1 was reused. The white ware pottery sherd recovered from the surface strip confirms that Feature 1 dates to the Coalition or Early Classic period.

Feature 1

Feature 1 was partly excavated during the test excavation in 1996. Complete excavation of Feature 1 revealed a shallow roasting pit that may have had a cobble-lined perimeter. It measured

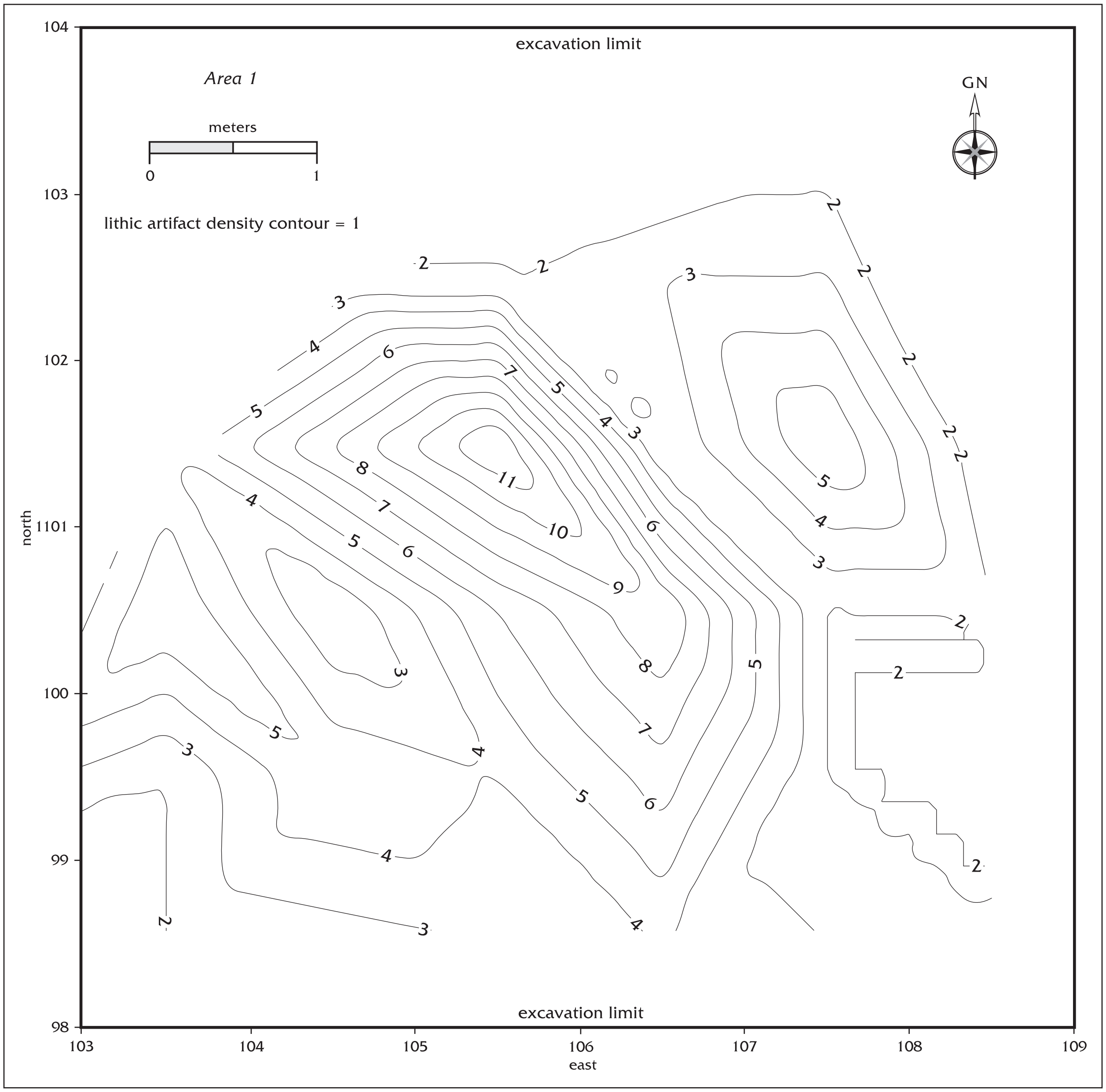


Figure 261. Chipped stone distribution density plot, Area 1, LA 113954.

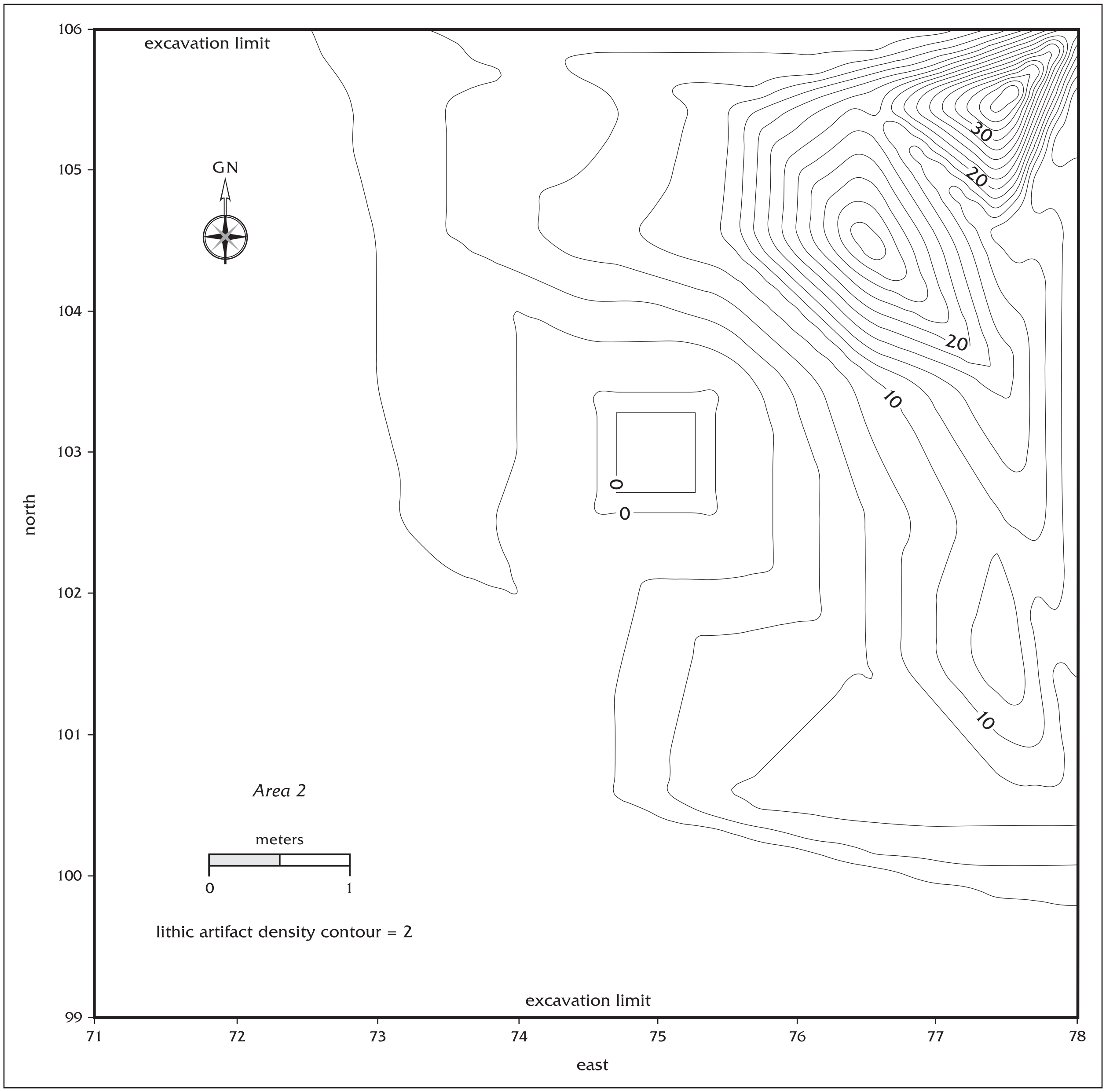


Figure 262. Fire-cracked rock density plot, Area 2, LA 113954.

112 cm long by 84 cm wide by 12 cm deep (Fig. 263). The feature was oval with gently sloped and deflated walls and a regular, heavily burned bottom. Three strata were identified within the feature limits. Stratum A was a 2 to 6 cm thick light reddish brown (5YR 6/3, dry), loose eolian sand mixed with abundant gravel consisting of pebble- and cobble-sized clasts. This may have been the deflated remnant of the A1 horizon of the Pojoaque Rough Broken Land soil association. Stratum B was a 3 to 10 cm thick dark gray (7.5YR 2–3/0, dry), moderately consolidated sandy loam that has increased organic content with depth. The dark gray color reflected charcoal diffusion, and almost all charcoal had disintegrated by natural bioturbation and cryoturbation. Fire-cracked rocks and spalls remained from the final cleanout before feature abandonment. Stratum B encases interior cobbles, suggesting that feature disarticulation occurred in conjunction with processing. One or two piñon shell or cone fragments were observed, suggesting the feature was used for nut roasting. Stratum C was 2 to 4 cm thick, dark brown (7.5YR 4/4, dry),

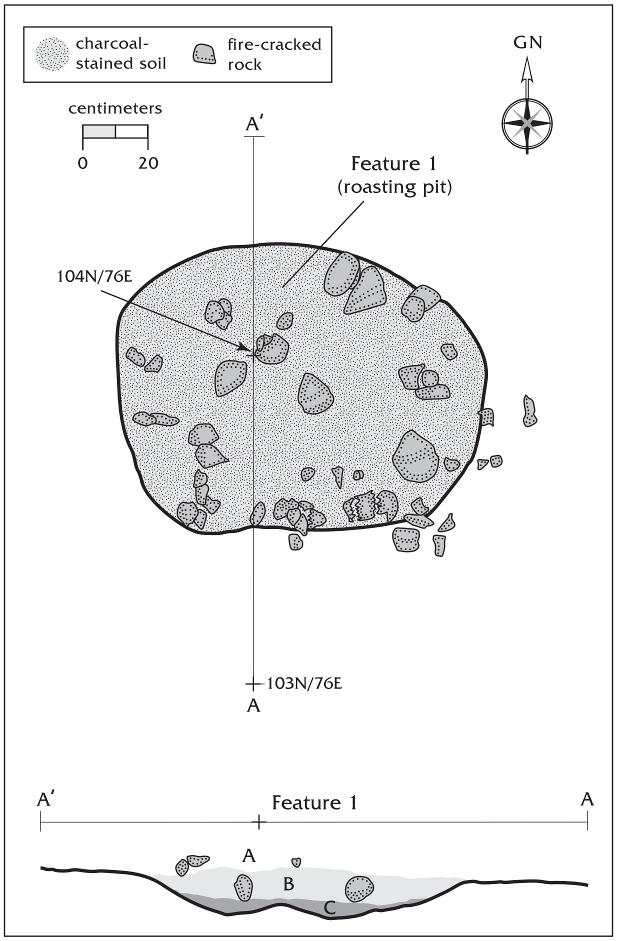


Figure 263. Plan and profile of Feature 1, Area 2, LA 113954.

consolidated sandy loam with oxidized caliche and charcoal staining at the bottom of the feature. The hardened floor and oxidized caliche suggest feature reuse and high internal temperature.

Additional evidence of feature reuse is the fire-cracked and altered condition of the internal and peripheral cobbles. This magnitude of thermal alteration in combination with the oxidized caliche on the pit floor are reminiscent of the pottery-firing features at LA 86159 and LA 84793 and excavated during the Las Campanas project (Post 1996a; Lakatos 1996). Feature 1 differs from the pottery-firing features in the lack of internal cobble structure, the lack of discarded sherds, and the low feature walls. Instead, Feature 1 appears to be a roasting or processing facility.

Chipped Stone Artifacts

Eighty chipped stone artifacts and five pottery sherds were recovered during excavation. Ceramic artifacts are described later in this report.

The chipped stone artifacts weighed a total of 1.00 kg. The assemblage is comprised of core flakes, angular debris, and two cores. These artifacts reflect limited raw-material procurement and core reduction.

The assemblage is completely comprised of locally available materials. Chert and metaquartzite are among the typical constituents of the Santa Fe group gravel deposits. The Madera chert also occurs in these deposits as residual cobbles and pebbles eroded from an earlier Pennsylvanian age limestone bedding in the Sangre de Cristo foothills.

Material quality is fine or medium grained. Some (17.6 percent) of the material contains flaws, mainly in the form of cracks.

Area 1. Debitage: Area 1 yielded 70 chipped stone artifacts (Table 101). With the exception of two cores, the assemblage is solely comprised of debitage. This debitage includes 41 core flakes and 27 pieces of angular debris. No biface flakes, which would suggest formal tool production, or tool maintenance debitage were recovered. None were thermally altered. Flake attributes reflect early- to middle-stage core reduction.

The noncortical to cortical core flake ratio is 1:1.1, indicating that cortical core flakes are slightly more frequent than noncortical core flakes. Of the core flakes that retain dorsal cortex, 34.1 percent have 10–50 percent cortex, and 17.1 percent have 60–100 percent. The majority of angular debris (48.1 percent) retains 10–50 percent cortex, followed by 33.3 percent that lacks cortex and 18.5 percent that retains 60–100 percent. With the exception of one artifact that retains an indeterminate type of cortex, all cortex is waterworn.

Most core flakes (87.8 percent) display 0–2 dorsal scars, suggesting early- to middle-stage core reduction. Those that remain exhibit 3–5 dorsal scars, suggesting middle- to late-stage reduction.

The majority of core flakes (56.1 percent) have single-facet or cortical platforms, which reflect early- to middle-stage core reduction. Those that remain exhibit various types of platform breakage, including absent, collapsed, crushed, and broken-in-manufacture. Whole flakes account for 22.0 percent of the assemblage. Proximal and lateral portions have the highest frequencies of the flake

Table 101. Debitage artifact type by material type, Area 1, LA 113954

Number Row % Column %	Chert	Madera Chert, Yellow/Red Mottled	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Chalcedony (blue/gray)	Metaquartzite	Total
Angular debris	7	-	10	5	5	-	27
	25.9%	-	37.0%	18.5%	18.5%	-	100.0%
	63.6%	-	37.0%	41.7%	41.7%	-	38.6%
Core flake	4	4	16	7	7	3	41
	9.8%	9.8%	39.0%	17.1%	17.1%	7.3%	100.0%
	36.4%	80.0%	59.3%	58.3%	58.3%	100.0%	58.6%
Unidirectional core	-	1	-	-	-	-	1
	-	100.0%	-	-	-	-	100.0%
	-	20.0%	-	-	-	-	1.4%
Multidirectional core	-	-	1	-	-	-	1
	-	-	100.0%	-	-	-	100.0%
	-	-	3.7%	-	-	-	1.4%
Total	11	5	27	12	12	3	70
	15.7%	7.1%	38.6%	17.1%	17.1%	4.3%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

fragments, constituting 36.6 percent and 31.7 percent of the core flakes, respectively. Medial fragments account for the remaining proportion (Table 102).

Cores: Three cores representing 3.9 percent of the total assemblage (80) were recovered from the site. FS 1-2 is fine-grained, flawed, mottled white-gray Madera chert angular debris with three complete flake scars removed from one platform. It retains 20 percent waterworn cortex and is crazed, indicating thermal alteration. It measures 52 mm long by 37 mm wide by 29 mm thick and weighs 48.4 g. FS 6-1 is a medium-grained, flawed, yellow/red Madera chert unidirectional core. Four of ten scars are complete and removed from one platform. The remaining scars are obscured by later flake removal but appear similarly oriented. The core retains 30 percent waterworn cortex. It measures 48 mm long by 55 mm wide by 44 mm thick and weighs 118.7 g. FS 19-1 is a fine-grained, gray, semitranslucent Madera chert with four complete negative flake scars. The core is multidirectional and appears to be exhausted. It retains 20 percent waterworn cortex. It measures 51 mm long by 37 mm wide by 16 mm thick and weighs 27.1 g.

Comparison of the testing- and excavation-phase assemblages. In addition to the assemblage described above, the testing phase yielded 79 chipped stone artifacts that were analyzed in the field or laboratory (Post 1997:12–26, 47–53). Twenty-three of these artifacts were recovered from Area 1. This assemblage was compared to the 70 artifacts recovered during excavation of Area 1. In comparing the testing and excavation-phase assemblages from Area 1, assemblage-level and artifact- level attributes were addressed.

An expanded material-type distribution is evident in the excavation-phase assemblage. Material types not recorded during the testing

Table 102. Debitage mean whole measurements, Area 1, LA 113954

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Number	23	16	24	24	9
Mean	6.7	36.2	33.3	10.9	26.8
SD	4.9	13.2	19.1	6.3	30.1
Minimum	0.3	11	9	3	0.5
Maximu	18.4	53	83	24	90.4

phase include locally available undifferentiated chert and metaquartzite. Nonlocal materials are not present at either site.

The artifact type distribution was also expanded during the excavation phase. Artifacts that were not recovered during testing include unidirectional and multidirectional cores. No evidence of formal tool production, namely biface flakes, were recovered during testing or excavation of Area 1. There were 20 core flakes in the testing-phase assemblage.

There are no drastic differences between the testing- and excavation-phase core flake dorsal cortex distributions. In the testing-phase assemblage, there is a larger proportion of core flakes that lack dorsal cortex (6.2 percent more) and a smaller proportion of core flakes that retain 10–50 percent cortex (9.1 percent less). The proportions representing the 60–100 dorsal cortex class are comparable. The difference does not exceed 3 percent. The testing- (1:0.8) and excavation-phase assemblage (1:1.1) noncortical to cortical core flake ratios are fairly comparable. The excavation-phase assemblage has only a slightly higher frequency of cortical core flakes than noncortical core flakes than in the testing-phase assemblage.

Testing- (1:2.3) and excavation-phase assemblages (1:3.7) have different whole-to-fragmentary core flake ratios. In the excavation-phase assemblage, fragmentary portions are more than 1.5 times more frequent than whole core flakes. Flake condition may be related to reduction sequence, postreduction breakage, and material flaws.

Between assemblages, there are considerable differences in the core flake platform type distributions. In the testing-phase assemblage, core flakes with multifaceted platforms are represented by a proportion of 20 percent, whereas in the excavation-phase assemblage, core flakes with multifaceted platforms are lacking. In the testing-phase assemblage, there is a larger proportion of core flakes that exhibit platform breakage (6.1 percent more) and a smaller proportion with single-facet or cortical platforms (26.1 percent) than in the excavation assemblage. Platform type is related to reduction sequence.

For core flake whole length and thickness, the central tendency and dispersion statistics are comparable between assemblages. No difference exceeds 2 mm. Size may be related to reduction sequence.

The most obvious differences between the assemblages are the whole to fragmentary and the noncortical to cortical core flake ratios and the core flake platform type distributions. The testing-phase core flakes, with their multifaceted platforms, smaller proportion of single-facet or cortical platforms, and larger proportion of platform breakage, may reflect a greater abundance of middle- to late-stage reduction debris. In comparing the whole-to-fragmentary core flake ratios, it initially appears that the lower testing-phase ratio does not support this notion. In fact, both ratios reflect a predominance of noncortical flakes that occur in the later stages of the reduction trajectory. The expansion of the material and artifact type distributions is not unexpected for the excavation-phase assemblage since, presumably, recovery intensifies during this phase.

Area 2. Debitage: Ten chipped stone artifacts were recovered during excavation of Area 2. All are debitage, including eight core flakes and two pieces of angular debris (Table 103). No biface flakes, which would suggest formal tool production, or tool maintenance debitage were recovered. None were thermally altered.

Flake attributes primarily reflect early-stage core reduction. Most core flakes (5) retain 60–100 percent dorsal cortex, followed by those that lack dorsal cortex (2) and one core flake that retains 10–50 percent cortex. One piece of angular debris lacks cortex, while the other retains 10–50 percent cortex. All cortex is waterworn. Most core flakes (7) have 0–2 dorsal scars, suggesting earlier-stage reduction. The remaining core flake has four dorsal scars. Three core flakes have single-facet or cortical platforms, while five have platform breakage, including absent and collapsed platforms. One whole core flake and four lateral and three proximal portions were recovered (Table 104).

Site Summary

Excavation of the two activity areas within LA 113954 did not yield results that were substantially different from those of the testing. Area 1 yielded lower artifact frequency than was expected. A

Table 103. Debitage artifact type by material type, Area 2, LA 113954

Number Row % Column %	Chert	Madera Chert, Yellow/Red Mottled	Madera Chert, Red and Mottled Red	Madera Chert, Nonred	Metaquartzite	Total
Angular debris	-	-	2	-	-	2
	-	-	100.0%	-	-	100.0%
	-	-	40.0%	-	-	20.0%
Core flake	2	1	3	1	1	8
	25.0%	12.5%	37.5%	12.5%	12.5%	100.0%
	100.0%	100.0%	60.0%	100.0%	100.0%	80.0%
Total	2	1	5	1	1	10
	20.0%	10.0%	50.0%	10.0%	10.0%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 104. Debitage whole measurements, Area 2, LA 113954

FS No.	Portion	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
4	proximal	-	-	20	4	.
8	lateral	8.2	-	-	-	-
9	whole	13.7	61	73	21	88.3
12	lateral	-	15	-	-	-
13	proximal	6.8	-	32	10	-
31	proximal	-	-	18	6	-

higher density was recorded during testing. Surface stripping defined an oval distribution that conformed somewhat to the prevalent drainage pattern. Two or three hot spots suggest one or two occupation episodes. These episodes were characterized by similar activities, with a focus on core reduction. However, the more diffuse artifact distribution may indicate that other activities accompanied core reduction. This is in contrast to LA 113946, where the artifact distribution clearly originated from one episode of raw-material testing and reduction. No temporally diagnostic artifacts were recovered from Area 1, but it is most likely that it dates to the Ancestral Pueblo period. Repeated use of this gentle slope is indicated by Feature 1 and the other small-scale reduction area examined during testing. Also, many thermal features west of the right-of-way were associated with Santa Fe Black-on-white pottery.

Feature 1 is a large, shallow thermal feature that was lined or ringed with cobbles. These cobbles were heavily burned, indicating repeated exposure to high heat. The fire-cracked rock halo northeast of the feature remains from maintenance and cleanout. The heavily burned cobbles and the discard area are strong indicators of repeated use. Curiously, the artifact counts, especially for the pottery, remained low. The initial observation that Feature 1 might be a pottery-firing kiln was not supported by feature morphology, content, stratigraphy, or the recovery of more than the one spalled sherd from testing. Feature 1 obviously dates to the Coalition or Early Classic period. Feature function could not be determined by excavation. It is similar to the piñon nut roasting pit at LA 61290, but no evidence of nut roasting was found.

LA 113954 was a multiple-occupation foraging camp situated to exploit the floral resources of Arroyo Gallinas and its major side drainages. Repeated occupation of probable prime resource areas was a consistent pattern along the Santa Fe Relief Route. Close examination of sites often resulted in the identification and excavation of multiple features or features that were characteristic of repeated use. That these sites were consistently on the margins of major tributaries is strong evidence that the riparian and piedmont slope transition zone was a highly desirable and regularly exploited resource zone.

LA 114071

LA 114071 was between centerline stations 683+00 and 685+00, almost completely within the eastern half of the right-of-way. The site was test excavated in 1996 (Post 1997:37–41).

The site was on a gentle, southeast-facing middle slope of a broad, digitate ridge that separates the Arroyo Gallinas and Arroyo de los Frijoles drainage basins. The slope extends to the north floodplain of the Arroyo Gallinas on the south. The site surface was deflated with a shallow Pojoaque Rough Broken Land A1 soil overlaying deeper more stable $CaCO_3$ deposits. Artifacts occurred on top of the gravel/cobble deposit or mixed with the modern eolian mantle. Vegetative cover was sparse to moderate with grasses, prickly pear, narrowleaf yucca, and a sparse to moderately dense overstory of piñon and juniper. The vegetative setting can be characterized as piñon-juniper parkland.

Preexcavation Description

LA 114071 was a dispersed chipped stone scatter with a cluster of chipped stone debris associated with a thermal feature (Feature 1) at the northern site limit, and purple glass bottle fragments along the western site limit. Site dimensions were 60 m north-south by 24 m east-west, or 1,440 sq m. Data recovery focused on Feature 1 and the associated artifact concentration. The possibility that Feature 1 was used for lithic heat-treating is an unusual functional inference for Northwest Santa Fe Relief Route sites.

Excavation Methods

The excavation of Features 1 and 2 and the adjacent activity area and artifact concentration followed the data recovery plan (Post 1997:64). The test excavation baseline and grid system were reestablished, and the excavation area was expanded. A total of 361 by 1 m units encompassing the artifact concentration and Feature 1 were excavated. In the process of surface stripping, Feature 2 was exposed (Fig. 264). Excavation was halted as peripheral unit artifact counts decreased to fewer than five artifacts per unit.

Excavation Results

During excavation of the artifact concentration associated with Features 1 and 2, 60 chipped stone artifacts, in addition to the 34 artifacts recovered during the test excavation, were recovered. The chipped stone artifacts were mixed with the loose sandy loam that covers the gentle piedmont slopes. Excavation focused on the near-surface cultural deposit, since previous archaeological testing had indicated no potential for more deeply buried deposits.

Data recovery and test excavation produced artifact counts per unit ranged from 0 to 17, with a mean artifact frequency of 2.6 artifacts. The artifact-distribution plan shows two hotspots south of Features 1 and 2 (Fig. 265). The location of the hot spots indicates that they were discard or reduction areas associated with the features. It is interesting that there was a one-to-one correlation between the features and hotspots. This spatial relationship indicates that the activity area was established during two occupations consisting of a very similar range of activities.

Features

Feature 1 was partly excavated during the test excavation in 1996. Feature 2 was not found during testing and was exposed by surface stripping.

Complete excavation of Feature 1 revealed an undifferentiated burned pit measuring 26 cm long by 15 cm wide by 21 cm deep (Figs. 266 and 267). The feature was oval with steep walls and a regular, concave bottom. Three strata were differentiated based on texture, content, and color. Stratum A was a brown (7.5YR 5/4, dry), loose, fine-grained sandy loam with 5 to 10 percent pea-sized gravel. This colluvial deposit was more closely related to modern geomorphological

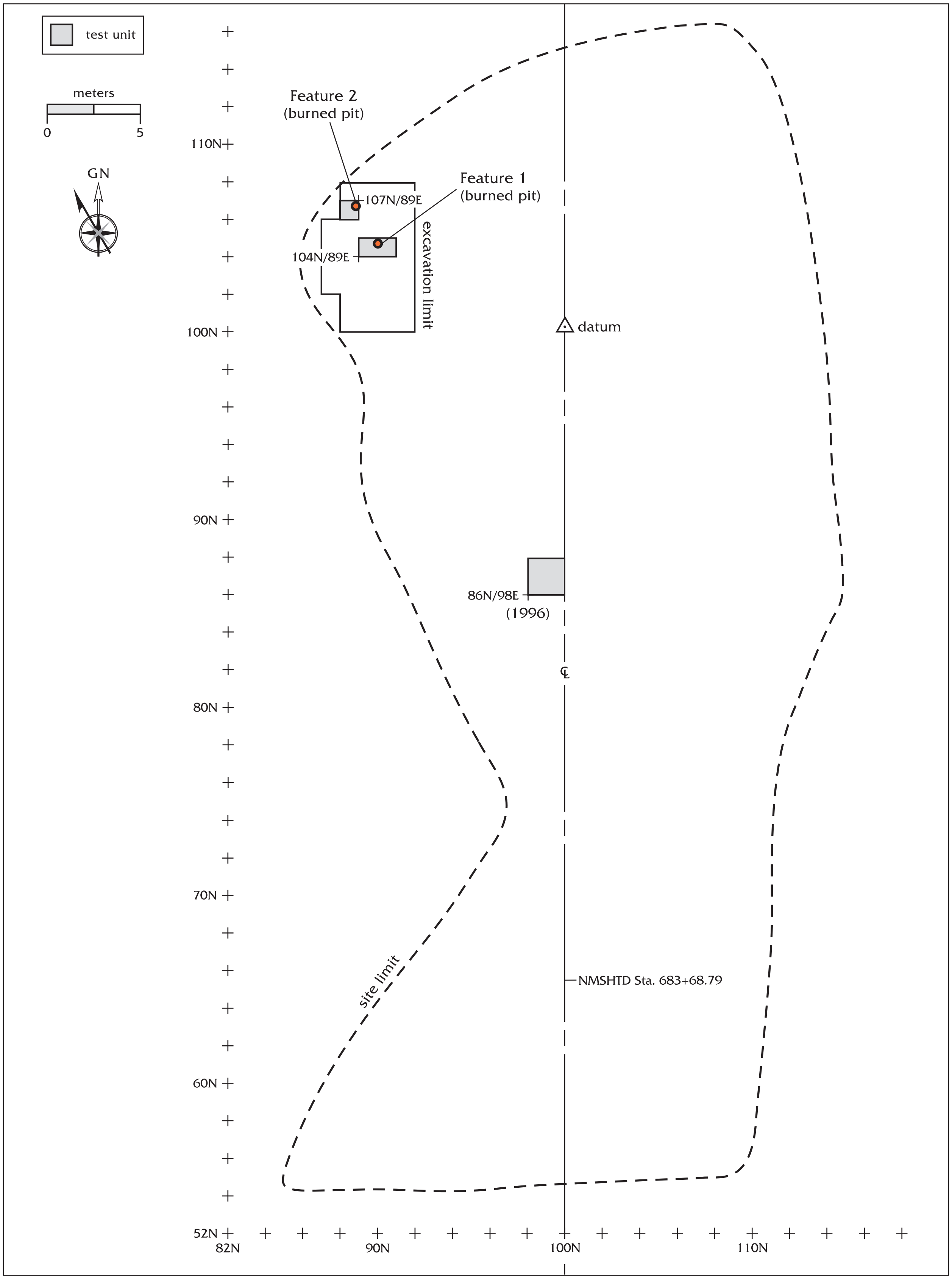


Figure 264. Plan of LA 114071.

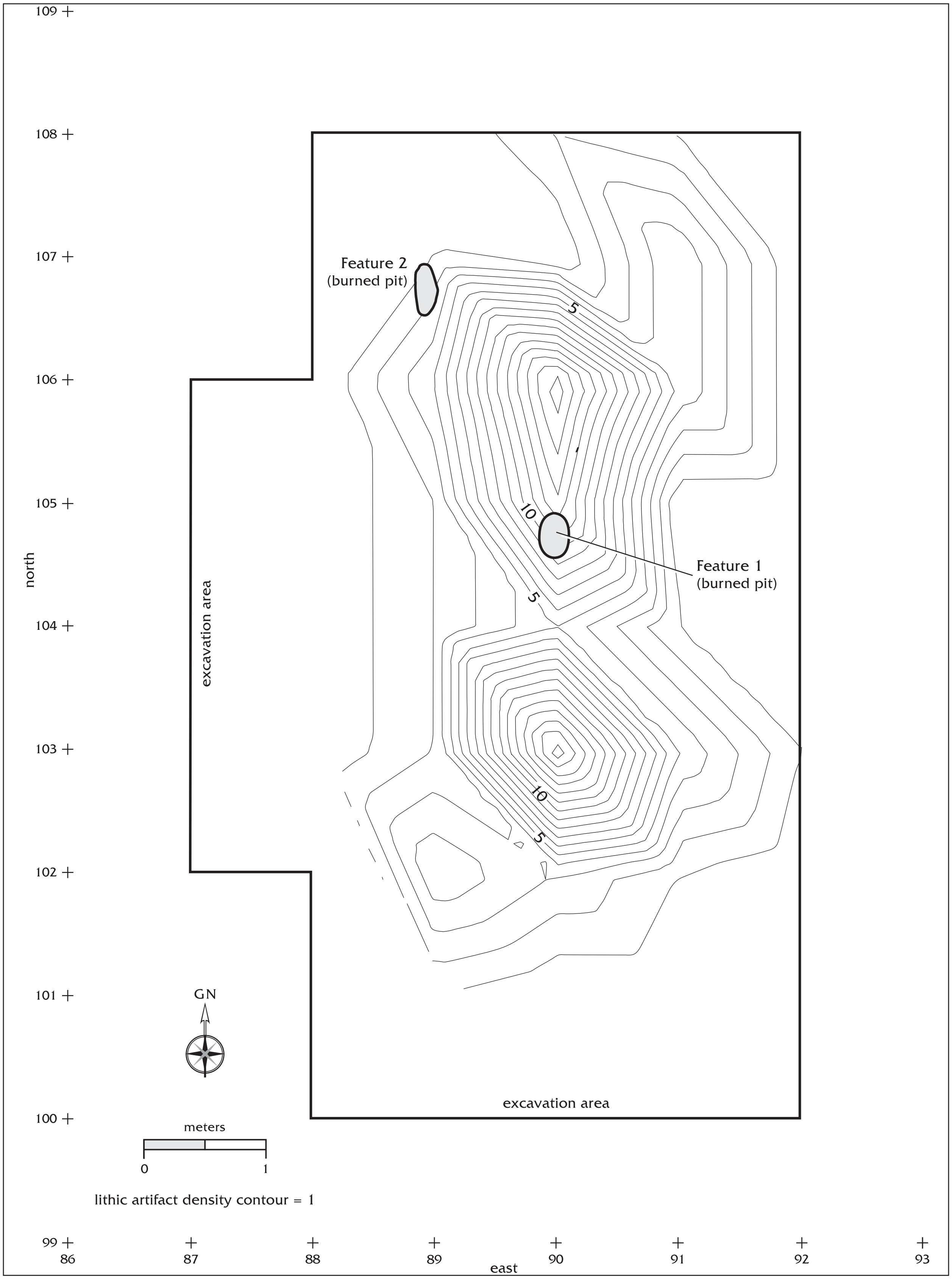


Figure 265. Plan of chipped stone distribution, LA 114071.

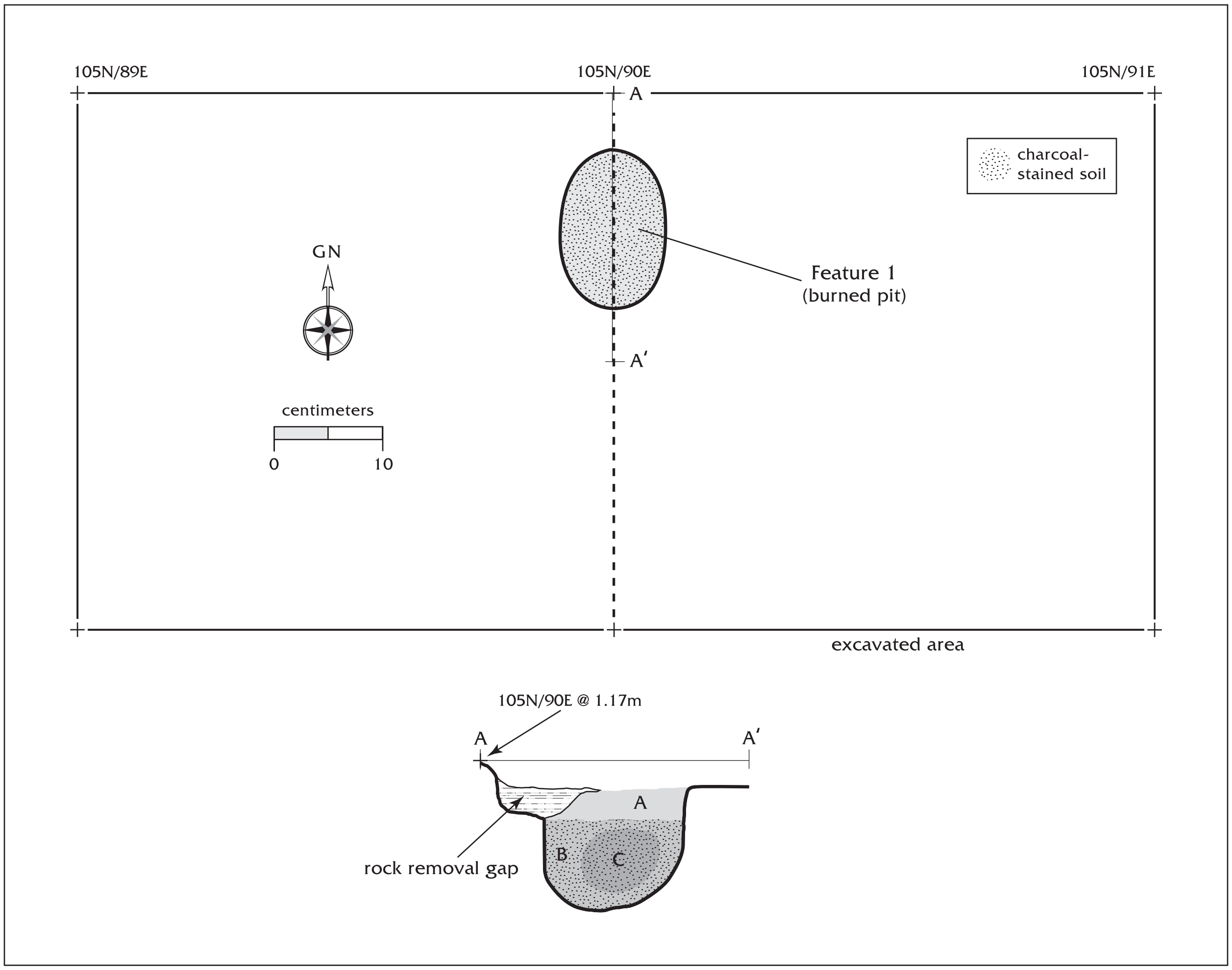


Figure 266. Plan and profile of Feature 1, LA 114071.

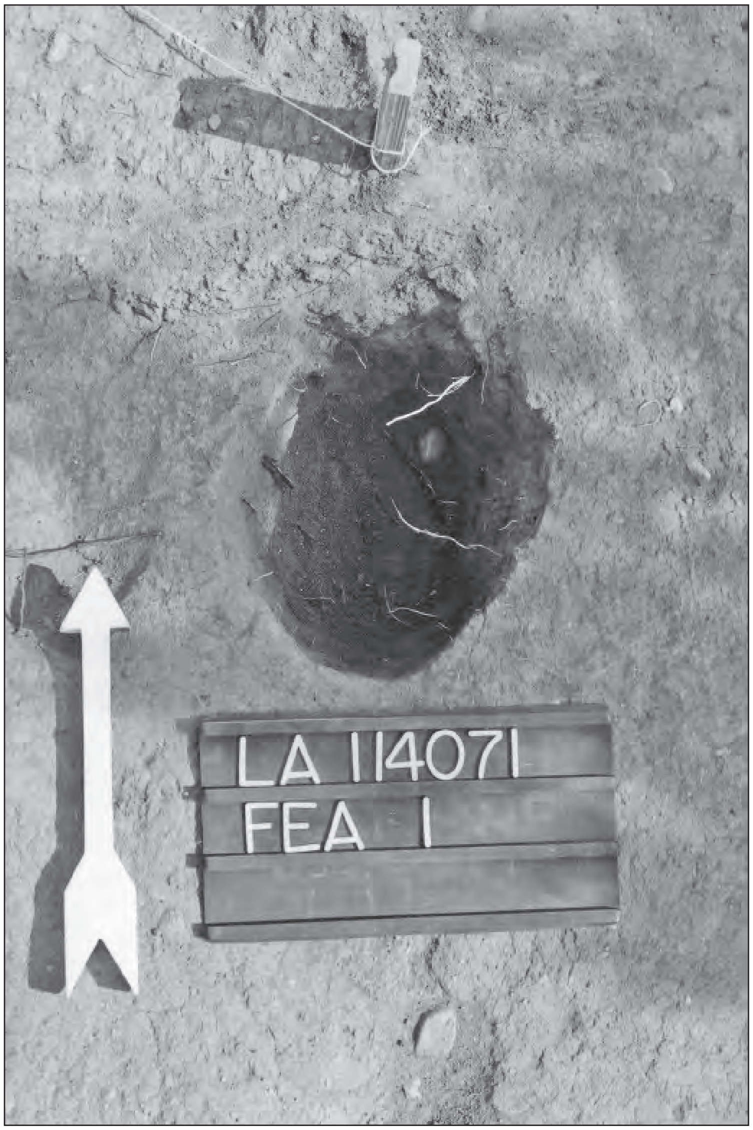


Figure 267. Feature 1, LA 114071.

processes than to cultural activity. Stratum B was a strong brown (7.5YR 4/6, wet), fine sandy loam with light staining caused by charcoal diffusion. The deposit was homogenized by root action and insect burrowing. Stratum C was the same matrix as Stratum B but had a higher charcoal content and was dark brown (7.5YR 3/2, moist). No chipped stone artifacts were recovered from the fill. No ethnobotanical remains were recovered from the flotation samples. Insufficient charcoal was available for C-14 dating. The interior of this feature was unburned, and the walls were unaltered. Since there was no extramural charcoal source, it is likely the charcoal flecks and stain remain from the primary deposit, though it has been mixed with postabandonment colluvium and subjected to bioturbation. Since no other heat-treated chipped stone artifacts were recovered, feature function cannot be determined beyond the inference drawn from the testing results.

Feature 2 was 1.5 m north of Feature 2 and excavated into the same native soil. Excavation revealed an undifferentiated burned pit. It was oblong with steep sides and a concave bottom. It measured 47 cm long by 20 cm wide by 26 cm deep (Figs. 268 and 269). The feature interior is unburned, though a small burned cobble was at the bottom of the feature. Three strata were identified by excavation. Stratum A was a very dark brown (10YR 2/2, dry), loose, fine-grained sandy loam that contained charcoal and ash. Stratum B is similar to Stratum A except that it was it was darkly charcoal stained to black (10YR 2/1, moist). Stratum B was a dark yellowish brown (10 YR 4/4, moist), fine sandy loam with 2 to 5 percent pea gravel. No chipped stone artifacts were recovered from the fill. No ethnobotanical remains were recovered from the flotation samples. Insufficient charcoal was available for C-14 dating. Feature 2 contained darkly stained fill that was the mixed remnant of a primary deposit and slope wash. The intensity of the charcoal staining relative to that of Feature 1 suggests that a substantial fire was built in Feature 2 and partly smothered prior to site abandonment. The similar size and shape of Features 1 and 2 may represent a similar limited function, though Feature 2 may have been used more intensively.

Features 1 and 2 are close to each other and were excavated into the same soil stratum. Their similar form and stratigraphic position suggest that they were contemporaneous. Excavation and sample analysis provided no additional evidence that would indicate contemporaneous and complementary feature use. The age of the features could not be determined from the artifacts, nor was sufficient charcoal recovered from either feature for radiocarbon dating.

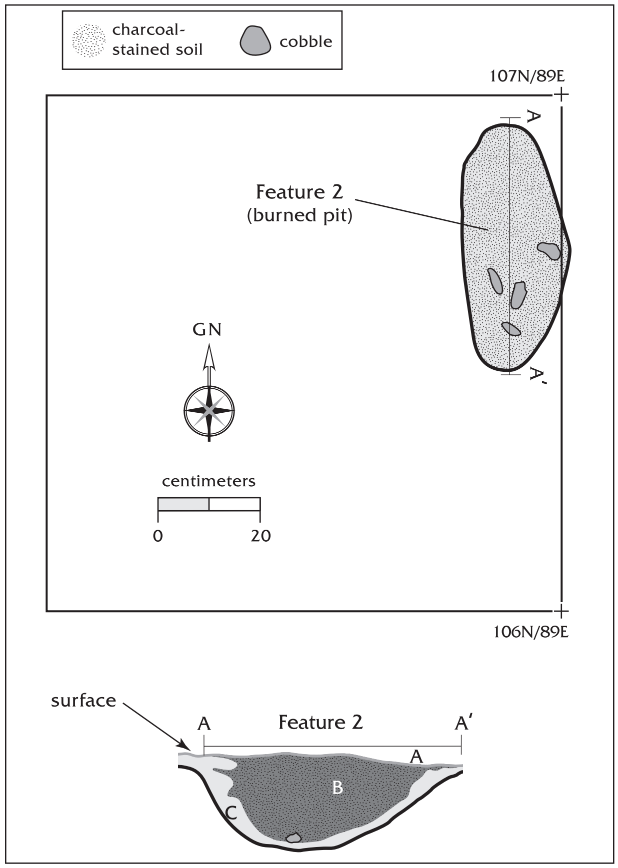


Figure 268. Plan and profile of Feature 2, LA 114071.

Figure 269. Feature 2, LA 114071.

Chipped Stone Artifacts

A total of 94 chipped stone artifacts weighing 3.76 kg were recovered from LA 114071. They consist mainly of core flakes and angular debris, as well as a tested cobble (Table 105), and reflect limited raw-material procurement and core reduction.

The assemblage is completely comprised of locally available materials. Chert and metaquartzite are among the typical constituents of the Santa Fe group gravel deposits. The Madera chert also occurs in these deposits as residual cobbles and pebbles eroded from an earlier Pennsylvanian age limestone bedding in the Sangre de Cristo foothills. Granite occurs in the Sangre de Cristo foothills (Kelley 1980:10).

Material quality ranges from fine to coarse grained. A substantial proportion (45.8 percent) of the material contains flaws, mainly in the form of cracks.

Debitage. Debitage represents 99 percent of the chipped stone assemblage, including 64 core flakes and 29 pieces of angular debris, making the angular debris to core flake ratio 1:2.2. No biface flakes, which are indicative of formal tool production, or tool maintenance debitage were recovered. None of the debitage appears to be thermally altered. Flake attributes indicate that the debitage represents the remains of early- to middle-stage core-reduction activity.

The majority (67.2 percent) of the core flakes is noncortical, while 20.3 percent have 10–50 percent dorsal cortex, and 12.5 percent are over 50 percent cortical. Flakes with 0–1 dorsal scar are represented by a proportion of 39.1 percent, while 51.6 percent have 2–3 dorsal scars, and 9.3 percent have 4–8 scars.

Angular debris has a noncortical to cortical ratio of 1:1.6, indicating a higher frequency of cortical core flakes, which reflect the earlier stages of reduction. The majority (55.2 percent) has 10–50 percent cortex. The two remaining pieces of angular debris have 60–70 percent cortex. All cortex on flakes and angular debris is waterworn.

Flakes with cortical and single-facet platforms constitute 43.8 percent of the total (64) and reflect early-stage reduction. One flake with a multifacet platform reflects a later stage of reduction. Collapsed and absent platforms constitute 17.2 percent and 34.4 percent, respectively.

The whole-to-fragmentary core flake ratio is 1:4, indicating a preponderance of fragmentary core flakes. Factors related to flake breakage frequencies include increased breakage in the later stages of reduction, postreduction breakage, and material quality. Lateral portions have the highest frequency (31, 48.4 percent) of the core flake fragments. Proximal (14.1 percent), medial (6.3 percent), and distal portions (7.8 percent) are also represented (Table 106).

Cores. Five pieces of further reduced angular debris or fragmentary cores exhibiting three or more complete flake scars were recovered. These cores and the relatively dense concentration of flakes and debris they are associated with are probably from the same parent raw material and may represent one fairly intensive core-reduction episode. The material is a fine to coarse-grained, flawed, red Madera chert with waterworn cortex. Three retain cortex. One has 60 percent, and the other two have 40 percent (Table 107).

Hand tool. FS 15-2 is a medium-grained metaquartzite hammerstone. Battering wear in the form of crushing and step-fracturing is confined to one short-axis margin of the cobble ridge. The cobble is ovate and flattened, and it retains 80 percent waterworn cortex. One complete negative flake scar is present on one surface. Its platform opposes the battering wear. The hammerstone was recovered from a relatively dense concentration of red Madera chert core-reduction flakes and debris. It measures 114 mm long by 74 mm wide by 58 mm thick and weighs 283.4 g.

Comparison of the testing- and excavation-phase assemblages. During the analysis of the excavation-phase chipped stone assemblage, 35 testing-phase chipped stone artifacts were reanalyzed and incorporated into the excavation-phase results. These artifacts were recovered from a concentration that may represent one episode of core reduction. During the testing phase, an additional 22 chipped stone artifacts were analyzed in the field or laboratory (Post 1997:12–26, 47–53). These artifacts, which are from the general site scatter, were not incorporated into the excavation-phase results. Therefore, these artifacts will be compared to the excavation-phase assemblage. The following comparative discussion addresses assemblage-level and artifact-level attributes.

Table 105. Chipped stone artifact type by material type, LA 114071

Number Row % Column %	Chert	Madera Chert, Red and Mottled Red	Granite	Metaquartzite	Total
Angular debris	-	28	-	1	29
	-	96.6%	-	3.4%	100.0%
	-	32.6%	-	16.7%	30.9%
Core flake	1	58	1	4	64
	1.6%	90.6%	1.6%	6.3%	100.0%
	100.0%	67.4%	100.0%	66.7%	68.1%
Tested cobble	-	-	-	1	1
	-	-	-	100.0%	100.0%
	-	-	-	16.7%	1.1%
Total	1	86	1	6	94
	1.1%	91.5%	1.1%	6.4%	100.0%
	100.0%	100.0%	100.0%	100.0%	100.0%

Table 106. Debitage mean whole measurements, LA 114071

	Platform Width (mm)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
Number	29	20	24	24	15
Mean	9.2	35.8	31.4	12.7	15.7
SD	3	10.9	8.7	4.3	14.7
Minimum	2.1	18	16	6	3.1
Maximu	14.8	64	50	24	52.8

Table 107. Cores, LA 114071

FS No.	Scars	Cortex (%)	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
15-1	3	60	78	74	58	283.4
3-1	5	30	74	55	39	174.6
1-1	5	0	65	42	36	64.1
1-7	4	40	42	36	24	27.6
1-15	3	40	73	32	28	58.7

A slightly expanded material type distribution is evident in the excavation-phase assemblage. One granite core flake is present in this assemblage. Granite is absent from the testing-phase assemblage. All materials from both assemblages are locally available.

The artifact type distribution of the testing phase exhibits slightly more diversity. During testing, one unidirectional core was recovered. No such artifact type was recovered during the excavation phase. The testing-phase assemblage, namely the tested cobble and the unidirectional core, lends additional support to the notion that raw-material procurement occurred on site. Both assemblages lack evidence of formal tool production. Sixteen core flakes are included in the testing-phase assemblage.

Considerable differences are evident in the core flake dorsal cortex distributions. In the testing-phase assemblage, there is a larger proportion of core flakes that retain 60–100 percent dorsal cortex (15 percent more), a smaller proportion that retain 10–50 percent cortex (7.8 percent less), and a smaller proportion that lack cortex (17.2 percent less). The noncortical to cortical core flake ratios are 1:1 and 1:0.5 for testing- and excavation-phase assemblages, respectively. Cortical core flakes are twice as frequent than noncortical core flakes in the testing phase. The excavation-phase ratio may reflect a prevalence of middle- to late-stage reduction debris.

Testing (1:0.6) and excavation-phase assemblages (1:4) have disparate whole-to-fragmentary core flake ratios. Fragmentary portions are more than six times more frequent than whole flakes in the excavation-phase assemblage. Flake condition may be related to reduction sequence, postreduction breakage, and material flaws.

There are minor differences in the testing- and excavation-phase core flake platform type distributions. In the testing-phase assemblage, there is a larger proportion of core flakes with single-facet or cortical platforms (18.7 percent more) and a smaller proportion that exhibit platform breakage (23.4 percent less) such as absent, collapsed, crushed, or broken-in-manufacture platforms. Both assemblages have one core flake with a multifaceted platform. Between assemblages, the difference in the percentages, which these flakes constitute, does not exceed 5 percent. Platform type is related to reduction sequence.

The assemblages have comparable core flake whole length central tendency and dispersion statistics. No difference in mean or standard deviation statistics exceeds 2 mm. The testing-phase core flakes have a smaller mean whole thickness (4.2 mm smaller) than the excavation-phase assemblage but a similar standard deviation (only 1 mm less). Size may be related to reduction sequence.

The most glaring differences are in the whole to fragmentary and noncortical to cortical core flake ratios. These differences may reflect the recovery of a larger proportion of middle- to late-stage reduction debris in the excavation phase, but this notion is not supported by the smaller core flake mean whole thickness of the testing phase.

Site Summary

Excavation of two activity areas within LA 114071 expanded on the testing results with the recovery of more artifacts and the exposure of a second thermal feature. Artifact distribution indicated two occupations with two higher-density hotspots. The feature and artifact distribution represent two occupations. Similar artifact assemblage traits and feature morphology suggest that the activities conducted during the two occupations were very similar. No temporally diagnostic artifacts were recovered from the excavation, but it is most likely that the occupation dates to the Ancestral Pueblo period. Repeated use of this gentle slope is indicated by the two features.

Features 1 and 2 represent similar occupation episodes and activities. These long, narrow features are deeper that many other thermal features excavated during the project. The features lacked internal or associated fire-cracked rock, indicating they were functionally different from most of the Ancestral Pueblo features but similar to the Middle and Latest Archaic features. The lack of ethnobotanical remains from these features and the absence of associated tools makes functional determinations difficult. The small size of the features indicate limited cooking or processing. Their depth indicates roasting, perhaps of small mammals, but no animal bones were recovered from the features.

LA 114071 was a multiple-occupation foraging camp situated to exploit the floral resources of Arroyo Gallinas and its major side drainages. Repeated occupation of probable prime resource areas is a consistent pattern along the Santa Fe Relief Route. Close examination of sites often results in the identification and excavation of multiple features or features that are characteristic of repeated use. That these sites were consistently found on the margins of major tributaries is strong evidence that the riparian and piedmont slope transition zone was a highly desirable and regularly exploited resource zone.

Ceramic Artifacts

C. Dean Wilson

A total of 96 sherds and one complete vessel were analyzed from nine sites investigated during the Northwest Santa Fe Relief project: LA 111364, LA 61299, LA 61290, LA 108902, LA 61293, LA 61286, LA 61287, LA 61289, and LA 113954 (Table 108). The small amount of pottery recovered from the sites reflects the very sporadic nature of pottery use and discard associated with temporary or seasonal episodes of pueblo use in the piedmont north of the Santa Fe River. Previous investigations of a large number of sites in this area found no evidence of permanent habitations by ceramic-producing groups (Lang 1997; Post 1996a). Sites with pottery reflect temporary or seasonal use by individuals living in pueblos, mainly along the Santa Fe River. Thus, the pottery from sites in the piedmont area may add to our knowledge of the seasonal utilization of this environment by individuals or small groups residing in Santa Fe River villages such as Pindi, Agua Fria, Cieneguitas, the School Site, and Fort Marcy Pueblo (Post 1996a).

Despite the small size of the pottery assemblages recovered during this project, ceramic data from these investigations has the potential to provide useful insights relating to single or seasonal foraging episodes in the piedmont by individuals or small groups. Ceramic data from these sites may provide clues to the use of specific pottery forms in various activities at a scale of resolution normally not possible for assemblages from habitation sites, where ceramic assemblages often reflect mixes of pottery accumulated during countless tasks or activities over generations. The occurrence of pottery at these sites also provides useful information concerning the basic period of occupation of a particular component, and the occurrence of this pottery often provides the only clues to the use of the area by Pueblo groups residing elsewhere.

Table 108. Ceramic artifacts, all sites

Site	Type	Form	Count
LA 111364	Kwahe'e Black-on-white	jar body	1
	plain gray	jar body	1
LA 61299	Santa Fe Black-on-white	complete dipper	1
	Santa Fe Black-on-white	bowl body	1
LA 61290	smeared corrugated	jar neck	10
	smeared corrugated	jar body	45
	unpainted white	indeterminate	9
LA 108902	Santa Fe Black-on-white	bowl body	4
	Santa Fe Black-on-white	bowl body	1
	unpainted white	bowl body	1
	unpainted white	indeterminate	1
	smeared corrugated	jar body	1
	plain corrugated	jar body	1
	indeterminate plain gray	jar rim	1
LA 61293	Santa Fe Black-on-white	bowl body	5
	smeared corrugated	jar body	4
	smeared corrugated	jar neck	1
LA 61286	Santa Fe Black-on-white	bowl body	1
LA 61287	Santa Fe Black-on-white	bowl rim	1
LA 61289	Santa Fe Black-on-white	bowl rim	1
LA 113954	Santa Fe Black-on-white	bowl body	3
	unpainted white	bowl body	2
Total			96

Pottery Analysis and Classification

Discussions presented in this study are based on information relating to ceramic types and attributes recorded for pottery from all phases of the project. These distributions reflect combinations of traits typical of pottery noted for sites along the Santa Fe River and surrounding areas dating to either the Late Developmental or Coalition periods (Kidder 1917; Habicht-Mauche 1993; Lang and Scheick 1989; 1997; McKenna and Miles 1989; Post 1996a; Stubbs and Stallings 1953). All of this pottery was assigned to "local" Rio Grande gray ware or white ware types based on paste and temper characteristics.

Sherds derived from unpolished or unpainted gray ware jars consistently exhibited dark silty pastes and granite temper and were assigned to Rio Grande Gray Ware types. Surface texture varied little, and all but one of the gray ware sherds were classified as smeared corrugated or indented corrugated. One sherd with a smoothed exterior surface was assigned to plain gray. Sherds that could have derived from portions of gray ware vessels with either plain or corrugated exteriors were classified as indeterminate plain.

Polished or painted white ware pottery consistently exhibited characteristics described for early (Late Developmental or Coalition period) Rio Grande or Tewa white ware types. Pastes of all white ware pottery identified was light gray to gray with very fine inclusions. Similar inclusions were noted in pottery analyzed during the Las Campanas project (Hill 1996; Lakatos 1996). While inclusions in all white ware sherds appear to represent natural inclusions in clays rather than added temper, two broad compositional groups were identified (Hill 1996). One of these groups consisted of abundant fine quartz particles; the other also contained fine rock fragments (Hill 1996). Temper described here as fine sand or silt appears to be analogous to Group 1 as defined by Hill (1996), and that classified here as fine tuff corresponds to Group 2.

White wares with these pastes were assigned to various Rio Grande types based on paint type and decoration. Some white ware sherds were placed into specific types based on paint type and style and decoration. Those without painted decoration were placed into an unpainted white category. One sherd decorated with mineral paint was assigned to Kwahe'e Black-on-white. The other painted sherds exhibited decorations in organic paint and were assigned to Santa Fe Black-on-white.

Distribution of Ceramic Types

Ceramic types reflect at least two occupation periods associated with the use of this area by Pueblo groups. A site with Kwahe'e Black-on-white (LA 111364) indicates use of this area during the end of the Late Developmental period (AD 1000–1200). The occurrence of Santa Fe Black-on-white or smeared corrugated pottery from all other sites indicates discard during the Coalition period. This period is usually defined as AD 1150–1200 to 1350 (Stuart and Gauthier 1981; Wendorf 1954; Wendorf and Reed 1955). Despite the very small quantity of pottery recovered at any of these sites, the wide range of pottery and associations indicate a variety of settings and activities where pottery was used and discarded.

LA 111364

Two sherds from LA 111364 are the earliest evidence of activity by ceramic-producing groups in this project. Both were recovered from the surface or the surface-strip area. One is a Kwahe'e Black-on-white jar sherd. The painted surface is slipped and polished over a gray paste. Temper consists of a fine silt. It has hatchured designs in an indeterminate layout and was assigned to Kwahe'e rather than Santa Fe Black-on-white on the basis of its decoration in dark brown mineral rather than organic paint. That this sherd is derived from a jar further supports its classification as Kwahe'e Black-on-white, since jar forms are extremely rare in Santa Fe Black-on-white and relatively common in Kwahe'e Black-on-white (Post 1996a). The other sherd is a plain gray ware jar body sherd with granite temper, the only gray ware body sherd found during the present study. While plain gray wares do occur in Coalition period sites, they are usually present in low numbers along with corrugated gray ware forms. In contrast, plain gray wares are often the most common pottery in Developmental period components. Thus, these sherds suggest a Late Developmental period component dating sometime between AD 1050 and 1200 (McNutt 1969; Wendorf and Reed 1955).

A number of Late Developmental phase occupations have been documented along the Santa Fe River, including the earliest component of Pindi Pueblo (Stubbs and Stallings 1953; Wendorf 1954; Wendorf and Reed 1955), although the overall scale of this occupation is small compared to the later Coalition phase occupation of this area. Still, the occurrence of pottery types associated with the Developmental period in this area may reflect the timing of initial patterns of seasonal use of the piedmont by ceramic-using groups. Evidence of Developmental period occupation was also noted during the testing phase of LA 111364, during which a Kwahe'e Black-on-white sherd was recovered from a diffuse soil stain (Post 1996a). The eleven sherds recovered during the testing phase also included later types such as Biscuit A, Biscuit B, and Sankawi Black-on-cream (Post 1997).

LA 61299

The most noteworthy ceramic artifact recovered during the study is a complete Santa Fe Black-on-white bowl dipper from LA 61299 (Figs. 270 and 271). Seven clay pellets, all the same size, were recovered from inside the hollow handle. Such pellets have been noted in other dipper handles and appear to have been included for a rattle effect. The overall length of the vessel is 52 cm. The bowl diameter is 24 cm, and its height is 10 cm. The length of the handle is 28 cm, and its maximum width is 6 cm. The handle is cylindrical and hollow. It contains two small perforations in the top of the center portion of the handle, which may have allowed air to escape during firing. A loop at the end of the handle was presumably used to hang the dipper. One of the unique characteristics of this vessel is the absence of exterior or rim wear. Such wear is almost always present on dippers recovered from any context, and its absence on this vessel indicates that the vessel was left in place after firing and never used.

The vessel has a thin white slip on both the exterior and interior surfaces, which were applied over a gray paste. The temper is fine tuff and sand. The interior bowl exhibits remnants of organic-paint decoration. The surface is buff colored with some gray sooting. The faded paint and buff interior surface indicate that during firing this vessel was exposed to an oxidizing atmosphere and partly sooted during the last stage of firing. This combination of conditions resulted in a negative design effect, whereby the painted areas are light gray to buff and the unpainted areas are gray to dark gray. Such a departure from the neutral atmosphere normally obtained for white ware firing is a strong indication of a misfired vessel.

Decorations consist of a banded design with elements intersecting the thin framing lines. Motifs incorporated into this design include parallel horizontal lines, step triangles, and scrolls. The overall design is very similar to those employed in McElmo Black-on-white produced in the Northern San Juan region during the Pueblo III period (Breternitz et al. 1974; Oppelt 1991; Wilson and Blinman 1995). This vessel exhibits ticked decoration and flat rims. Ticked decorations are represented as negative dots resulting from the combination of sooting and oxidation during the misfiring of this vessel.

This vessel contrasts with typical Santa Fe Black-on-white pottery but is remarkably similar to Pueblo III pottery from Northern San Juan sites. One similarity with Northern San Juan pottery is a flat rim with ticked decorations. Polishing of interior and exterior surfaces also resembles surface finishes common on San Juan forms. The overall design of horizontal lines, triangles, and scrolls is extremely similar to designs noted in McElmo Black-on-white. McElmo Black-on-white is the dominant white ware in Early Pueblo III assemblages dating from about AD 1130 to 1200 and persisting with greater amounts of Mesa Verde Black-on-white until the abandonment of the Northern San Juan in about AD 1300. At Mug House, a late Pueblo III site in Mesa Verde National Park, dippers were the only vessel form that was mainly decorated in the McElmo Black-on-white style (Rohn 1971).

The overall shape of the dipper from LA 61299 dipper and those from Pueblo III sites in the Northern San Juan are surprisingly similar. Such similarities in vessel shape are reflected in the hollow handle with clay pellets and rattles, and perforations (Cattanach 1980; Rohn 1971). While dippers are found at sites in the Northern San Juan region dating as early as the Basketmaker

Figure 270. Three-quarter and bottom views of Santa Fe Black-on-white dipper, LA 61299.

Figure 271. Side and interior views of Santa Fe Black-on-white dipper, LA 61299.

III period, white ware bowl dippers similar to the LA 61299 dipper are not common until the Pueblo II period, when they occur in Mancos Black-on-white (Hayes and Lancaster 1975). Similar bowl forms are common in Pueblo III period assemblages, where they are dominated by McElmo Black-on-white styles along with lower frequencies of Mesa Verde Black-on-white styles (Cattanach 1980:198–202; Rohn 1971:171–175).

Along with mugs and kiva jars, dippers exhibiting this constellation of attributes can be characterized as a distinctive Northern San Juan Pueblo form. Like these other forms, bowl rattle dippers may have had certain ritual significance. Such significance may be reflected by the elaborate shapes and apparent dual use as a rattle, as well as the conservative nature of associated designs. While dipper forms have been reported for Santa Fe Black-on-white (Habicht-Mauche 1993), they are extremely rare, as are most white ware vessel forms other than bowls. Thus, it is possible that leaving behind a usable vessel had ritual connotations, related to its specialized form and design elements.

While combinations of styles and manipulations resembling those noted for Northern San Juan white ware forms have been noted in low frequencies of Santa Fe Black-on-white from Coalition period assemblages in the Northern Rio Grande region, pottery clearly exhibiting such characteristics tend to be extremely rare for this type. While similarities in the organic painted pottery found at thirteenth-century sites in the San Juan and Northern Rio Grande regions have sometimes been interpreted as an indication of movement or connections between these regions, some suggest that contemporary organic painted white wares from these regions tend to be quite distinct. The distinct characteristics of Santa Fe Black-on-white appear to cast some doubt on scenarios proposing the mass migrations of groups from the Northern San Juan to the Rio Grande during the thirteenth century (Mera 1935). A more likely scenario is that while small groups did make such migrations, they largely moved into areas already occupied, and these groups appear to have merged with or adapted to the local technology and material culture (Cordell 1989). Sites in the Northern Rio Grande region containing Santa Fe Black-on-white often have pottery assemblages dominated by forms exhibiting distinct local styles and traits, along with some forms that are similar to those produced by groups from the Northern San Juan region. Nonlocal pottery from the Colorado Plateau tends to be absent at sites dating to the Coalition period. A difficult task facing archaeologists working with prehistoric Northern Rio Grande pottery involves the documentation and interpretation of elements reflecting both the distinct nature of Rio Grande ceramics as well as the occasional occurrence and blend of San Juan elements.

Thus, the single Santa Fe Black-on-white vessel from the kiln at LA 61299 is unusual in that it appears to reflect combinations of Northern San Juan influences that are rare in pottery from Northern Rio Grande sites. Associated paste characteristics and the recovery of this vessel from a kiln, however, indicates it was definitely manufactured locally. One possibility is that it may have been produced by an individual directly influenced by a technology derived from the Northern San Juan, such as an immigrant from that region. Interestingly, other partial Santa Fe Black-on-white vessels recovered from nearby pit kilns excavated as part of the Las Campanas project also commonly exhibit northern San Juan characteristics (Post 1996a). It is possible that kilns in this area were employed by potters with stronger ties to the San Juan region than those used in other areas.

The occurrence of distinctive firing kilns at contemporaneous sites in the Northern Rio Grande and Northern San Juan regions has stimulated comparisons and suggestions of a direct relationship between kiln features in the two regions (Lakatos 1996; Post and Lakatos and 1995). The possibility of some kind of relationship between kiln features in these two regions seems to be further suggested by the general absence of features clearly exhibiting attributes of a pottery kiln for other periods and regions, and evidence that kiln features found in both the Northern San Juan and Northern Rio Grande were used to fire white ware vessels decorated with organic paint. Other similarities between kilns found in the two regions include their shallowness relative to length and width, moderately steep angles along the sides, similar stratigraphic sequences, and their location at a considerable distance from the nearest habitation site (Post and Lakatos 1995). These similarities may reflect the widespread production of well-made white wares decorated with organic paint during the thirteenth century. Challenges associated with retaining organic paint during firing may have resulted in the use of distinct firing features. Despite these similarities, the pit kilns found in the Northern Rio Grande are distinguished from Northern San Juan trench kilns in topographic setting, size, and geologic materials (Post and Lakatos 1995). These differences may reflect the distinct characteristics of material available in different regions and differences in overall firing technology. Interestingly, the kiln at LA 61299 is also more similar to Northern San Juan trench kilns than other Rio Grande pit kilns in that it is stone lined, which is a common characteristic of Pueblo III trench kilns in the San Juan region (Fuller 1984; Purcell 1993).

It is possible that some of the kilns found north of the Santa Fe River reflect firing activities by potters who may have been recent emigrants or influenced by groups from the San Juan region. Other pottery made by individuals less influenced by San Juan influences may have been produced at these sites and fired in kilns located elsewhere. The pottery from pueblos along the Santa Fe River seems to reflect a mixture of forms that were largely locally derived forms with lower frequencies of those more influenced by the San Juan ceramic tradition.

One Santa Fe Black-on-white bowl body sherd recovered from the kiln at LA 61299 was not derived from the dipper. The paste is gray, and the temper is a fine crushed tuff. The interior surface is polished and slipped, and the exterior surface is smooth and bumpy. Interior decorations are in a diffuse dark gray organic paint. No other pottery was recorded during the initial testing of this site (Wolfman et al. 1989), so all pottery at this site was associated with the pit kiln.

LA 61290

A total of 64 sherds were recovered from LA 61290. No pottery was recovered from the site during the testing phase (Wolfman et al. 1989). Fifty-five of these sherds are neck and body sherds from one smeared corrugated jar that was surrounded by piñon nut shell fragments. This vessel exhibits attributes typical of smeared corrugated common in many Coalition phase sites (Habicht-Mauche 1993; Stubbs and Stallings 1953). Exterior coil treatments consisted of smeared or partially obliterated coils, and the junctures between coils were not visible. Indentations were very shallow and evenly spaced. Surface color ranged from dark gray to reddish brown. Temper consisted of granite without mica fragments.

The occurrence of this vessel with piñon nuts is extremely important. While the association of utility ware with thermal features is relatively common in the piedmont, the recovery of piñon shells or other plant materials with such associations is not. At least in this case, there is direct evidence of the use of gray ware vessels in activities associated with the collection of wild plant resources. Thus, the association of this pot drop with piñon nuts provides another glimpse of seasonal activities that may have been fairly common but are usually invisible in the archaeological record.

Nine sherd spalls were recovered from another feature at LA 61290. These are indeterminate polished white ware sherds. Their distinctive morphology, identified as spalling, may have resulted from exposure to high temperatures. These sherds were recovered from a pit feature that in retrospect could represent a kiln, although this feature was not recognized as a kiln during excavation (Post, this volume). Vessel form could not be determined, although at least one surface is polished. Temper is a fine silt.

LA 108902

Ten sherds were recovered from LA 108902. Five of these were from Santa Fe Black-on-white bowls and include four body and one rim sherd. Although the sherds were recovered from four different proveniences, their characteristics are similar, and it is possible that one vessel is represented. Paste is light gray, and temper is a fine tuff. The interior surface is polished but not slipped, and the exterior surface is unpolished. Designs consisted of unknown solids decorated in organic paint. Two other white ware sherds from two proveniences had similar pastes but were without painted decorations. One of these sherds was assigned to a bowl based on a polished interior. The other of these sherds could not be assigned to a specific type because the interior surface was missing. Three utility wares were also represented. Each represented jars with a crushed granite temper. Each of these sherds wares were assigned to different types based on surface texture. One represents a portion of a plain gray rim but could represent the uppermost part of a fillet on a corrugated vessel with a brown paste. Another represents a smeared corrugated jar neck with a dark gray paste. The other gray ware sherd was assigned to plain corrugated based on distinct junctures between the coils. Sherds recovered during the testing phase included one classified as Santa Fe Black-on-white and another assigned to Pindi Black-on-white (Post 1997).

LA 61293

Ten sherds were recovered from LA 61293, including five from the same provenience and derived from one Santa Fe Black-on-white vessel. The paste is gray to brown, and the temper is a fine silt. All are bowl body sherds. The interior surface has a thick white slip and is well polished. The exterior surface is also polished and is reddish brown, which reflects apparent accidental oxidation of the exterior surface of this vessel. The interior surface also has decorations in black organic paint. These appear to represent black horizontal lines with incorporated solid designs. These sherds appear to be similar to one Wiyo Black-on-white sherd noted during the testing phase of this site (Wolfman et al. 1989). The other five sherds were recovered from four different proveniences but appear to have been derived from one smeared corrugated jar. These include four jar body and one neck sherd. The surfaces are brown, the paste is dark gray, and the temper is crushed granite.

LA 61286

One Santa Fe Black-on-white bowl body sherd was recovered from the surface of LA 61286. This sherd exhibited a dark gray paste. The interior surface had a relative thick slip and was well polished. The exterior surface was unslipped and unpolished. The interior surface exhibited decoration in a black organic paint with a hatchured design. Investigations during the testing phase resulted in the recovery of 26 sherds, including 1 Santa Fe Black-on-white, 20 smeared corrugated (probably from one pot), and 5 smeared indented (Wolfman et al. 1989).

LA 61287

A Santa Fe Black-on-white sherd was recovered from LA 61287. It is a bowl rim sherd that has been worked along the edge. The rim is tapered and undecorated. The paste is gray, and the temper is a fine silt. The interior surface has a white slip and is well polished. The exterior surface is unpolished and unslipped. Decoration consists of a black organic paint applied to the interior surface. The design consists of a band with incorporated triangles framed by thick lines. Five sherds were recovered from this site during the testing phase, including unclassified white and corrugated (Wolfman et al. 1989).

LA 61289

A Santa Fe bowl rim sherd was recovered from LA 61289. The rim is tapered and undecorated. The paste is gray, and the temper is fine silt. The interior surface has a white slip and is well polished. The exterior surface was not polished or slipped. Decoration consists of a slightly diffuse gray-brown paint applied to the interior surface. The design consists of unknown solid banded designs framed by thin lines.

LA 113954

Five bowl sherds were recovered from three proveniences at LA 113954, including two Santa Fe Black-on-white bowl body sherds from one vessel. Both of these sherds are very thick for Santa Fe Black-on-white. They have a gray paste and are tempered with fine tuff. The interior surface is slipped and polished, while the exterior surface is unpolished. The designs are executed in a black organic paint and have a combination of solid and hatchured motifs. Another Santa Fe Black-on-white bowl body sherd has a gray paste and fine tuff temper. The interior surface is polished and unslipped, while the exterior surface is unpolished. Decorations consist of an indeterminate solid motif executed in a gray slightly faded organic paint. The other two sherds are unpainted white wares. The surfaces of these sherds are extremely worn, although the interior surface exhibits some polishing, indicating bowl body sherds. The paste is gray, and the temper is fine tuff.

Conclusion

The pottery collected during the excavation phase of the Northwest Santa Fe Relief Route project provides clues about the use of the piedmont and other outlying areas by Pueblo groups residing along the Santa Fe River. This data provides perspective on the type and nature of activities conducted by Pueblo groups that could not be obtained through an examination of material from habitation sites along the Santa Fe River alone. Thus, data from the present study and other investigations in this area compliment and expand our view of the range of subsistence patterns practiced by Northern Rio Grande Pueblo groups (Post 1996a).

The pottery examined during the present study consists of two distinct forms manufactured in this area: gray ware and white ware. Gray ware exhibits extremely homogenous pastes and was probably manufactured with alluvial clays and crushed igneous rock found along the Santa Fe River. The absence of gray ware pottery at pit kilns in the piedmont indicates that it may have been fired in unidentified features closer to residential sites.

While the pastes and temper associated with these white wares are very different from those of the utility wares, characteristics within white wares were fairly uniform. The temper appears to reflect natural inclusions, rather than added tempering material (Hill 1996). Similarities in the pastes in white wares examined during the present study and the Las Campanas project indicate uniformity in pastes (Lakatos 1996). This similarity appears to contrast with variation noted at Pindi and other Coalition phase habitations, where Coalition phase white wares were assigned to a broad range of types based on paste variability (Habicht-Mauche 1993; Stubbs and Stallings 1953). This similarity may indicate the use of a relatively restricted clay source, perhaps from the Culebra Lake deposits (Lakatos 1996). The two distinct temper groups noted during the Las Campanas Project (Hill 1996) appear to be represented in the white wares examined during the present study. Petrographic analysis during the Las Campanas project indicated similarity in paste color and temper composition between two temper groups, which may indicate the use of geologically related clay sources (Hill 1996). As in the Las Campanas project, pottery examined during the present study is dominated by white wares at seven sites exhibiting fine silt (24 sherds, or 75 percent of the total) with lower frequencies of fine sand temper (Table 109). Lower frequencies (8 sherds, or 25 percent) of white wares from three sites exhibited fine tuff temper. The presence of a similar fine silt temper in the single Kwahe'e sherd indicates that similar clay sources may have been exploited during the Late Developmental period.

Table 109. White ware temper, all sites

Site	Fine Tuff	Fine Silt	Total
LA 111364	-	1	1
LA 61299	2	-	2
LA 61290	-	9	9
LA 108902	5	2	7
LA 61293	-	5	5
LA 61286	1	-	1
LA 61287	-	1	1
LA 61289	-	1	1
LA 113954	-	5	5
Total	8	24	32

The differences in the two local wares may reflect their use in different activities. All the gray wares examined appear to have derived from jars. With the exception of one jar sherd from the Developmental phase component and the complete bowl dipper, all the white ware sherds appear to have derived from bowls. The use of different wares in distinct activities conducted in the piedmont is indicated by the association of certain wares with specific feature types and may be associated with specific ceramic forms. Excellent examples of specific pottery forms associated with various activities were encountered during the present study. One such example is the evidence of seasonal collection of piñon nuts as reflected by a smeared gray utility ware pot drop from Feature 1, LA 61290. Another example was the association of white ware pottery from pit kilns. In particular, the unique form and decorations of the complete dipper from LA 61299 provide a unique and fascinating glimpse of the complex nature of influences from the San Juan region on pottery production.

While most of the pottery examined during the present study are gray ware jar sherds, this dominance is the result of 55 sherds from one vessel. While white ware sherds were recovered from nine sites with ceramics, gray ware sherds were only recovered from four of these sites. Data from the Las Campanas project also indicates that types of activities associated with Coalition phase activities conducted in the piedmont and resulting in the discard of white ware pottery were more common than those resulting in the discard of gray ware pottery (Post 1996a).

The occurrence of pottery at such sites largely reflects unusual situations resulting from firing mistakes and the breakage of vessels during foraging activities, and it is likely that other sites associated with such activities may not contain pottery. Thus, it is very likely the number of seasonal and limited activities that can be assigned to Pueblo period components is drastically underrepresented. Still, enough such sites have been identified to indicate that this area was important to the economy of Pueblo groups residing along the Santa Fe River, particularly during the Coalition period.

A Projectile Point Typology for the Archaic Period of the Santa Fe Area

Jesse B. Murrell

The Oshara Tradition (Irwin-Williams 1973) is often used to classify projectile points from the Santa Fe area and the Northern Rio Grande Valley, among other areas of Southwest. This typology is based on short descriptions of projectile points and photographs of a limited number of representative specimens. The phases of the Oshara Tradition with their respective projectile points provided an intuitive classification scheme seemingly based on changes in outline form, with a specific focus on basal morphology. The intuitive or subjective nature of this scheme has led to typological vagaries. Through time, broad similarities in projectile point morphology are evident across the Southwest and beyond. It is not uncommon for morphologically similar points from different areas to be given different names, leading to further typological confusion. This lack of systematic classification is compounded by the recovery of points that defy classification and a proliferation of new named types (Thoms 1977). In the Northern Rio Grande Valley, projectile points reflect more formal variation than accounted for by the Oshara Tradition. This is not unexpected, since Irwin-Williams's report was intended to be a summary of the preliminary results of the Arroyo Cuervo fieldwork, rather than an encompassing typology.

Irwin-Williams (1967:441) defined the integrative Picosa, an acronym for the Pinto, Cochise, and San Jose cultures, as "a continuum of similar closely related preceramic cultures existing in the Southwestern United States during the last three millennia BC" and originating as early as 8000 BC. In a more recent overview of the Archaic Period, Matson (1991:129) argued that the Picosa complex is a pan-Southwestern tradition dating from 6000 to 8500 BP. Matson's overview (1991) appears to have the stronger chronometric basis, whereas Irwin-Williams's does not explicitly present the derivation of her dates. Irwin-Williams (1967:445) sees the Picosa complex as part of the more widespread Desert Culture as defined by Jennings (1957:6B9), who saw evidence of this mobile hunting and gathering culture from Oregon to Mexico and over into the High Plains and possibly the Midwest. It should be noted that Irwin-Williams (1967:444B446) valued the Desert Culture as an integrative concept but questioned its merit as an isolative concept.

In the Southwest, early, middle, and late subdivisions are typically used in ordering the longstanding Archaic period. Since this is a discussion regarding the Oshara Tradition, its phases will be equated with the tripartite subdivision of the Archaic period (Irwin-Williams 1973). The Early Archaic period encompasses the Jay and Bajada phases and lasts from 5500 to 3300 BC. The Middle Archaic period encompasses the San Jose phase and lasts from 3300 BC to 1800 BC. The Late Archaic and Latest Archaic periods encompasses the Armijo, En Medio, and the early Trujillo phases and last from 1800 BC to AD 850 or 900. Irwin-Williams (1973:2) sees Oshara Tradition phases as a continuous sequence of regional developments without episodes of population replacement. Evaluating this model is hampered by the lack of published chronometric data, especially for the Early and Middle Archaic periods, on which these phase ranges are based. The need for temporal fine tuning is acknowledged, but beyond the scope of the present discussion. Refinements may reveal abutting or overlapping phase ranges that would lend support to the continuous, in situ development model, while discontinuities or interruptions between phase ranges could reflect population movement.

Early Archaic Period

The technological transition from Paleoindian projectile point forms to Archaic forms involves the transition from a subsistence based primarily on the hunting of now-extinct large animals to a more generalized subsistence strategy incorporating the hunting of smaller game and the gathering of wild plants. The earliest Archaic projectile point describe by Irwin-Williams (1973:5) is the Jay, which has a relatively large parallel to slightly contracting stem and sloping shoulders. The lateral edges and base of the stem are usually ground (R. Moore 1994:472). In an analysis of 365 Archaic projectile points, including 24 Jay points, R. Moore (1994:468) found that Jay points tend to be the largest and thickest and that there is a decrease in mean size as well as maximum and minimum measurements through time. The Jay point resembles the Lake Mohave point of the San Dieguito Culture of Arizona and California (Irwin-Williams 1973:5).

Chronometric data associated with the Jay point is scarce. In the San Juan Basin on Gallegos Mesa, seven radiocarbon dates from four excavated sites containing one or more Jay points suggest a range of 5950 BC to 4970 BC for the Jay phase (Wiens 1994:64–65). Three Jay points, termed Rio Grande points, from LA 8066 in Catron County are illustrated by Honea (1971:170, Figs. 1e, 1f, 1g). Two sites in the Rosemont area of southern Arizona yielded at least three Early Archaic projectile points (Huckell 1984: Figs. 5.7a, 5.8b–5.8c), which are morphologically similar to Jay points. In the Jemez Mountains, the OLE data recovery project yielded two Jay points, one of which is loosely associated with a feature that was radiocarbon dated to 5559–5242 BC (Turnbow 1997:172). A survey of Guadalupe Mountain in Taos County, New Mexico, recovered two Jay points at LA 38424 and LA 38427 as well as other later Archaic projectile points (Seaman 1983:15, 18). Surface collecting and limited testing yielded one Jay point with no associated chronometric data from LA 27018 in the Abiquiu Reservoir area (Earls et al. 1989:319, Fig. 8.6j).

The Early Archaic period Bajada point of the Oshara Tradition along with the Pinto point of the San Dieguito Culture and the Great Basin Archaic are the foundation of the longstanding trend of the expanding stem-indented base projectile points, which endures into the Late Archaic period in northern New Mexico with the Armijo point. Other point types with similar forms include the San Jose point of the Oshara Tradition (Irwin-Williams 1973) and the Chiricahua point (Sayles 1983; Dick 1965:26; Haury 1950) of the Cochise Tradition. Irwin (1964:496) hints at a possible earlier Eastern Paleoindian connection after observing similarities between San Jose points from Grants, New Mexico, and Dalton-Hardaway points from Stanfield-Worley Bluff Shelter in northern Alabama. Within the Oshara Tradition, there appears to be a general trend in the expanded stem-indented base form toward a decrease in stem length or stem-to-blade ratio, an increase in stem expansion, and an increase in the frequency of blade serration through time (Irwin-Williams 1973:8; Cordell 1978:26; Matson 1991:118).

The Bajada point has a relatively large, parallel-sided to expanding stem and indented or concave base. Often, grinding of the stem is apparent. Shoulders are sloping to pronounced, and evidence of basal thinning is often present. Continuities can be seen with the later expanded stem-indented base forms of the San Jose phase and more roughly with the earlier Jay point.

LA 9500, a Bajada phase–type site at a canyon head on top of the La Bajada escarpment near Santa Fe, yielded 27 Bajada points. Seven were whole, five of which display reworking. Basalt, a locally abundant material, was the most common (81 percent) material used in the production of Bajada points. No chronometric data was given (Hicks 1982).

Chronometric data associated with Bajada points is scant. During the ENRON project, work at two sites in the San Juan Basin produced two possible Bajada points (Burchett et al. 1994:47, 68). One, from LA 83487, is loosely associated with two radiocarbon determinations ranging from 4780 to 3690 BC (Burchett et al. 1994:68). R. Moore (1994:461) presents a problematic obsidian hydration date of 1935 ± 102 BC from a Bajada point recovered during the Abiquiu Archaeological Project. This date appears to be much too late. The point is not illustrated. Elsewhere in the Northern Rio Grande Valley, more specifically the Galisteo Basin, LA 356, the La Bolsa site, yielded two fragmentary Bajada points (Honea 1971:170, Figs. 1a, 1b).

Both Jay and Bajada points correspond well with a variation of the Rio Grande point as first described by Renaud (1942:23–26). Both Jay and Bajada forms are illustrated by MacNeish and Beckett (1987:11) as representative of the Gardner Springs Complex of the Archaic Chihuahua Tradition, which is suggested to date from 6000 ± 500 to 4000 ± 30 BC on the basis of three radiocarbon determinations from Fresnal Shelter and the Gardner Springs site.

The Pinto point is the northern Colorado Plateau and the Basin and Range version of the expanding stem-indented base form. These points strongly resemble San Jose points. They also resemble Bajada, Armijo, and Chiricahua points. Formby (1986) presents photographs of a relatively large sample of surface-collected "Pinto" points from north-central Arizona and southwestern New Mexico. At Sudden Shelter in Utah on the northern Colorado Plateau, Pinto points occur in the lowest seven strata, suggesting a temporal range of 8400 to 6350 BP based on radiocarbon determinations (Holmer 1980a:80). This is a rather restricted temporal range compared to Great Basin sites, such as Danger Cave, which has a Pinto sequence ranging from 8000 to 1000 BP.

The eastern boundary of the Pinto type may extend into the Rocky Mountains, which is evident from its occurrence at the Yarmony Pit House site of Eagle County, Colorado (Metcalf and Black 1991). Excavation in an area containing two structures yielded 28 Pinto points with an Early Archaic Period combined temporal range of 7294 to 6742 BP based on five loosely associated radiocarbon dates. Two Elko corner-notched points and a Northern side-notched point were recovered from the House 1 area, where they co-occur with Pinto points, and the surface, respectively.

The Elko series points make an appearance in the lower, Early Archaic strata at Sudden Shelter (Holmer 1980a:80–81). They are most common in layers dated between 7600 and 5300 BP, but the total estimated range appears to be 7595 to 3760 BP (Jennings 1980:80–81, Tables 4 and 13). The utility of the Elko series points as temporal indicators is limited by this relatively wide date range. Thomas (1983:182) reports a more restricted and Late Archaic temporal range of 1300 BC to AD 700 for the Elko corner-notched type at Gatecliff Shelter, Monitor Valley, Nevada. These northern Colorado Plateau and Great Basin sites suggest quite different temporal distributions with no overlap. Whether this suggests that the type originated in the Sudden Shelter area or further complicates this type's utility as a temporal indicator is questionable.

The En Medio point of the Oshara Tradition Late Archaic period bears a strong morphological resemblance to the Elko corner-notched type. Working with points from the Jemez Mountains, the OLE project analysts differentiated between the two types on the basis of notch width, notch depth, and proximal shoulder angle (Turnbow 1997:187). The two types co-occurred and were associated with some of the same radiocarbon determinations, which range from 2290 BC to AD 220 (Turnbow 1997:187). It appears that the Elko corner-notched type defined in the OLE project could easily be subsumed by the En Medio type. Interestingly, both types are more closely contemporaneous with the Gatecliff Shelter Elko corner-notched assemblage than with the Elko assemblage of Sudden Shelter.

Middle Archaic Period

Within the Oshara Tradition, the San Jose point is diagnostic of the Middle Archaic period. Distinguishing between late Bajada and early San Jose forms as well as between late San Jose and early Armijo forms can be problematic (Matson 1991:160). As previously mentioned, Irwin-Williams (1973:8) recognized a continuity in early and late forms but an increase in the frequency of blade serration, decreased length, and increasingly expanded stems through time. Ground stems and basal thinning also characterize the San Jose type. San Jose and Pinto points are morphologically similar.

In the Northern Rio Grande Valley, near the confluence of the Rio Chama and the Rio Ojo Caliente, site OC-8 yielded two San Jose points and one loosely associated radiocarbon date of 5240 ± 130 BP (Lang 1980:209, 55). At LA 27016, two San Jose points producing obsidian hydration dates of 2216 ± 127 BC and 2171 ± 114 BC were recovered during the Abiquiu Archaeological Project (R. Moore 1994:460–461). A survey of Guadalupe Mountain, Taos County, New Mexico, yielded nine San Jose points from four sites (Seaman 1983). Work at Abiquiu Reservoir by Schaafsma (1975:158) yielded at least two and possibly four San Jose points lacking associated chronometric data. The San Jose type appears to be fairly well distributed throughout the Northern Rio Grande Valley.

From sites in the Jemez Mountains, the OLE project recovered 12 San Jose points, one of which is loosely associated with an accelerated mass spectometry (AMS) radiocarbon date range of 3298 to 2701 BC (Turnbow 1997:174B175).

The San Jose point bears a resemblance to the Chiricahua Cochise expanding stem-indented base form (Sayles 1983:120, Figs. 9.4a, 9.4fB9.4j). Sayles (1983:58) suggests the Chiricahua phase lasts from 6000 to 1500 BC. In a reevaluation of Southwestern Archaic chronological and conceptual models, Berry and Berry (1986:280) are not convinced by the chronometric evidence, much of which was collected from mixed deposits and determined by the old solid-carbon method, of a Southern Basin and Range Archaic period predating 3000 BC. They go on to contend that the Chiricahua phase, which incorporates temporally and culturally distinct remains and obscures patterning that may exist, is conceptually flawed. An expanding stem-indented base form, which is similar to the San Jose point, along with a contracting stem form occurred in the ChiricahuaBArmagosa II levels of Ventana Cave (Haury 1950: Plate 22). Bat Cave Chiricahua points (Dick 1965:26) may be a relatively late variant. These points were either recovered from levels that postdated 2800 BP, placing them in the Late Archaic period, or from disturbed or undated contexts (Wills 1988:18). MacNeish and Beckett (1987:14) illustrate five expanding stem-indented base projectile points, which are consistent with the San Jose point, as representative of the Fresnal phase of the Archaic Chihuahua Tradition, with a suggested temporal range of 2500 ± 200 to 900 ± 200 BC based on radiocarbon and obsidian hydration determinations.

The high side-notched form, here called the Moquino side-notched type, may initially appear in the late Middle Archaic period and persists into the Late Archaic period. This type is characterized by a triangular blade with a large rectangular flange and opposing high-side notches. Variants include forms with convex, straight, concave, indented, or notched bases. The type corresponds well with Thoms's (1977:117, 121c, 121i–121k) Arroyo Hondo subconcave type and one point illustrated under the large-lateral-lateral type. Its form was not incorporated into Oshara Tradition (Irwin-Williams 1973) typology. It is somewhat comparable to the Northern side-notched and the Sudden Shelter side-notched types, which appear at Sudden Shelter in Early Archaic layers with suggested temporal ranges of 7000 to 6500 BP and 6500 to 4600 BP, respectively (Holmer 1980a:82). However, Moquino side-notched points have a larger flange than the Northern side-notched type and do not have the contracting flange of the Sudden Shelter side-notched type as defined by Holmer (1980a:76). One variation of this form, namely the Moquino side-notched-indented base, appears to correspond well with the fragments representing the San Rafael type, which was defined during the Sudden Shelter project by Holmer (1980a:76), and with Thoms's (1977:144,146gB146j) Abiquiu-eared type. The San Rafael type occurred in Stratum 15 and overlying Stratum 16 of Sudden Shelter; charcoal from near the top of Stratum 15 yielded a radiocarbon determination of 4425 ± 85 BP (Jennings 1980:21, 83). This date is more in accord with dates associated with this form in northern New Mexico than the temporal ranges suggested for the Sudden Shelter side-notched and the Northern side-notched types.

The Moquino site, which is in Valencia County, New Mexico, just east of the village of Moquino, yielded numerous Moquino side-notched points. Also, two San Jose points, one of which may more appropriately be classified as an Armijo point, were recovered from the surface. Excavation of Zone 4A yielded a C-14 date of 3920 ± 155 BP and three Moquino 1Btype points. This type and the Moquino 2 and 3 types, which were recovered from the surface, are variations of the Moquino side-notched form. The Moquino 4 type closely resembles the Chiricahua type (Sayles 1983:120, Figs. 9.4 b and 9.4c). Beckett (1973; 1997:20), who once attributed the Moquino side-notched form to the Chiricahua phase of the Cochise Culture, later saw similarities to Great Basin types, namely Sudden Shelter side-notched and Northern side-notched.

Post (1994:50–51) recovered two points strongly resembling Moquino side-notched points from LA 66472, just north of Cuba, New Mexico. Both points were recovered from a burned structure which yielded a radiocarbon date of 1266 ± 80 BC. Obsidian hydration dates of 1257 ± 463 BC and 2739 ± 557 BC were obtained from two cuts of the same point. Both points have concave bases.

Few sites in the Northern Rio Grande Valley have produced both Moquino side-notched points and associated chronometric data. A fragmentary projectile point, which appears to be a convex base variant of the Moquino side-notched type, was recovered from Occupation 3 at Ojala Cave (Waber et al. 1982:334–335, 320–321). This layer is associated with a radiocarbon determination of 1750 BC (Waber et al. 1982:334–335, 320B321). Ojala Cave is 16 m west of the Rio Grande in Bandelier National Monument (Waber et al. 1982:315). During the Abiquiu Archaeological Study, LA 27042 yielded two Moquino side-notched points, from which four obsidian hydration dates were derived (Earls et al. 1989:312, 343, Figs. 8.3l and 8.3m). Dates of 202 and 232 BC were derived from one point, and dates of 2321 BC and AD 750 were derived from the other point. A cross-date range of 3000 BC to AD 1000 is suggested (Earls et al. 1989:312, 343, Figs. 8.3l and 8.3m).

In the Jemez Mountains, OLE project sites yielded 16 points (Turnbow 1997:192–195), here designated Moquino side-notched. Of these, 11 were classified as Sudden Shelter side-notched points despite the fact that 9 of the 10 illustrated points representing this type lack the contracting to well-rounded lateral flange edges described by Holmer (1980a:76; 1986:104). Two of these points, which were recovered from the surface, are loosely associated with a feature radiocarbon dated to cal. AD 347–632. The remaining five points are here classified as the Moquino side-notched-indented base variant. Turnbow (1997:194–196) classifies these points as San Rafael side-notched, which appears to be a more consistent comparison than the straight base variant's classification as Sudden Shelter side-notched. During the 1934–1935 excavation of Jemez Cave, three points, which are morphologically similar to the Moquino side-notched type, were recovered (Alexander and Reiter 1935:24–25, Plate 7r).

In the Albuquerque area, surface collections of sites BR-17 and BR-39 yielded three points that are morphologically similar to the Moquino side-notched type. These sites are attributed to the Atrisco phase, with a suggested pre–1000 BC range (Reinhart 1968:113, Figs. 26 and 6e, Table 26).

In the Bodo Canyon area, La Plata County, southwestern Colorado, two Late Archaic period sites yielded at least two and possibly three points that are comparable to the Moquino side-notched type. Two with straight bases came from site 5LP1102, from which radiocarbon determinations of 440 ± 70 BC and 140 ± 70 BC were obtained. The points are not directly associated with either date. A large corner-notched point, which is similar to En Medio points, was also recovered from this site. The single side-notched-convex base point from 5LP1114 was not illustrated (Fuller 1988:280, 314, Fig. 152).

Another form which appears in the Middle Archaic period and endures into the Late Archaic period is the contracting stem form known as the Gypsum Cave point in the Great Basin and the Augustin point in the Plains of San Agustín, New Mexico. This form shares a partial temporal overlap with the expanded stem-indented base form, as does, it seems, the Moquino side-notched type. This form corresponds with Thoms's (1977:114, 116a–116d, 116k) En Medio contracting type and one of the points illustrated under the Ghost Ranch serrated type. Formby (1986) presents photographs of a relatively large sample of surface-collected "Gypsum Cave" points from north-central Arizona and southwestern New Mexico. These photographs allude to the range of variation in size and shoulder form. The Chiricahua–Armagosa II levels at Ventana Cave (Haury 1950: Plate 22) yielded this form, as did Levels 3–6 and the Buff Sand at Bat Cave (Dick 1965:28, 33). Based on radiocarbon determinations, Holmer (1980a:83) suggests a temporal range of 4600 to 3300 BP for his Sudden Shelter specimens. MacNeish and Beckett (1987:8, 13–14) illustrate points of this form as representative of both the Keystone and Fresnal phases of the Archaic Chihuahua Tradition, with a combined temporal range of 4000 ± 300 to 900 ± 200 BC based on radiocarbon and obsidian hydration determinations. Berry and Berry (1986:280) state that the contracting stem form may have its origins in the Mexican Highlands, where it appears earlier than in the Southwestern United States. Irwin-Williams (1973: Fig. 6e) illustrates a contracting stem point alongside En Medio and Trujillo phase cultural material, which hints at this form's co-occurrence with Late Archaic material. For the Northern Rio Grande Valley, Thoms (1977:114, Plate 12) designates contracting stem points as the En Medio contracting type and notes that they are probably an early En Medio phase (800 BC to AD 400) type.

From the Jemez Mountains, at least one of the Jemez-type points (Turnbow 1997: Fig. 16.15g) and one of the En Medio/Armijo Stemmed–type points (Turnbow 1997: Fig. 16.8b) defined during the OLE project appear to be of the contracting stem form. The illustration of the aforementioned Jemez type point seems to be inverted, with the distal end or tip pointing downward. Alexander and Reiter (1935: Plate 7b) include a photograph with a contracting stem point recovered from the 1934–1935 excavations at Jemez Cave.

In the Santa Fe area, a contracting stem point was recovered from the surface of LA 84787 during the Las Campanas project (Post 1996a:266–267, Fig. 9.18b). Other points from this site include San Pedro and Armijo types. Recently, a contracting stem point was recovered from LA 61315, which was excavated during the Santa Fe Relief Route project (Post 2000b).

Late Archaic Period

The Armijo point is the terminal end of a continuum of expanded stem-indented base forms which express a shortening of the stem, expansion of the base, and an increase in the frequency of blade serration through time (Irwin-Williams 1973:8). Late in its range, the type becomes more eclectic, showing a fairly wide range of variation in haft morphology that seems transitional to notched forms. This range of variation encompasses forms that could be described as stemmed, side-notched, and corner-notched.

Armijo points are relatively common in the Northern Rio Grande Valley. Obsidian hydration dates from nine Armijo points and two pieces of obsidian debitage in direct association with two more Armijo points recovered from six sites during the Abiquiu Archaeological Project give a combined temporal range of 1796 BC to AD 50 (R. Moore 1994:460). As R. Moore (1994:460) notes, if the youngest date is dropped, the range becomes 1796 BC to 791 BC, which is an exceptional fit with Irwin-Williams's (1973:9) proposed Armijo phase range of 1800 BC to 800 BC. LA 25480, also in the Abiquiu Reservoir area, yielded a basal fragment of an Armijo point with an obsidian hydration determination of 1715 ± 69 BC (Earls et al. 1989:311, 332, Fig. 8.2e).

In the Santa Fe area, LA 84787, which was excavated during the Las Campanas project, yielded at least two Armijo points (Post 1996a:266–267, Figs. 9.18c and 9.18d). Several possible Armijo point basal fragments were recovered during the Tierra Contenta Archaeological Project (Schmader 1994a).

Work in the Jemez Mountains during the OLE project led to the definition of five separate Armijo types (Turnbow 1997:175–182), one of which, the Armijo side-notched type (Turnbow 1997: Fig. 16.8a), appears to be a good example of a San Pedro point. The Elko Eared type as defined during the OLE project (Turnbow 1997:190, Fig. 16.12) could easily fall within the range of variation exhibited by the Armijo point. At least one Armijo point is present in the plate of representative projectile points from Jemez Cave (Alexander and Reiter 1935: Plate 7q).

En Medio points are large, corner-notched to stemmed projectile points with slightly convex, straight, or slightly concave bases. Irwin-Williams (1973:13) notes increasingly long barbs through time. The similarities of the En Medio and the Elko corner-notched types were discussed above. At least eight of Thoms's (1977:127–141) types, including Agua Fria subconcave, Pindi convex, Española wide blade, Santa Cruz barbed, Jemez short blade, Short-wide barbed, Ojo barbed, and Echo shouldered, could be subsumed by the En Medio type. The latter three types appear to be reworked. At En Medio Shelter, layers containing points of this form had a temporal range of 1000 to 10 BC based on radiocarbon determination (Irwin-Williams and Tompkins 1968:6–12). Several En Medio points are included in the photograph of representative points from Jemez Cave (Alexander and Reiter 1935: Plate 7). During the 1965 re-excavation of Jemez Cave, two En Medio points were recovered from Level 3 and 4 underlying a Level 2 corncob fragment (Ford 1975: Figs. 2a and 2b, Tables 1 and 4).

En Medio points are common in the Northern Rio Grande Valley. R. Moore (1994:460–461) presents a temporal range of 796–2 BC for 26 En Medio points associated with radiocarbon and obsidian hydration determinations. These were recovered from LA 25358 during the Abiquiu Archaeological Project (R. Moore 1994: Table 2). Numerous whole and fragmentary En Medio points were recovered during the Abiquiu Archaeological Study with a combined cross-date range of 3000 BC to AD 1600 (Earls et al. 1989). Lent (1991:54–55) recovered four whole and fragmentary En Medio points from LA 51912, near Otowi, San Ildefonso Pueblo. An obsidian hydration date of 3374 ± 657 BP was obtained from one of these points, and for the occupation, 11 radiocarbon determinations provided a combined temporal range of 2560–1780 BP. At least three En Medio points were recovered from Ojala Cave (Waber et al. 1982:334, Figs. 223e, 223f, and 223l). One is from an occupation surface also containing a Trujillo point and corn, and providing radiocarbon determinations of 590 ± 75 BC and 670 ± 145 BC (Waber et al. 1982:326, Fig. 223e, Table 52). Four fragmentary En Medio points were found during the Northwest Santa Fe Relief Route excavations. Three of these are from LA 61286, and the other is from LA 61290.

In the Albuquerque area, excavations at Boca Negra Cave yielded 19 En Medio points (Reinhart's Types 1, 2, and 4) from all levels (Reinhart 1968: Fig. 22, Table 18). Those from Levels 1–4 are loosely associated with maize (Reinhart 1968: Table 24). The points postdate a radiocarbon determination of 1580 ± 168 BP, which was obtained from the basal level of the cave (Reinhart 1968:154). Additionally, four points that are morphologically similar to En Medio points were recovered from four open sites, all of which are attributed to the Rio Rancho phase, with a suggested temporal range of 1000–1 BC (Reinhart 1968:113, Figs. 13 and 26, Table 260). Another eleven points with morphological similarities to the En Medio type were from a Rio Rancho phase or local Basketmaker II site (Reinhart 1967).

En Medio points exhibit similarities to the large corner-notched to stemmed forms of the Los Pinos phase of the Navajo Reservoir District (Eddy 1961:71); Type 5 of Bat Cave (Dick 1965: Figs. 20j and 20k); the Marcos point of south-central Texas, with a suggested range of 600 BC to AD 200 (Turner and Hester 1985:117–118); and the Hueco point of the Hueco phase, which is dated to 900 ± 200 BC to AD 250 ± 200 on the basis of 11 radiocarbon and obsidian hydration determinations from four sites of the Archaic Chihuahua Tradition (MacNeish and Beckett 1987:16–18, Table 1).

An inconsistently classified Late Archaic period projectile point form, specifically a large, slender, shallow to deeply side-notched form with straight to excurvate blade edges, bears a striking resemblance to the San Pedro point of the Cochise Culture (Sayles 1983). This form corresponds well to Thoms's (1975:109, 111a–111c) Excurvate straight base type. Within the Oshara Tradition, points of this form are sometimes classified as Armijo points. For examples of this classification from the Northern Rio Grande Valley, see Earls et al. (1989:318, 338, Fig. 8.5n) and a survey of Guadalupe Mountain, Taos County (Seaman 1983: Fig. 4). For an example from the Jemez Mountains, see the Armijo side-notched type of the OLE project (Turnbow 1997:179–181, Fig. 16.8a). It appears that this San Pedro/Armijo form represents a widespread formal trend rather than a culturally specific type.

In the Albuquerque area, a Rio Rancho phase site yielded two Type 2 projectile point fragments (Reinhart 1967:463), which resemble San Pedro points. In the Santa Fe area, LA 84787 yielded a point of the San Pedro form, at least two Armijo points, and a contracting stem point (Post 1996a:266–167, Fig. 9.18a).

For the San Pedro phase, Sayles (1983: Fig. 6.1, Table 5.4) suggests a temporal range of approximately 1500 BC to AD 1 based on radiocarbon determinations, many of which used the solid-carbon method, from five sites in southern Arizona. Berry and Berry (1986:280) conceptualize the San Pedro phase of the Southern Basin and Range as Early Formative with incipient sedentism and agriculture, equivalent to the Basketmaker II period on the Colorado Plateau, rather than Archaic. They suggest initial dates of 500 BC for the San Pedro phase (Berry and Berry 1986:280). At Ventana Cave, Haury (1950:288–290) recovered numerous San Pedro points in the upper part of the midden, where they are primarily associated with preceramic levels but persist into the immediately overlying ceramic levels.

Appearing in the Late Archaic period and enduring into the Developmental period, the Trujillo point of the Oshara Tradition represents the introduction of the bow and arrow (Irwin-Williams 1973:13). The Trujillo point is basically a more diminutive form of the En Medio point (Irwin-Williams 1973:13). It corresponds well with three of Thoms's (1977:148, 150, 155, 152a–152d, 152i–152k, 158e–158h) types, including Lumbre narrow base, Slight barb narrow base, and Tesuque narrow base. At En Medio Shelter, this form was classified as types AEM 1–3 and was associated with Lino Gray, San Marcial

Black-on-white, and Alma Plain ceramics (Irwin-Williams and Tompkins 1968). These points were distributed between Units A and B1 (Irwin-Williams and Tompkins 1968:9). Unit B1 has an radiocarbon determination of 10 BC, and Unit A underlies a layer dated to AD 810 (Irwin-Williams and Tompkins 1968: Table 1).

South of La Bajada, the Developmental period Sheep Chute site (Bradley 1983: Figs. 30h–30p) near Zia Pueblo and Artificial Leg site (Frisbie 1967:265, see small corner-notched forms, Plate 17) near Corrales, yielded numerous specimens that are morphologically similar to the Trujillo point. Three floor features in three separate Sheep Chute site pithouses produced archaeomagnetic determinations ranging from AD 898 to 967 (Ferg 1983:11–29). The upper five levels of Boca Negra Cave yielded several points of this form (Reinhart 1968: Table 18, Fig. 22, top row, first, third, and fourth points). At these three sites, Trujillo points seem to co-occur with a small, basally notched-tanged form. BR 88 and BR 37a, two open sites in the Albuquerque area, yielded these points and were attributed to the Rio Rancho phase (Reinhart 1968: Figs. 13 and 26, Table 26).

In the Jemez Mountains, excavations at Jemez Cave rendered several points (Alexander and Reiter 1935: Plates 7e–7h; Ford 1965: Fig. 2d) that are similar to the Trujillo type. The use of blade serration on this form is evident in two of the Jemez Cave specimens (Alexander and Reiter 1935: Plates 7g and 7h). In the 1965 re-excavation of Jemez Cave, this form came from Level 2, which also produced a corncob fragment (Ford 1975: Fig. 2d, Tables 1 and 4). A total of 12 Trujillo points were recovered during the OLE project, but none were associated with chronometric data (Turnbow 1997:202–205).

In the Northern Rio Grande Valley, excavations at Ojala Cave produced four points (Waber et al. 1982:333–334, Figs. 223c, 223d, 223g, and 223k) of the Trujillo form. Point D is associated with maize and radiocarbon determinations of 590 ± 75 BC and 670 ± 145 BC (Waber et al. 1982:326, Table 52). Point G was recovered from an overlying occupation surface (Waber et al. 1982:327, Table 52). The Developmental period components, including a portion of Area B and the Intermediate Area at the Tesuque Bypass site yielded Trujillo points (McNutt 1969: Plates 7f–7h and 9c). Three points which fit within the Trujillo points' range of variation were recovered from LA 84758 during the Las Campanas project (Post 1996a:96, Figs. 6.27a–6.27c). One Trujillo point was recovered from LA 67959 during the Northwest Santa Fe Relief Route project.

Trujillo points are similar in form to the Rose Spring corner-notched type (Heizer and Baumhoff 1961:123, Figs. 2a–2g; Holmer 1980b:32, 36, Figs. 17 a–17f) of the Great Basin ad Northern Colorado Plateau. At Cowboy Cave, on the northern Colorado Plateau, Rose Springs points were limited to Unit 5, which had a suggested beginning date of 1600 BP and continued to an unknown date (Holmer 1980b:38). For Gatecliff Shelter in the Great Basin, Thomas (1983:179–180) combined the Rose Springs corner-notched and the Eastgate expanding stem (Heizer and Baumhoff 1961:123, Figs. 2h–2v) types to form the Rosegate series, which is diagnostic of the Underdown phase, ca. AD 700 to 1300. The Eastgate expanding stem type corresponds well with the previously noted small basally notched-tanged points, which co-occur with Trujillo points at several sites south of La Bajada. These points are also present at the Tesuque Bypass site (McNutt 1969: Plates 3d and 7d). The aforementioned temporal range for the combined Rosegate series suggests that the small basally notched-tanged points have an overlapping, but possibly later, temporal range than the Trujillo point. The Trujillo point corresponds fairly well with the Cienega point defined by Huckell (1995:51–54, Figs. 4.1a–4.1i and 4.13d) for preceramic Early Agricultural period sites in the Cienega Valley of southern Arizona. A Cienega point from Los Ojitos site (Huckell 1995: Fig. 4.13d) exhibits blade serration, which was noted above for a Jemez Cave specimen. Two sites yielding Cienega points have a combined date range of cal. 810 BC to AD 130 (Huckell 1995: Table 3.1). The Trujillo point may also favorably compare to the Hatch point of Archaic Chihuahua Tradition (MacNeish and Beckett 1987:19). Blade serration is also noted for this type, which has a suggested temporal range of 500 BC to AD 200 (MacNeish and Beckett 1987:19).

Summary

Jay, Bajada, San Jose, Armijo, En Medio, and Trujillo are phase designations within the Oshara

Tradition. Irwin-Williams (1973) discussed these phases in summary of the preliminary results of her Arroyo Cuervo fieldwork. Her discussion included brief descriptions of the cultural-material inventory of each phase. Projectile point descriptions and photographs of a limited representative sample accompanied this report. The groundwork of an Archaic period projectile point typology was implicitly laid. Later workers have frequently used Jay, Bajada, San Jose, Armijo, En Medio, and Trujillo as projectile point types, but not without some confusion. This confusion involves typological vagaries produced by a lack of systematic classification and by variability not accounted for under a typology that was not explicitly defined.

By explicitly recognizing the morphological similarities of some different types—such as the Pinto and San Jose, San Pedro and Armijo side-notched, Elko corner-notched and En Medio, as well as Trujillo, Rose Springs, and Cienega types—and by recognizing the contracting stem form and Moquino side-notched type, which were only loosely incorporated or excluded, respectively, from the Oshara Tradition, the preceding discussion is an attempt to alleviate some of this confusion.

When available, associated chronometric data were presented. Several problematic determinations that were included in the narrative were not integrated into Figure 272 and Table 110. These include an obsidian hydration determination from a Bajada point (R. Moore 1994:461); disparate obsidian hydration determinations from single Moquino side-notched points from a site near Cuba, New Mexico (Post 1994:50–51), and from the Abiquiu Reservoir area (Earls et al. 1989:312, 343, Fig. 8.3m); the outlying Armijo point determination, as suggested by R. Moore (1994:461); an obsidian hydration determination from an En Medio point (Lent 1991:54–55); two determinations from

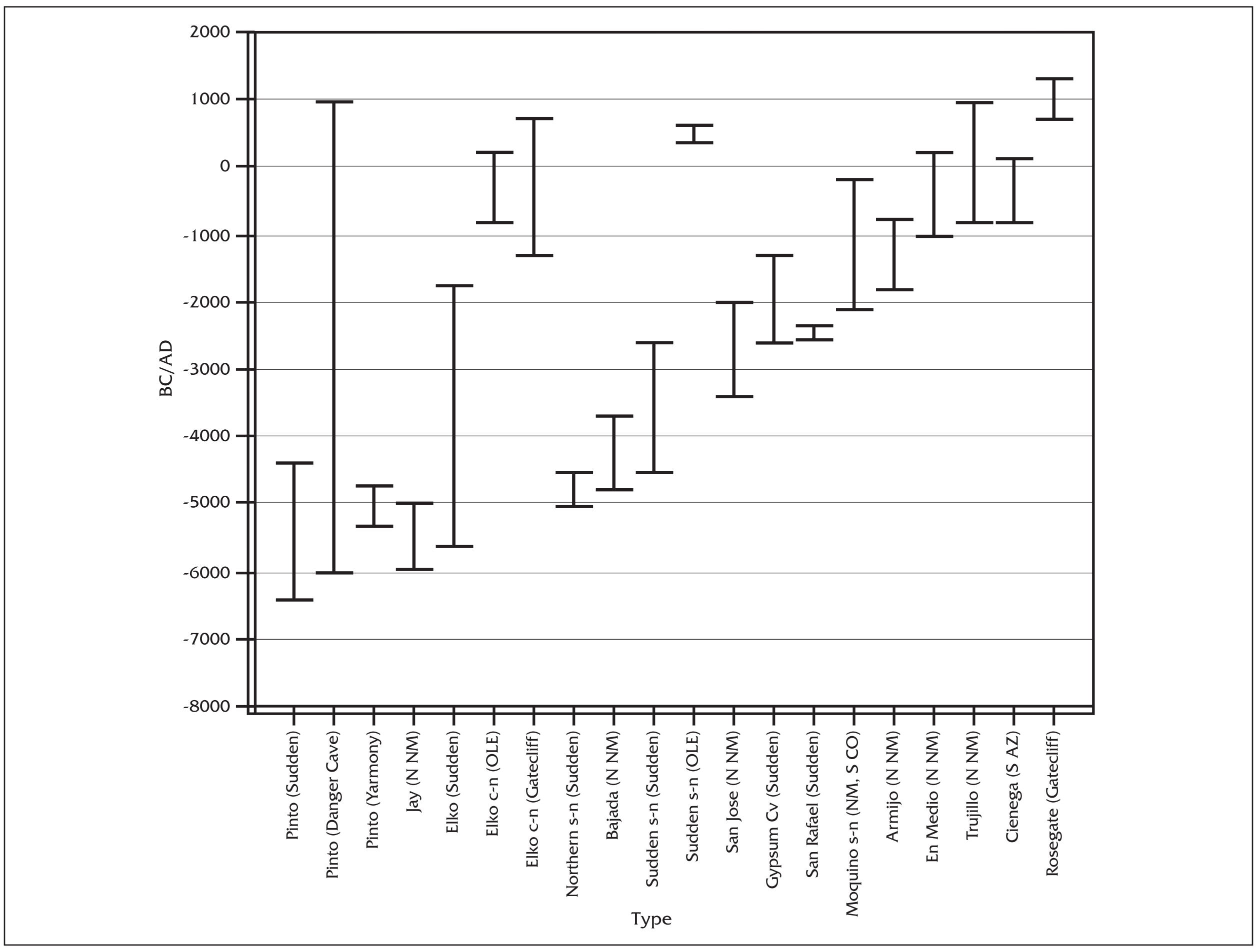


Figure 272. Projectile point type by temporal range.

Table 110. Chronometric data used in Figure 272

Type	Site/Area	Estimated Uncalibrated Radiocarbon Range	Combined Range	Single Determination	Reference
Jay	Gallegos Mesa, San Juan Basin, NM	-	5950-4970 B.C. (7 radiocarbon)	-	Wiens 1994:65
Jay	Jemez Mountains, OLE Project, NM	-	-	5559-5242 B.C. (cal. radiocarbon)	Turnbow 1997:172
Bajada	San Juan Basin, NM	-	-	4350-3690 B.C. 4780-4403 B.C. (cal. 2-sigma radiocarbon)	Burchett et al. 1994:68
Pinto	Sudden Shelter, UT	8400-6350 B.P.	-	-	Holmer 1980:80
Pinto	Danger Cave, UT	8000-1000 B.P.	-	-	Holmer 1980:80
Pinto	Yarmony site, CO	-	-	7143 ± 127 B.P. 7153 ± 141 B.P. 6859 ± 117 B.P. 7114 ± 113 B.P. 6909 ± 117 B.P.	Metcalf and Black 1991: Table 6.1
Elko series	Sudden Shelter, UT	7595-3760 B.P.	-	-	Jennings 1980: Tables 4 and 13
Elko corner-notched	Jemez Mountains, OLE Project, NM	-	-	758 B.C.-A.D. 220 800-210 B.C. (cal. radiocarbon)	Turnbow 1997:182-184
Elko corner-notched	Gatecliff Shelter, NV	-	1300 B.C.-A.D. 700 (uncorrected radiocarbon)	-	Thomas 1983:182
Northern side-notched	Sudden Shelter, UT	7000-6500 B.P.	-	-	Holmer 1980:82
Sudden side-notched	Sudden Shelter, UT	6500-4600 B.P.	-	-	Holmer 1980:82
Sudden side-notched	Jemez Mountains, OLE Project, NM	-	-	AD 347-632 (cal. radiocarbon)	Turnbow 1997:192-195
San Rafael	Sudden Shelter, UT	-	-	4425 ± 85B.P. (uncal. radiocarbon)	Jennings 1980:21, 83
San Jose	OC-8, northern Rio Grande Valley, NM	-	-	5240 ± 130 B.P. (uncal. radiocarbon)	Lang 1980:55, 209
San Jose	Abiquiu Reservoir area, NM	-	-	2216 ± 127 B.C. 2171 ± 114 B.C. (obsidian hydration)	Moore 1994:460-461
San Jose	Jemez Mountains, OLE Project, NM	-	-	3298-2701 B.C. (AMS cal. radiocarbon)	Turnbow 1997:174-175
Moquino side-notched	Moquino site, NM	-	-	3920 ± 155 B.P. (uncal. radiocarbon)	Beckett 1973; Beckett 1997
Moquino side-notched	LA 66472, near Cuba, NM	-	-	1266 ± 80 B.C. (radiocarbon) 1257 ± 463 B.C. (obsidian hydration)	Post 1994:50-51

Table 110 (continued).

Type	Site/Area	Estimated Uncalibrated Radiocarbon Range	Combined Range	Single Determination	Reference
Moquino side-notched	Ojala Cave, NM	-	-	1750 B.C. (radiocarbon)	Waber et al. 1982:334-335, 320-321
Moquino side-notched	Abiquiu Reservoir area, NM	-	-	202 B.C. 232 B.C. (obsidian hydration)	Earls et al. 1989:312, 343, Fig. 8.3 l
Moquino side-notched	Bodo Canyon area, CO	-	-	440 ± 70 B.C. 140 ± 70 B.C. (radiocarbon)	Fuller et al. 1988:280, 314, Fig. 15.2
Gypsum Cave	Sudden Shelter, UT	4600-3300 B.P.	-	-	Holmer 1980:83
Armijo	Abiquiu Reservoir area, NM	-	1796-791 B.C. (10 obsidian hydration)	-	Moore 1994:460
Armijo	LA 25480, Abiquiu Reservoir area, NM	-	-	1715 ± 69 B.C. (obsidian hydration)	Earls et al. 1989:311, 322, Fig. 8.2 e
En Medio	En Medio Shelter, NM	-	1000-10 B.C. (3 radiocarbon)	-	Irwin-Williams and Tompkins 1968: 6-12
En Medio	LA 25358, Abiquiu Reservoir area, NM	-	796-2 B.C. (2 radiocarbon, 3 obsidian hydration)	-	Moore 1994: Table 2
En Medio	LA 51912, San Ildefonso Pueblo, NM	-	2560-1780 B.P. (11 uncalibrated radiocarbon)	-	Lent 1991:54-55
En Medio	Ojala Cave, NM	-	-	590 ± 75 B.C. 670 ± 145 B.C. (radiocarbon)	Waber et al. 1982:326, Fig. 23e, Table 52
En Medio	Jemez Mountains, OLE Project, NM	-	-	758 B.C.- A.D. 220 800 B.C.-A.D. 210 487 B.C.-A.D. 20 373-112 B.C. (cal. radiocarbon)	Turnbow 1997:182-185
Trujillo	En Medio Shelter, NM	-	-	10 B.C. (radiocarbon)	Irwin-Williams and Tompkins 1968:9-10, Fig. 7,Table 1
Trujillo	Ojala Cave, NM	-	-	590 ± 75 B.C. 670 ± 145 B.C. (radiocarbon)	Waber et al. 1982:326, Fig. 23d, Table 52
Trujillo	Sheep Chute, near Zia Pueblo, NM	-	-	A.D. 925 ± 15 A.D. 910 ± 12 A.D. 950 ± 17 (archaeomagnetic)	Ferg 1983: Figs. 30h-30o, 16-29
Cienega	Donaldson site, Cienega Valley, AZ	-	-	790-210 B.C. 790-210 B.C. 500-210 B.C. 800-410 B.C. (2-sigma cal. radiocarbon)	Huckell 1995: Table 3.1
Cienega	Los Ojitos site, Cienega Valley, AZ	-	-	810 B.C.-A.D. 130 750 B.C.-A.D. 130 (2-sigma cal. radiocarbon)	Huckell 1995: Table 3.1
Rosegate	Gatecliff Shelter, NV	-	A.D. 700-1300	-	Thomas 1983: 179-180

features with suggested intrusive En Medio and Elko corner-notched points (Turnbow 1997:182–185); and a determination from the basal levels of Boca Negra Cave that was not directly associated with En Medio points (Reinhart 1968:154).

Using this limited data set, the Jay, Bajada, and San Jose points of the Oshara Early and Middle Archaic periods display discrete temporal ranges. The distribution of these points is not continuous. An approximate maximum gap between these types is 250 years. Whether these interruptions are real or the product of an unrepresentative sample could be fleshed out with more data. The Armijo, En Medio, and Trujillo points of the Oshara Late Archaic period display a partial overlap, with a maximum of approximately 100 years. En Medio and Trujillo points show a maximum overlap of roughly a millennium, and Trujillo points endure close to 800 years beyond the En Medio point's range. The Trujillo point's range encompasses that of the Cienega point and overlaps the early end of the Rosegate point's range. The Moquino side-notched type's range partially overlaps the late end of the San Jose point's range and encompasses the Armijo point's range and overlaps a substantial portion of the early end of both the En Medio and Trujillo points' ranges. Relative to the Northern side-notched, Sudden side-notched, and San Rafael types at Sudden Shelter, the Moquino side-notched type makes a later appearance in northern New Mexico and southern Colorado. Of the three northern Colorado Plateau types, the San Rafael type is the most closely contemporaneous with the Moquino side-notched type. The range displayed by the Sudden side-notched type of the OLE project is based on one radiocarbon determination. Nevertheless, note the temporal disparity of this type and the Sudden side-notched points from Sudden Shelter. Chronometric data is lacking for the contracting stem form in northern New Mexico, but a Middle Archaic period range is assigned to the Gypsum Cave type at Sudden Shelter. In northern New Mexico, the contracting stem form's persistence into the Late Archaic period is pointed to by its co-occurrence with Armijo points at LA 84787, in the Santa Fe area (Post 1996a:266–267, Fig. 9.18). The range of the Elko corner-notched type at Gatecliff Shelter encompasses the comparable ranges of the En Medio and Elko corner-notched points of northern New Mexico. In comparison to the range of the full Elko series at Sudden Shelter, the Elko corner-notched and En Medio types, which may be agglomerated for northern New Mexico, postdate the initial appearance of an Elko series point by at least four millennia. As previously noted, Holmer (1980a:80) suggests that the Pinto points of Sudden Shelter have a restricted range in comparison to Great Basin sites like Danger Cave. If the temporal distribution of Pinto points at Danger Cave is more typical, and not the product of mixed deposits or otherwise unreliable dating, then this type is useless as an intra-Archaic period temporal indicator. This range encompasses the combined ranges of the Oshara expanding stem-indented base types, including Bajada, San Jose, and Armijo points, predating them by a millennium and postdating them by approximately 1,800 years. The temporal ranges for Pinto points expressed at Sudden Shelter and Danger Cave encompass the Yarmony site range. The Yarmony Pinto points partially overlap both the Jay and Bajada point ranges. Jay and Bajada points occur farther south in the southern Rocky Mountains (Renaud 1942; Honea 1971; Seaman 1983; Earls et al. 1989; R. Moore 1994; Turnbow 1997).

Conclusion

Several projectile point types recognized in the Basin and Range physiographic province of western Utah, Nevada, California, southern Arizona, southern New Mexico, and northern Mexico; in the northern Colorado Plateau of southeastern Utah and southwestern Colorado; in the southern Rocky Mountains of northwestern Colorado; and in the plains of Texas show morphological similarities to types occurring in the southern Rocky Mountains, the southeastern Colorado Plateau, and the northern Basin and Range of northern New Mexico. Some projectile points, such as Moquino side-notched, San Pedro, and contracting stem points, occur in this portion of northern New Mexico but are excluded or only loosely incorporated into local typologies. Whether these types represent intrusive cultural groups is yet to be determined. At this point, it seems more likely that they represent spatially widespread or integrative formal trends. By explicitly recognizing these forms, this discussion attempts to contribute to the refinement of an Archaic period projectile point typology for the Santa Fe area and northern New Mexico. Beyond the scope of this discussion, a more exhaustive review of the chronometric and the recovery of new data is necessary for temporal refinements. These refinements may enable archaeologists to isolate areas of origin for these formal trends. Only then can the question of mode of transmission be approached.

Animal Bone

Susan Moga

A small amount of animal bone was recovered from five sites: LA 61286, LA 61289, LA 61290, LA 61293, and LA 108902. These sites had numerous features but produced only 156 bones. The bones were retrieved from pit-structure foundations, middens, hearths, roasting pits, possible kilns, and sheet trash areas. Specimens were recovered from contexts dating to the Middle Archaic, Latest Archaic, Coalition, unknown prehistoric, and historic periods.

During excavation, 1/4-inch screen was utilized for general-purpose screening and 1/8-inch screen for feature fill. The 1/4-inch screen is often responsible for altering the sample size of small animals, which have a tendency to fall through the screen. Researchers have demonstrated that approximately 95 percent of small-rodent bones (mice and pocket gophers) and 71 percent of small-mammal bones (cottontail and jackrabbit) are not recovered with 1/4-inch screen. Nearly 65 percent of rodent bones will fall through an 1/8-inch screen. In the laboratory, the bone was dry-brushed, and each piece was assigned a lot number.

Faunal information was recorded by coded variables: site, field specimen (FS) and lot numbers, count, taxon, element, side, portion of the element present, age of the animal, criteria for aging, environmental, animal and thermal alterations, and evidence of human processing or modification.

The bone was identified with the Office of Archaeological Studies comparative collections. Sources on New Mexico fauna (Bailey 1971; Findley et al. 1975) were consulted to determine which species inhabit the site area.

Unidentifiable Taxa

The unidentifiable assemblage was separated into five size ranges: small mammal, small to medium mammal, medium mammal, medium to large mammal, and very large mammal, based on the thickness of the compact tissue (Table 111).

Small mammal bones (43) are the most abundant of the unidentifiable taxa. Cottontail bones (60) were the most numerous recovered from all five sites, so many of the small-mammal remains may represent cottontails. Other possibilities are woodrat and jackrabbit.

The small to medium and medium mammal categories have one bone each. The medium to large fragments (15) were recovered from three of the five sites and could belong to dog, sheep, or deer, all of which are represented in the faunal assemblage.

Four very large mammal bones came from LA 108902. Considering that is a prehistoric site, they could be bison or elk.

Identified Taxa

Peromyscus sp. (Mice)

Ranging throughout most of New Mexico, five of the eight *Peromyscus* species (*Peromyscus maniculatus*, *P. leucopus*, *P. trueii*, *P. difficulis*, and *P. boylii)* inhabit the site area (Bailey 1971:142–160; Findley et. al 1975:204–215). Their similar skeletal systems make them difficult to distinguish; therefore, they were categorized as *Peromyscus* sp. Four mouse bones were recovered from a thermal feature (Feature 1) at LA 61293. Possibly a postoccupational intruder, this creature could have burrowed into the loose soils of the feature and died there, or the mouse was eaten and its bones tossed into the fire pit and burned.

Neotoma sp. (Woodrats)

Four varieties of woodrats inhabit Santa Fe county (Findley et al. 1975:238–251). Their skeletal systems are extremely similar, and the first upper molar (M1) is the only distinguishing factor between the species (Hoffmeister and de la Torre 1960:477). This presents a problem when 1/4-inch screens are used because small bones have a tendency to fall through the screen and disappear.

Table 111. Animal bone by site (count and column percentage)

Taxon/Category	Common Name	LA 61286	LA 61289	LA 61290	LA 61293	LA108902
Small mammal	Jackrabbit or smaller	7	1	7	28	-
		50.0%	33.3%	43.8%	24.8%	-
Small-medium mammal	Dog or smaller	-	-	1	-	-
		-	-	6.3%	-	-
Medium mammal	Dog size	-	1	-	-	-
		-	33.3%	-	-	-
Medium-large mammal	Dog to sheep or deer size	6	-	-	3	6
		42.9%	-	-	2.7%	60.0%
Very large mammal	Bison or elk size	-	-	-	-	4
		-	-	-	-	40.0%
Peromyscus sp.	Mice	-	-	-	4	-
		-	-	-	3.5%	-
Neotoma sp.	Wood rats	-	-	-	2	-
		-	-	-	1.8%	-
Small rodent	Mouse size	-	1	-	-	-
		-	33.3%	-	-	-
Sylvilagus audubonii	Desert cottontails	-	-	3	57	-
		-	-	18.8%	50.4%	-
Lepus californicus	Black-tailed jackrabbit	1		3	12	-
		7.1%		18.8%	10.6%	-
Canis sp.	Dog, coyote, wolf	-	-	-	1	-
		-	-	-	0.9%	-
Odocoileus hemionus	Mule deer	-	-	1	-	-
		-	-	6.3%	-	-
Ovis/Capra	Sheep\goat	-	-	-	4	-
		-	-	-	3.5%	-
Medium bird	Crow to small hawk	-	-	-	1	-
		-	-	-	0.9%	-
Passeriformes	Small perching birds	-	-	1	-	-
		-	-	6.3%	-	-
Sauria	Lizards	-	-	-	1	-
		-	-	-	0.9%	-
Total		14	3	16	113	10
		100.0%	100.0%	100.0%	100.0%	100.0%

Small Rodents

Unidentifiable to a species, a complete caudal vertebrae was categorized and size-ranged as a small rodent. It was extremely difficult to distinguish the species of this minute bone. The vertebrae was unburned and recovered from a cobble-lined thermal feature (Feature 6) dating to the Middle Archaic period at LA 61289.

Sylvilagus audubonii (Desert Cottontail)

Distributed throughout the Southwest, desert cottontails have a preference for open grasslands. They survive on succulent grasses and plants, but during times of drought they eat dry grasses and obtain moisture from cactus. The number of litters per year varies within the *Sylvilagus* species and according to the latitude they inhabit. The higher the elevation and latitude, the later the breeding season begins (Chapman et al. 1982:93, 96). In Arizona, cottontails have five litters per year (New Mexico Game and Fish: Species 050587). Cottontail bones were the most numerous (60) in the assemblage in the assemblage. The entire assemblage represents at least three mature and two juvenile individuals. Forty-two bones displayed some degree of burning, of which 27 were blackened. These charred bones included long bones, front and hind feet, vertebrae, and four cranial fragments. It appears that both the edible and inedible portions of the rabbit were tossed into the fire after it was eaten.

Lepus californicus (Black-tailed Jackrabbit)

Jackrabbits are found throughout New Mexico below the ponderosa forest zone. They prefer dining on succulent vegetation, but during the winter months, when succulents are unavailable, their diet consists of soap tree, yucca, snakeweed, mesquite leaves, and seed pods (Findley et al. l975:93–94; Dunn et al. l982:130–133). Approximately three mature individuals were represented by 16 pieces of bone from three sites. Juvenile individuals were not available in the assemblage. Most of the bones, including long bones, vertebrae, and sternum, were charred from a fire, and one jackrabbit tibia was calcined.

Canis sp. (Dog, Coyote, Wolf)

A mature, maxillary molar from a canid was recovered from a historic thermal feature (Feature 1) at LA 61293. It was completely charred and similar in size and attributes to a dog or a coyote.

Odocoileus hemionus (Mule Deer)

Mule deer range throughout most of New Mexico except for the eastern grasslands (Findley et al. 1975:328). One mature mule deer ulna, only 50–75 percent present and heavily weathered, was recovered from a Late Archaic roasting pit at LA 61290. The absence of burning or processing on the ulna may indicate this solitary bone was not a dietary item. It could have been brought into the habitation area from elsewhere, then discarded into the roasting pit.

Ovis/Capra (Domestic Sheep or Goat)

The Spaniards introduced sheep and goats into New Mexico in 1540, but not until 1598 did Juan de Oñate and his colonists establish sheep husbandry (Scurlock 1998:10; Carlson l969:26). Sheep and goat bones are osteologically difficult to distinguish, except for a few elements, so they are usually categorized as sheep/goat (Boessneck l969:331).

Four bones representing one mature individual were recovered near and in Feature 1, a historic thermal feature (LA 61293). The bones—two radii, one ulna, and a phalanx—represent the lower front leg of a sheep or goat. Whether this portion of the animal was consumed is unknown, but it is not a choice piece of meat. All four bones display some degree of weathering or sun-bleaching, and one radius exhibits a carnivore tooth puncture. Possibly, this less desirable piece of carcass was discarded and eventually carried off by dogs or coyotes. During cleanup activities of the area, the inhabitants may have tossed the bones into the thermal feature. However, the fire was extinguished or not hot enough to burn them.

Medium Bird

A partial rib belonging to a mature bird could not be assigned to a species. It was from a bird about the size of a crow or small hawk. Recovered from a historic thermal feature (Feature 1), the bone was not burned.

Passeriformes (Small Perching Birds)

This family encompasses many similar, small birds, making it extremely difficult to identify bones to the species level. A mature, fragmented ulna was collected from a historic campfire (Feature 4) at LA 61290. It is charred.

Lizards

A partially charred palate of a lizard was recovered from a historic thermal feature (Feature 1) at LA 61293. Hundreds of lizard species occupy various habitats throughout New Mexico, so it is difficult to identify. This lizard may have been eaten by those who used the site.

Taphonomy

Taphonomy refers to natural alterations that affect the condition of bone (Lyman l994:1). Animal, environmental, and burning modifications were monitored for this assemblage (Table 112).

Animal Alterations

A carnivore tooth puncture on a sheep/goat radius and gnawing on three rabbit and one

Table 112. Taphonomic alteration by site (count and column percentage)

Alteration	LA61286	LA61289	LA61290	LA61293	LA108902
			Animal		
Carnivore puncture	-	-	-	1	-
	-	-	-	1.1%	-
Rodent gnawing	-	-	-	4	-
	-	-	-	4.4%	-
			Environmental		
Pitting/Corrosion	3	-	1	6	10
	20.0%	-	6.3%	6.6%	100.0%
Sun bleaching	-	-	-	1	-
	-	-	-	1.1%	-
			Burning		
Light (scorched)	3	-	-	20	-
	20.0%	-	-	22.0%	-
Light-heavy	-	-	-	13	-
	-	-	-	14.3%	-
Heavy (black)	4	2	8	44	-
	26.7%	100.0%	50.0%	48.4%	-
Heavy (calcined)	1	-	2	-	-
	6.7%	-	12.5%	-	-
Calcined (white)	4	-	5	2	-
	26.7%	-	31.3%	2.2%	-
Total	15	2	16	91	10
	100.0%	100.0%	100.0%	100.0%	100.0%

medium to large mammal bones was observed at LA 61293. The remaining four sites lacked evidence of animal alterations.

Environmental Alterations

Environmental variables include pitting/corrosion, sun bleaching, exfoliation, and root etching. These variables were minimal or not present in the assemblage. Pitting is caused by soil erosion on the exterior surface of the bone (20). Pitted bones were collected from sites with Latest Archaic (4), unknown prehistoric (10), and historic (6) components. The small number of pitted bones is largely the result of burning, which inhibits environmental alteration.

Exposure to sun will cause bone to dehydrate, splinter, and turn white. One sheep/goat fragment from LA 61293 was sun bleached.

Thermal Alterations

The majority of the faunal assemblage (108, or 69 percent) exhibits some degree of burning (Table 113). The smallest site, LA 108902, a prehistoric component, was the only site lacking burned bone. The remaining four sites displayed a range of thermal intensity.

Lightly scorched bones are tan or light brown, indicating superficial burning. Light to heavy burning results in color-graded specimens ranging from tan to black, which usually indicates cooking when flesh partially adhered to the bone. Heavily charred bones (black) are created by excessive heat. A total of 44 charred bones from a variety of species were recovered from a historic thermal feature at LA 61293. With continuous high heat, charred bone will calcify and turn white (Lyman 1994:384–385). These high and recurrent temperatures were apparent in a hearth (Feature 20) within a pit structure (Feature 13) at LA 61293. Two calcified small-mammal bones were collected from this feature, as well as five from LA 61290 and four from LA 61286.

Temporal Distribution

Each of the five sites had animal bone from between one to four of the following temporal

Table 113. Thermal alteration of animal bone by species/category and period

Common Name	Prehistoric	Middle Archaic	Late Archaic and Latest Archaic	Coalition	Historic
Small mammal					
Lightly scorched	-	-	8	-	5
Light-heavy	-	-	-	-	1
Heavy (black)	1	2	3	-	10
Heavy (calcined)	-	-	1	-	1
Calcined	-	-	3	1	2
Small-medium mammal					
Calcined	-	-	-	1	-
Medium mammal					
Heavy (black)	-	1	-	-	-
Medium-large mammal					
Lightly scorched	-	-	-	-	1
Light-heavy	-	-	-	-	1
Heavy (black)	-	1	-	-	1
Calcined	-	-	3	-	-
Mouse					
Heavy (black)	-	-	-	-	1
Woodrat					
Light-heavy	-	-	-	-	1
Heavy (black)	-	-	-	-	1
Desert cottontail					
Lightly scorched	-	-	-	-	6
Light-heavy	-	-	-	-	8
Heavy (black)	-	-	1	-	26
Heavy (calcined)	-	-	-	-	1
Black-tailed jackrabbit					
Lightly scorched	-	-	1	-	2
Light-heavy	-	-	-	-	2
Heavy (black)	-	-	-	-	7
Calcined	-	-	-	-	1
Dog, coyote, wolf					
Heavy (black)	-	-	-	-	1
Small perching bird					
Heavy (black)	-	-	-	-	1
Lizard					
Heavy (black)	-	-	-	-	1
Total	1	4	20	2	81

components: unknown prehistoric, Middle Archaic, Late Archaic/Latest Archaic, Coalition, and historic (Table 114). Three components had more than 10 bones (Table 115). LA 61293 had 101 bones in a thermal feature (Feature 1) dating to the historic era.

LA 61286

Two components had animal bone at LA 61286. One medium-to-large mammal fragment was found in a sheet trash area (Area 2) dating to the Middle Archaic. The Latest Archaic component yielded 13 bones from five features. Bone was recovered from Feature 1 (midden, 3 medium to large mammal); Feature 4 (small pit, 1 medium to large mammal); Feature 5 (large pit, 3 small mammal, 1 jackrabbit, and 1 medium to large mammal); Feature 9 (hearth, 1 small mammal); Feature 11 (pit structure, 1 small mammal); and Feature 11 (fill, 2 small mammal). All but one bone is burned, ranging from lightly scorched (tan) to black to calcined (white).

Table 114. Temporal distribution of animal bone by site and provenience

Site	Provenience	Period	Number of Bones
LA 61286	Feature 1 (midden)	Latest Archaic	3
	Feature 4 (small pit)	Latest Archaic	1
	Feature 5 (large pit)	Latest Archaic	5
	Feature 9 (hearth)	Latest Archaic	1
	Feature 11 (pit structure)	Latest Archaic	1
	Feature 11 (fill)	Latest Archaic	2
	Area 2 (sheet trash)	Middle Archaic	1
LA 61289	Feature 6 (cobble-lined thermal feature)	Middle Archaic	1
	Feature 25 (thermal feature)	Middle Archaic	1
	Sheet trash area	Middle Archaic	1
LA 61290	Feature 1 (sheet trash area)	Coalition	1
	Feature 4 (campfire)	Historic	12
	Feature 2 (activity area with sheet trash)	Middle Archaic	1
	Feature 25 (roasting pit)	Late Archaic (?)	1
	Feature 27 (possible kiln)	Coalition	1
LA 61293	Feature 1 (thermal feature)	Historic	101
	Feature 13 (pit structure)	Latest Archaic	1
	Feature 19 (burned pit)	Prehistoric (probably Late Archaic)	1
	Feature 20-Hearth (within Feature 13)	Latest Archaic	3
	Feature 21-Hearth (within Feature 13)	Latest Archaic	6
	Surface strip area near Feature 1	Historic	1
LA 108902	Feature 1 (thermal feature)	Prehistoric	10
Total			156

Table 115. Animal bone by site, taxon/category, and period

Site	Common Name	Prehistoric	Middle Archaic	Late Archaic-Basketmaker II	Coalition	Historic
LA 61286	Small mammal	-	-	7	-	-
	Medium-large mammal	-	1	-	-	-
	Black-tailed jackrabbit	-	-	1	-	-
LA 61289	Small mammal	-	1	-	-	-
	Medium mammal	-	1	-	-	-
	Small rodent	-	1	-	-	-
LA 61290	Small mammal	-	1	-	1	5
	Small-medium mammal	-	-	-	1	
	Desert cottontail	-	-	-	-	3
	Black-tailed jackrabbit	-	-	-	-	3
	Mule deer	-	-	1	-	
	Small perching birds	-	-	-	-	1
LA 61293	Small mammal	1	-	8	-	19
	Medium-large mammal	-	-	-	-	3
	White-footed mouse	-	-	-	-	4
	Woodrat	-	-	-	-	2
	Desert cottontail	-	-	2	-	55
	Black-tailed jackrabbit	-	-	-	-	12
LA 61293	Dog, coyote, wolf	-	-	-	-	1
	Sheep/goat	-	-	-	-	4
	Medium bird	-	-	-	-	1
	Lizard	-	-	-	-	1
LA 108902	Medium-large mammal	6	-	-	-	-
	Very large mammal	4	-	-	-	-
Total		11	5	19	2	114

LA 61289

LA 61289, a Middle Archaic site with numerous features, produced little fauna. Only three bones were collected from three features. A thermal feature (Feature 25) had one medium mammal bone, a cobble-lined thermal feature (Feature 6) contained one small rodent bone, and one small mammal bone was recovered from a sheet trash area. Two bones exhibit burning.

LA 61290

LA 61290 is an extensive site with numerous features dating over four time periods. Animal bone was minimal at this site. Only 16 pieces from six species were recovered. A Middle Archaic activity area with sheet trash (Feature 21) contributed one small mammal bone. A Late Archaic roasting pit (Feature 25) had one mule deer fragment. A Coalition period sheet trash area (Feature 1) had one small mammal bone, and a small to medium mammal fragment was retrieved from a possible kiln from the same period. Most of the bone from these features displayed signs of burning, except one.

All of the bone (12) recovered from a historic campfire (Feature 4) was burned. The fauna included one small perching bird, five small mammal, three cottontail, and three jackrabbit bones.

LA 61293

LA 61293 produced the largest number of animal bones in the assemblage (113). A Latest Archaic pit structure (Feature 13) had one unburned cottontail bone. The interior of the pit structure contained two hearths (Features 20 and 21). Feature 20 provided one cottontail and two small mammal bones. Feature 21 had six small mammal bones. All but one of the bones from the hearths is burned. An undated prehistoric (probably Late Archaic) burned pit (Feature 19) produced one heavily charred small mammal long bone.

The historic component had a thermal feature (Feature 1), which yielded 102 pieces of bone, and 69 of them were burned: mice (4), woodrats (2), medium bird (1), lizard (1), cottontail (55), jackrabbit (12), small mammal (19), dog or coyote (1), sheep or goat (4), and unknown medium to large mammal (3). A surface-strip area surrounding Feature 1 produced only one sheep/goat fragment.

LA 108902

LA 108902 had one prehistoric thermal feature (Feature 1) containing ten unburnt bones, including medium to large mammal (6) and very large mammal (4). It is the only site in the assemblage with very large mammal bones. Bison inhabited lands east of the Rio Grande Valley (Bailey 1971:12; Findley et al. 1975:335), and elk still occupy the montane area of northern New Mexico extending south to Santa Fe and Las Vegas (Bailey l971:40; Findley et al. l975:327). Bison has been recovered in archaeological deposits to the south and east of the project area. These sites include the Cochiti Dam Project (Lange 1968:211–212) and Arroyo Hondo (Lang and Harris l984:49–50).

Summary

The excavation of five sites along the Santa Fe Relief Route yielded 156 pieces of bone from five different time periods (see Table 114).

Undated prehistoric components at LA 61293 and LA 108902 yielded one small bone, six medium to large mammal bones, and four very large mammal bones. The killing and butchering of large game was a productive means of subsistence for inhabitants along the Upper Middle Rio Grande during the prehistoric era (Post 1996a:11; Lent 1991:7).

During the Middle Archaic, sites were large and had complex occupation histories. A hunter-gathering economy focused on the procurement of small animals. It is debatable whether large game was depleted in response to environmental changes, forcing the inhabitants to exploit smaller mammals (Bayham 1979:220, 228). This would be difficult to assess at the Santa Fe Relief Route because only five bones were collected from the three Middle Archaic sites (LA 61286, LA 61289, and LA 61290). Two bones are from medium to large mammals and the remaining three are from small mammals.

The Latest Archaic period reveals the first evidence of more permanent occupants. The Santa Fe drainage supplied a water source which ensured seasonally abundant biotic resources (Post 1996a:12–13). Three sites from this project had rabbit remains and small mammal bones that are probably rabbit, with a few medium to large mammal bones and one deer bone. Piñon-juniper woodlands supported deer, but it is difficult to assess whether the deer was procured and consumed on or near the site, or if this solitary bone was transported to the habitation area. A similar incident occurred at LA 84758, an Archaic site at Las Campanas de Santa Fe, which also produced one deer bone (Mick-O'Hara 1996:510).

One site (LA 61290) falls into the Coalition period. Only two small and small to medium bones were collected. This sequence is characterized by permanent year-round settlements of substantial size with a dependence on agriculture.

The historic period was evident at two sites, LA 61290 and LA 61293. Animal bone was retrieved from thermal features at Feature 4 of LA 61290 and Feature 1 of LA 61293. These features contributed the largest number of bones (114) and the widest variety of species in the assemblage. Whether the culture(s) involved during this time span were Native American, Spanish, or Anglo is unknown. Most of the mammal bones recovered were probably from animals that were consumed, and scraps of bone were tossed into the thermal features to clean up the site. Rodents, small birds, and lizards may have been desperation foods for historic campers, travelers, or sheep herders. This was a time of great expansion in New Mexico (Post 1996a:26), when people traveled through regions in pursuit of appropriate areas for settlement. During their travels they left trails of campfires and campsites that were reused by other travelers and explorers with common goals. Historic campsites have been recorded throughout most of New Mexico.

Flotation and Wood Samples

Pamela J. McBride and Mollie S. Toll

Flotation and wood samples were taken from sites along the Santa Fe Relief Route dating to the Early Archaic (Jay and Bajada phases), Middle Archaic (San Jose phase), Late Archaic (Armijo and En Medio phases), Latest Archaic (Basketmaker II phase), Pueblo, and late historic periods. This project offers an important opportunity to look at subsistence through time within sites and across the region. Previous excavations in the Santa Fe area have been conducted at early sites (and smaller, limited-activity sites of all periods) that have poor preservation potential because they tend to be shallow, deflated, and lacking structures. Some simply lacked archaeobotanical analysis (Gossett and Gossett 1991; Schmader 1987) or suffered from very low recovery of cultural botanical remains in the sampled proveniences (Dean 1993a, 1993b; Toll 1994). Studies conducted during the excavations along the northwest portion of the Santa Fe Relief Route found that Archaic sites were largely situated in the piedmont, near gravel sources (igneous and metamorphic rocks, and redeposited chert and chalcedony nodules). These site locations allowed for easy access to raw materials for tool manufacture and the construction of food-processing features like roasting pits. Unfortunately, the plant remains recovered from features yielded no direct evidence of floral parts that may have been processed in thermal features and few clues about the subsistence regime (McBride and Toll 2000). One early site with better preservation is Tierra Contenta, on the southwestern edge of Santa Fe, where Schmader (1994:12–14) documented the existence of structural sites dating to at least the Late Archaic and possibly earlier. A rich array of weedy annual, grass, and perennial seeds recovered at Tierra Contenta sites points to broadly based subsistence activities and encourages the pursuit of such information at other sites (McBride 1994).

Site types in the Coalition and Classic periods range from a variety of small sites geared toward specific short-term activities, some of which were visited repeatedly for short periods, to large pueblos. Coalition period site components from the northwest section of the Santa Fe Relief Route were isolated thermal features; these were larger than those from preceding periods and showed signs of reuse, perhaps indicating a need to increase foraging capacity (Post 2000a:iii).

The substantial, large pueblos of the Coalition to Early Classic period hold the possibility of far better preservation conditions for plant materials. However, some sites were excavated before flotation was widely and systematically used, and the only floral remains collected were obvious cultivars like corncobs, sandal and cordage fragments, and contents of pots (as in the 1930s, when Pindi Pueblo was investigated). At Pindi a small assemblage of macrobotanical remains was analyzed by Volney Jones (1953:140–142). Excavation of Arroyo Hondo by the School of American Research was a model of thoroughness for archaeology in the early 1970s. Botanical studies directed attention to some vital interpretive and comparative issues, such as nutritional adequacy and productive capacity with respect to changing environmental and demographic trends (Wetterstrom 1986). Unfortunately for comparative purposes, we find ourselves frustrated by difficulties in reconstructing the data used to support conclusions. Agua Fria Schoolhouse (LA 2) was excavated recently, but only partially. The data from five flotation samples are clear and dependable but meager (Cummings 1989). Data available from large, complex, and potentially well-preserved pueblos are thus very uneven, and the contemporary, small, limited-activity sites have very little floral data at all (Cummings and Puseman 1992; Toll 1989; McBride and Toll 2000).

In the current project, 220 flotation samples were analyzed from contexts as varied as specialized activity areas, a pit-structure hearth from Archaic occupations, and a kiln from a Pueblo period site. Great Basin conifer woodland (Brown 1982) covers the bulk of the Santa Fe Relief Route project area. Juniper and piñon are widespread species forming the overstory. Subdominant taxa include gray oak, rabbitbrush, snakeweed, big sagebrush, four-wing saltbush, prickly pear and cholla cacti, and a variety of annual and grass species. Archaeological plant remains reflected the broad array of available economic resources occurring in this zone. We recovered a variety of annual and perennial species as well as at least two grasses in flotation samples (Table 116). Cultivars were found only in Pueblo period contexts.

Methods

Flotation and Full-Sort Analysis

The 220 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). Flotation soil samples ranged in volume from 1.4 to 5.7 liters. Each sample was immersed in a bucket of water, and a 30–40 second interval was 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 squares of fabric were 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, and 0.5 mm mesh) and reviewed under a binocular microscope at 7–45x. Charred and uncharred reproductive plant parts (seeds and fruits) were identified and counted. Table 116 lists all carbonized plant taxa encountered in samples by Latin and common names and anatomical parts. Flotation data are reported as a standardized count of seeds per liter of soil, rather than an actual number of seeds recovered. Relative abundance of nonreproductive plant parts such as pine needles and grass stems was estimated per liter of soil processed.

To aid the reader in sorting out botanical occurrences of cultural significance from the considerable noise of postoccupational intrusion, data in tables are sorted into categories of "cultural" (all carbonized remains), "possibly cultural" (indeterminate cases, usually of unburned, economically useful taxa found with burned specimens of the same taxon or found in relatively good preservation conditions), and "noncultural" (unburned materials, especially when of taxa not economically useful, and when found in disturbed contexts together with modern roots, insect parts, scats, or other signs of recent biological activity).

Charcoal Identification

From each flotation sample with at least 20 pieces of wood charcoal present, a sample of 20 pieces was identified (a maximum of 10 pieces from each screen size). In smaller samples, all charcoal from the 4 mm and 2 mm screens was identified. Each piece was snapped to expose a fresh transverse section and identified at 45x. Identified charcoal from each taxon was weighed on a top-loading digital balance to the nearest tenth of a gram and placed in labeled plastic bags. 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.

Macrobotanical wood specimens were examined in the same manner as flotation charcoal. Charcoal was separated by taxon, weighed, and placed in labeled foil packets for possible carbon-14 dating.

Results

LA 61286

LA 61286 is on a gentle southeastern slope overlooking Arroyo Gallinas. The site is presently dissected by numerous erosional channels, two of which define the eastern and southwestern edge of the site. Site areas sampled for floral remains include Area 1, a Late to Latest Archaic habitation site; Area 2, which has a variety of Late Archaic pits on elevated ground and a Middle Archaic habitation component; and Area 3, with two thermal features dating to the Early Archaic and a possible shallow hearth that may be associated with an ephemeral Middle Archaic occupation.

Early Archaic. Charred goosefoot seeds were recovered from all Early Archaic contexts (Table 117), while cheno-am and seepweed seeds were identified in an undifferentiated burned pit (Feature 56). The adaptive advantage that weedy annuals have of proliferating in the disturbed ground around habitation sites, agricultural fields, and middens makes them a readily available

Table 116. Charred plant taxa from flotation and wood samples

Latin Name	Common Name	Plant Part
	Annuals	
Amaranthus	Pigweed	Seed
Chenopodium/Amaranthus	Cheno-am	Embryo, seed
Chenopodium	Goosefoot	Embryo, seed
Corispermum	Bugseed	Seed
Mentzelia	Stickleaf	Seed
Physalis	Groundcherry	Seed
Plantago	Plantain	Seed
Portulaca	Purslane	Seed
Quercus	Oak	Wood
Suaeda	Seepweed	Seed
Cultivars:		
Zea mays	Corn	Cupule, kernel
Grasses:		
Gramineae	Grass family	Embryo
Oryzopsis	Ricegrass	Seed
Other:		
Compositae	Composite family	Achene
Solanaceae	Nightshade family	Seed
Unidentifiable	Unidentifiable	Fruit, seed
Unknown	Unknown	Capsule, embryo, nutshell, seed, stem, unknown
	Perennials	
Atriplex canescens	Four-wing saltbush	Fruit
Atriplex/Sarcobatus	Saltbush/greasewood	Wood
Cercocarpus	Mountain mahogany	Wood
Cylindropuntia	Cholla	Seed
Echinocereus	Hedgehog cactus	Seed
Gymnospermae	Conifer	Bark, wood
Juniperus	Juniper	Bark, cone, leaflet, seed, twig, wood
Nonconifer	Nonconifer	Wood
Pinus	Pine	Bark, cone scale, needle, wood
Pinus edulis	Piñon	Needle, nutshell, wood
Pinus ponderosa	Ponderosa pine	Bark
Platyopuntia	Prickly pear cactus	Embryo, seed
Quercus	Oak	Wood
Rhus	Lemonade berry	Seed

Table 117. Flotation plant remains per liter, Early Archaic component, LA 61286

Feature Number	46	55	56
Sample Volume	4.16	9.31	3.51
Feature Type	Charcoal Layer	Roasting Pit	Burned Pit
Cultural			
Annuals:			
Chenopodium	0.2*	3.85*	2.83*
Cheno-am	-	-	0.59*
Suaeda	-	-	0.46*
Other:			
Unidentifiable seed	-	0.1 pc	-
Unknown taxon	-	0.32 pp*, 0.1fruit*	-
Perennials:			
Juniperus	-	0.20*	0.23*
Platyopuntia	-	0.20*	-
Noncultural			
Grasses:			
Festuca	-	0.1	-
Other:			
Compositae	-	0.35	-
Dicot	-	+l	-
Unidentifiable seed	-	0.1	-
Perennials:			
Pinus	+n	+n	-

+ less than 1l; * charred; n needle; pc partially charred; pp plant part.

resource, and their seeds have been recovered from a wide array of prehistoric assemblages. The ethnographic literature abounds in examples of the economic use of the seeds of weedy annuals like goosefoot. Castetter (1935:23) describes the use of goosefoot as a ground meal eaten as gruel or combined with other food such as corn meal and made into cakes. The young leaves of goosefoot, purslane, seepweed, and pigweed were also cooked and eaten like spinach.

Juniper seeds were recovered in a roasting pit (Feature 56) and in Feature 55, which could relate to the use of juniper wood for fuel and/or the use of the cones (commonly called berries) for food. Juniper cones are often still attached to branches when collected for firewood so that the cones and their seeds are subsequently burned with the wood. Several Pueblo peoples ate juniper cones raw or cooked, using them as a seasoning for meat or grinding them into a meal (Castetter 1935:31–32). It would be realistic to think that their strong resinous flavor and low nutritive value would have precluded widespread or general food use, but according to Dunmire and Tierney (1995:106), the cones were "regularly harvested by Rio Grande Pueblo Indians up until the supermarket era."

The presence of charred prickly pear embryos in the roasting pit suggests the fruits were gathered and processed. The fruits of prickly pear cactus were eaten raw, boiled, or dried (Dunmire and Tierney 1995:190–191; Castetter 1935:35–37) and were one of the few sweets available prior to the arrival of Europeans.

Piñon charcoal dominates the Early Archaic wood assemblage, followed by juniper. Traces of pine and undetermined conifer woods were also present (Table 118).

Middle Archaic. Weedy annual seeds including cheno-am, goosefoot, pigweed, purslane, and seepweed and juniper seeds were the most common plant remains in Middle Archaic features (Table 119). The pit-structure foundation (Feature 60) and a fire-cracked rock filled roasting pit (Feature 29) yielded the most diverse floral remains, including pigweed, goosefoot, seepweed, and juniper seeds. Five of the ten undifferentiated burned pits with charred floral

Table 118. Wood from flotation samples, Early Archaic component, LA 61286 (weight in grams)

Feature Number	55	56	56	Total	
Feature Type	Roasting Pit	Burned Pit	Burned Pit	Weight	%
Conifers:					
Juniperus	0.04	0.1	0.2	0.34	13.4%
Pinus	0.1	-	-	0.1	3.9%
Pinus edulis	1	0.9	0.1	2	78.7%
Undetermined conifer	-	-	0.1	0.1	3.9%
Total	1.14	1	0.4	2.54	100.0%

Table 119. Flotation plant remains per liter, Middle Archaic component, LA 61286

Feature Number	2 0	21	25	28	29	30	31	32	34	35	37	38	39	40
Sample Volume	3.03	6.5	9.31	5.36	4.57	5.63	3.83	1.55	7.1	4.5	5.69	13.71	3.05	1.76
Feature Type	Hearth	Burned Pit	Burned Pit	Fire-cracked Rock-filled Roasting Pit	Fire-cracked Rock-filled Roasting Pit	Roasting Pit	Possible Posthole	Possible Posthole	Roasting Pit	Fire-cracked Rock-filled Pit	Fire-cracked Rock-filled Roasting Pit	Burned Pit with Fire-cracked Rock	Burned Pit with Fire-cracked Rock	Burned Pit
Cultural														
Annuals:														
Chenopodium	-	.33*	-	-	3.1*	-	-	-	-	-	-	-	-	-
Cheno-am	-	.33*	-	-	-	-	-	-	-	-	-	-	-	-
Portulaca	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2*
Suaeda	-	-	-	-	.2*	-	-	-	-	-	-	-	-	-
Other:														
Unknown taxon	-	.16 pp*	-	-	.2*	-	-	-	-	-	-	-	-	-
Perennials:														
Juniperus	-	-	-	-	.2*	-	-	-	-	-	.71*	-	-	-
Noncultural														
Grasses:														
Bromus	-	-	-	-	0.2	-	-	-	-	-	-	-	-	-
Other:														
Compositae	-	-	-	-	-	-	-	0.6	-	-	-	-	-	-
Unidentifiable seed	-	-	-	-	-	-	-	-	-	-	-	0.16	-	-
Perennials:														
Juniperus	-	-	-	-	-	-	-	-	-	-	-	.23, +t	-	-
Pinus	-	+n	-	-	-	-	-	-	-	-	-	+n, +t	-	-

+ less than 11; * charred; n needle; pp plant part; t twig

Table 119 (continued). Flotation plant remains per liter, Middle Archaic component, LA 61286

Feature Number	40	41	43	44	45	48	49	50	51	52	57	58	59
Sample Volume	1.76	2.8	8.6	3.5	4.05	6.78	5.48	6.2	7.81	2.84	12.47	2.25	3.25
Feature Type	Burned Pit	Roasting Pit	Burned Pit	Roasting Pit	Burned Pit	Burned Pit	Burned Pit	Burned Pit	Burned Pit	Burned Pit	Unburned Pit	Burned Pit	Burned Pit
Cultural													
Annuals:													
Chenopodium	-	-	-	-	-	0.14*	-	-	-	-	-	-	-
Cheno-am	-	0.4*	-	-	-	-	-	-	-	-	-	-	-
Portulaca	1.2*	-	-	-	-	-	-	-	-	-	-	-	-
Other:													
Unidentifiable seed	-	-	0.12*	-	-	-	-	-	-	-	-	-	-
Unknown taxon	-	-	0.11 pp*	-	-	-	-	-	-	-	-	-	-
Perennials:													
Juniperus	-	-	-	-	0.4*	0.14*	0.53*	-	-	-	-	-	1.2*
Pinus	-	-	-	-	-	-	-	-	+cs*	-	-	-	-
Noncultural													
Annuals:													
Amaranthus	-	-	-	-	-	-	-	-	-	0.4	-	-	-
Chenopodium	-	-	-	-	-	-	-	0.16	-	0.4	-	-	-
Grasses:													
Gramineae	-	-	-	-	-	-	-	-	0.14	-	0.07	-	-
Paniceae	-	0.4	-	-	-	-	-	-	-	-	-	-	-
Other:													
Dicot	-	-	-	-	-	-	-	-	-	-	-	+1	-
Perennials:													
Juniperus	-	-	+t	-	-	-	-	-	-	-	+t	-	-
Pinus	-	-	-	-	-	-	-	-	-	-	+n	-	-

+ less than 11; * charred; cs conescale; l leaf; n needle; pp plant part; t twig

Table 119 (continued). Flotation plant remains per liter, Middle Archaic component, LA 61286

Feature Number	60	61	62	63	65	67
Sample Volume	3.3	3.5	5.58	5.28	10.12	2.5
Feature Type	Pit Structure Foundation	Burned Pit	Burned Pit	Burned Pit	Roasting Pit within Features 60 and 66	Storage Pit within Feature 60
Cultural						
Annuals:						
Amaranthus	0.05*	-	-	-	-	-
Chenopodium	-	-	-	-	0.20*	-
Cheno-am	-	0.3*	-	-	-	-
Other:						
Unidentifiable seed	0.06*	-	-	-	-	-
Perennials:						
Juniperus	0.27*	-	3.01*	3.27*	-	-
Noncultural						
Grasses:						
Gramineae	-	-	+g	-	-	-
Other:						
Compositae	0.06	-	-	-	0.1	-
Perennials:						
Pinus	-	+n	-	-	-	-

+ less than 11; * charred; g glume; n needle

remains from this time period yielded juniper seeds exclusively. This could indicate that meat was roasted in the features and the cones were used for flavoring, or the cones were processed by themselves for consumption or represent firewood residue. An undifferentiated burned pit (Feature 51) contained charred pinecone scales, normally an indicator of piñon nut roasting when accompanied by the remains of piñon nutshell. Considering the lack of nutshell, the function of the pit is unclear. Floral remains from postholes that may have formed the foundation of a shade shelter consisted solely of uncharred composite seeds. The absence of charred or uncharred wood from the postholes is disappointing, and leaves us with no knowledge of the species used for posts.

Juniper is the most common wood by weight recovered from Middle Archaic features, followed by piñon (Table 120). A trace of oak was identified in an undifferentiated burned pit (Feature 50), and small amounts of pine were present in Feature 50 and the pit-structure foundation.

Late Archaic. Three out of five Late Archaic features that were sampled for plant remains yielded charred seeds (Table 121). Pigweed was identified in a roasting pit (Feature 18), juniper in a fire-cracked rock filled roasting pit (Feature 19), and unknown seeds in an undifferentiated burned pit (Feature 22). As in the preceding Middle Archaic period, juniper is the dominant wood taxon, followed by piñon. Traces of pine also occur (Table 122).

Latest Archaic. Large quantities of goosefoot seeds were recovered in pit-structure floor fill (Feature 11) and a hearth (Feature 9), verifying once again the importance of this prolific and readily available plant in the prehistoric diet (Table 123). Hedgehog cactus, ricegrass, and seepweed were restricted to single contexts, possibly indicating minimal use of these resources. The hedgehog cactus was found in a storage cist (Feature 16), and the dried fruits may have been stored there.

Like the undifferentiated burned pit associated with the Middle Archaic period, a large roasting pit (Feature 5) contained charred pinecone scales, and the feature may have been used to roast piñon nuts in the cone. Four-wing saltbush fruits were the only carbonized plant parts identified from an undifferentiated burned pit (Feature 7). The fruits are probably an artifact of wood use, since this feature is also the repository of the only saltbush/greasewood charcoal (1.2 g) recovered from the site (Table 124). The balance of the wood assemblage was dominated by juniper and piñon, with a small amount of pine from pit-structure floor fill. Charred conifer duff and products of fuelwood use (juniper seeds, pine needles, bark) are also abundant.

Table 120. Wood from flotation samples, Middle Archaic component, LA 61286 (weight in grams)

Feature Number Feature Type	25 Burned Pit	29 Fire-cracked Rock Filled Roasting Pit	30 Roasting Pit	34 Roasting Pit	39 Burned Pit with Fire-Cracked Rock	40 Burned Pit	43 Burned Pit	44 Roasting Pit	48 Burned Pit	49 Burned Pit	50 Burned Pit
Conifers:											
Juniperus	0.6	0.04	0.7	0.2	0.04	0.4	0.04	1.8	0.8	0.32	0.04
Pinus edulis	0.44	0.04	0.04	0.3	0.04	0.1	0.5	0.24	0.34	0.05	0.04
Undetermined conifer	-	-	0.04	-	0.04	-	-	-	-	-	-
Nonconifers:											
Quercus	-	-		-	-	-	-	-	-	-	0.04
Total	1.04	0.08	0.78	0.5	0.12	0.5	0.54	2.04	1.14	0.37	0.12

Feature Number Feature Type	51 Burned Pit	52 Burned Pit	56 Burned Pit	58 Burned Pit	59 Burned Pit	60 Pit-structure Foundation	61 Burned Pit	62 Burned Pit	63 Burned Pit	65 Roasting Pit within Features 60 and 66	63 Burned Pit	67 Storage Pit within Feature 60	Total Weight	 %
Conifers:														
Juniperus	2.5	0.1	0.4	0.1	0.08	0.3	0.1	0.4		3	0.04	0.01	12.01	67%
Pinus edulis	-	0.3	0.34	0.04	0.54	0.08	0.4	0.04	1	0.08	0.69	0.04	5.68	32%
Undetermined conifer	-	-	-	-	-	0.04	-	-	-	-	-	-	0.12	1%
Nonconifers:														
Quercus	-	-	-	-	-	-	-	-	-	-	-	-	0.04	<1%
Total	2.5	0.4	0.74	0.14	0.62	0.42	0.5	0.44	1	3.08	0.73	0.05	17.85	100%

Table 121. Flotation plant remains per liter, Late Archaic component, LA 61286

Feature Number	17	18	19	22	23
Sample Volume	3.7	6.17	6.8	3	4.01
Feature Type	Burned Pit	Roasting Pit	Fire-cracked Rock Filled Roasting Pit	Burned Pit	Burned Pit
		Cultural			
Annuals:					
Amaranthus	-	0.32*	-	-	-
Perennials:					
Juniperus	-	0.16*	0.14*	-	-
		Noncultural			
Grasses:					
Bromus	-	0.16	-	-	-
Other:					
Polygonaceae	-	-	-	0.16	-
Unidentifiable seed	-	-	-	0.16	-
Unknown taxon	-	0.16 fruit	0.16 pp	-	-
Perennials:					
Bidens	-	0.16	-	-	-
Juniperus	-	+t	-	-	-
Pinus	-	+cs	+n	-	-

+ less than 11; * charred; cs cone scale; n needle; pp plant part; t twig

Table 122. Wood from flotation samples, Late Archaic component, LA 61286

Feature	17	18	19	22	23	Total	
Feature Type	Burned Pit	Roasting Pit	Fire-cracked Rock Filled Roasting Pit	Burned Pit	Burned Pit	Weight	%
Conifers:							
Juniperus	0.2	1.9	1.2	0.5	0.3	4.1	74%
Pinus	0.04	-	-	0.04	-	0.08	1%
Pinus edulis	0.5	0.5	-	0.1	0.28	1.38	25%
Total	0.74	2.4	1.2	0.64	0.58	5.56	100%

Table 123. Flotation plant remains per liter, Latest Archaic component, LA 61286

Feature Number	1	2	3	4	5	7	8	9	11 (floor fill)	12	15	16
Sample Volume	38.36	2.93	3.69	4.71	47.86	4.64	2.55	13.75	4.34	5.54	13.06	5.2
Feature Type	Midden	Burned Pit	Burned Pit	Burned Pit	Roasting Pit	Burned Pit	Burned Pit	Hearth	Pit Structure	Burned Pit	Roasting pit	Storage Cist
Cultural												
Annuals:												
Amaranthus	-	-	0.54*	0.8*	-	-	-	-	0.06*	-	-	0.2*
Chenopodium	1.04*	-	12.7*	0.6*	-	-	-	34.50*	48.71*	0.4*	3.98*	-
Cheno-am	0.56*	-	-	2.5*	-	-	-	0.8	-	-	0.31*	0.6*
Corispermum	-	-	0.54*	-	-	-	-	-	-	-	-	-
Plantago	0.05*	-	-	-	-	-	-	-	-	-	-	-
Suaeda	-	-	-	-	-	-	-	-	-	-	.06*	-
Grasses:												
Oryzopsis	-	-	-	-	-	-	-	-	0.06*	-	-	-
Other:												
Compositae	-	-	-	-	-	-	-	0.07*	-	-	-	-
Solanaceae	0.02*	-	-	-	-	-	-	-	-	-	-	-
Unknown taxon	0.03*	-	0.27e*, 0.27pp*	-	-	-	-	0.08*	0.08*	-	.06*	-
Perennials:												
Atriplex canescens	-	-	-	-	-	0.2*	-	-	-	-	-	-
Echinocereus	-	-	-	-	-	-	-	-	-	-	-	0.2*
Juniperus	0.04*	-	0.54*	-	-	-	-	0.08*	1.27*	-	.06*	-
Pinus	-	-	+b*	-	+cs*	-	-	+ cs*, +n*	+n*	-	-	-
Noncultural												
Annuals:												
Amaranthus	-	-	-	-	-	-	-	-	-	-	-	0.2
Chenopodium	-	-	0.27	-	0.01	-	-	-	0.07	-	-	-
Physalis	-	-	-	-	-	-	-	-	0.07	-	-	-
Perennials:												
Croton	-	-	0.27	-	-	-	-	-	-	-	-	-
Juniperus	+t	-	-	-	-	-	-	-	.15, +t	-	-	-
Pinus	+n	-	-	-	-	-	-	-	+n	-	-	-

+ less than 11; * charred; b bark; cs cone scale; e embryo; n needle; p plant part; t twig

Table 124. Wood from flotation samples, Latest Archaic component, LA 61286 (weight in grams)

Feature Number	1	3	5	7	9	11 (floor fill)	12	15	Total	
Feature Type	Midden	Burned Pit	Roasting Pit	Burned Pit	Hearth	Pit Structure	Burned Pit	Roasting Pit	Weight	%
Conifers:										
Juniperus	1.2	0.02	0.14	0.2	0.2	7	0.1	3.5	12.36	60%
Pinus	-	-	-	-	-	0.2	-	-	0.2	1%
Pinus edulis	0.4	0.04	1.93	0.2	2.7	0.78	0.5	0.2	6.75	33%
Nonconifers:										
Sarcobatus/Atriplex	-	-	-	1.2	-	-	-	-	1.2	6%
Total	1.6	0.06	2.07	1.6	2.9	7.98	0.6	3.7	20.51	100%

Weedy annuals appear to have been the mainstay of the Archaic diet. Cactus fruits and possibly piñon nuts and juniper cones also played a role. Coniferous woods were targeted for fuelwood use. Only one instance of saltbush/greasewood exploitation was documented in the record, perhaps indicating a preference for the denser, longer-burning conifers.

LA 61287

LA 61287 is on a east-facing slope at the edge of a large grassy area that terminates at Arroyo Gallinas. The site has been interpreted as a foraging camp associated with the Ancestral Pueblo period. Feature 2 (a shallow, basin-shaped pit) produced carbonized juniper seeds, piñon nutshell, and pinecone scales (Table 125). Small amounts of juniper, piñon, and undetermined conifer wood were recovered from Feature 2 (Table 126). Juniper and piñon charcoal were the only cultural plant materials recovered from Feature 1 (a large thermal feature). LA 61287 could have served as a staging ground for the collection of fall-ripening piñon nuts.

Table 125. Flotation plant remains per liter, Ancestral Pueblo component, LA 61287

Feature Number	2
Sample Volume	4.6
Feature Type	Shallow, basin-shaped pit
Cultural	
Perennials:	
Juniperus	0.7*
Pinus	+cs*
Pinus edulis	2.4*

+ less than 11; * charred; c cupule; cs cone scale; pp plant part

LA 61289

During testing, corrugated pottery found at LA 61289 suggested a Coalition or Early Classic occupation. After excavation a different picture emerged. The site's 30 features display signs of dismantling and reuse, indicating multiple occupations and temporal components. Features 1 and 2 (roasting pits or thermal features associated with an Ancestral Pueblo occupation) were exposed near the surface. The features located downslope along an arroyo were preserved by the buildup of deep colluvial deposits and represent at least an Early Archaic and at least two Middle Archaic components. The earlier of the two Middle Archaic occupations includes a pit-structure foundation, and the latter is represented by a cluster of specialized roasting pits.

A shallow Early Archaic thermal feature (Feature 29) contained charred goosefoot and seepweed seeds (Table 127). Juniper was the dominant wood taxon identified in a macrobotanical sample; piñon was present as well. Flotation wood is similar to that of the macrobotanical sample (Table 128).

We examined 21 samples that were associated with the Middle Archaic, and 14 of these yielded carbonized plant remains (Table 129). Goosefoot seeds were the most common, followed by cheno-am and juniper seeds. Feature 18 (cobble-lined roasting pit) had the most diverse floral assemblage, including midsummer annuals (goosefoot, cheno-am, bugseed) and late-summer or fall perennials (juniper and prickly pear seeds). There may be some evidence of specialized use of cobble-lined roasting pits. Sequestered recovery of perennial taxa include the prickly pear cactus seeds in Feature 18, evidence of piñon nut processing from Feature 17, and hedgehog cactus seeds from Feature 22. Cultural plant material with wider distribution consisted of pine needles and bark, the most likely by-products of fuelwood use. Juniper and piñon were the most common wood taxa in macrobotanical samples (Table 130). Oak was recovered from Feature 17 and the pit-structure foundation (Feature 19). The flotation wood assemblage echoes that of the macrobotanical samples, with the addition of traces of unknown nonconifer wood (Table 131).

Plant remains from the Ancestral Pueblo component consisted of charred goosefoot and cheno-am seeds, and the products of fuelwood use like pine needles and cone scales and juniper twigs (Table 132). Wood from macrobotanical and flotation samples was primarily pine and piñon with small amounts of juniper (Table 133).

Features that are not directly associated with a particular time period include Features 28 (fire-cracked rock filled roasting pit) and 30 (burned pit). Charred goosefoot seeds, and juniper,

Table 126. Flotation wood, Ancestral Pueblo component, LA 61287 (weight in grams)

Feature Number	1	2	Total	
Feature Type	Cobble-lined Thermal	Shallow, basin-shaped pit	Weight	%
Conifers:				
Juniperus	0.2	0.04	0.24	31%
Pinus edulis	0.4	0.04	0.44	56%
Undetermined conifer	0.1	-	0.1	13%
Total	0.7	0.08	0.78	100%

Table 127. Flotation plant remains per liter, Early Archaic component, LA 61289

Feature Number	29
Sample Volume	2.59
Feature Type	Hearth
Cultural	
Annuals:	
Chenopodium	11.7*
Suaeda	4.1*

* charred

Table 128. Flotation and macrobotanical wood, Early Archaic component, LA 61289 (weight in grams)

Feature Number	29		Totals	
Feature Type	Hearth		Weight	%
Sample Type	Flotation	Macrobotanical		
Conifers:				
Juniperus	0.5	2.2	2.7	65%
Pinus edulis	0.04	1.4	1.44	35%
Total	0.54	3.6	4.14	100%

Table 129. Flotation plant remains per liter, Middle Archaic component, LA 61289

Feature Number	3	4	5	6	7	8	9	10	11	13	16
Sample Volume	3.86	7.95	3.51	7.39	5.48	2.12	9.2	4.75	4.64	5.53	2.8
Feature Type	Cobble-lined Roasting Pit	Cobble-lined Roasting Pit	Cobble-lined Roasting Pit	Cobble-lined Roasting Pit	Cobble-lined Roasting Pit	Cobble-lined Roasting Pit	Burned Pit	Burned pit	Burned pit	Unlined pit	Burned pit
					Cultural						
Annuals:											
Chenopodium	0.5*	-	-	-	-	0.5*	-	0.6*	-	0.4*	-
Portulaca	-	-	-	-	-	-	-	0.4*	-	-	-
Other:											
Unidentifiable seed	-	0.12*	-	-	-	-	-	-	-	-	-
Unknown taxon	0.3*	-	-	-	-	-	-	-	-	-	-
Perennials:											
Juniperus	-	0.37*	-	-	-	-	0.30*	-	-	-	-
Pinus	-	-	+n*	-	+b*	-	-	-	-	-	-
					Noncultural						
Annuals:											
Chenopodium	-	-	-	-	-	-	0.1	-	-	-	-
Other:											
Unknown taxon	-	0.25 pp	-	0.29 pp	-	-	-	-	-	-	-
Perennials:											
Juniperus	0.8, +t	0.36, '+t, male c	0.3, +t	+l, +t	-	+l	+t	0.2	-	-	0.4, +t
Pinus	-	+n	+n	+n	-	+n	-	+n	-	-	-

+ less than 11; * charred; b bark; c cone; l leaflet; n needle; pp plant part; t twig

Table 129 (continued). Flotation plant remains per liter, Middle Archaic component, LA 61289

Feature Number	17	18	19	20	21	22	23	24	25	26	31
Sample Volume	7.41	9.52	4.78	3.35	4.44	3.64	3.28	3.69	2.2	3.08	5.28
Feature Type	Cobble-lined Roasting Pit	Cobble-lined Roasting Pit	Possible Pit-structure Foundation	Cobble-lined Roasting Pit	Cobble-lined Roasting Pit	Cobble-lined Roasting Pit	Hearth	Cobble-lined Roasting Pit	Pit	Hearth within Feature 19	Cobble-lined
Cultural											
Annuals:											
Chenopodium	-	0.64*	0.4*	-	-	0.72*	-	-		0.6*	-
Cheno-am	0.28*	0.47*	-	-	-	0.95*	-	0.3*		-	-
Corispermum	-	0.12*	-	-	-	-	-	-		-	-
Portulaca	0.28*	-	-	-	-	-	-	-		-	-
Grasses:											
Gramineae	0.11*	-	-	-	-	-	-	-		-	-
Other:											
Unidentifiable seed	-	0.40*	-	-	-	-	-	-		-	-
Perennials:											
Echinocereus	-	-	-	-	-	0.22*	-	-		-	-
Juniperus	-	0.21*	-	-	-	0.11*	-	-		-	0.6*
Opuntia	-	0.21*	-	-	-	-	-	-		-	-
Pinus	-	-	-	-	-	+b*	-	-		+n*	-
Pinus edulis	0.11*	-	-	-	-	-	-	-		-	-
Noncultural											
Perennials:											
Juniperus	-	-	-	-	-	-	-	-		-	0.2

+ less than 11; * charred; b bark; n needle

Table 130. Macrobotanical wood, Middle Archaic component, LA 61289 (weight in grams)

Feature Number	9	17	19	22	26	56N/43E	Total	
Feature Type	Burned Pit	Cobble-lined Roasting Pit	Possible Pit-structure Foundation	Cobble-lined Roasting Pit	Hearth within Feature 19		Weight	%
Conifers:								
Juniperus	-	0.3	0.1	3.0	0.1	2.5	6	48%
Pinus edulis	0.2	0.1	0.1	0.2	2.6	1.7	4.9	39%
Nonconifers:								
Quercus	-	1.5	0.1	-	-	-	1.6	13%
Total	0.2	1.9	0.3	3.2	2.7	4.2	12.5	100%

Table 131. Flotation wood, Middle Archaic component, LA 61289 (weight in grams)

Feature Number	3	4	5	9	11	10	12	17
Feature Type	Cobble-lined Roasting Pit	Cobble-lined Roasting Pit	Cobble-lined Roasting Pit	Burned Pit	Burned Pit	Burned Pit	Shallow Unburned Pit	Cobble-lined Roasting Pit
Conifers:								
Juniperus	0.8	0.04	-	0.04	0.2	0.3	0.2	0.4
Pinus edulis	0.3	-	0.04	0.08	0.04	-	0.2	0.04
Undetermined conifer	-	0.14	0.04	0.04	-	-	-	-
Nonconifers:								
Quercus	-	-	-	-	-	-	-	0.1
Undetermined nonconifer	-	-	-	-	-	-	0.04	-
Total	1.1	0.18	0.08	0.16	0.24	0.3	0.44	0.54

Table 131 (continued).

Feature Number	18	20	21	22	23	25	26	Total	
Feature Type	Cobble-lined Roasting Pit	Cobble-lined Roasting Pit	Cobble-lined Roasting Pit	Cobble-lined Roasting Pit	Hearth	Pit	Hearth within Feature 19	Weight	%
Conifers:									
Juniperus	0.9	0.3	0.5	1.4	0.5	0.4	0.5	6.48	63%
Pinus edulis	0.3	0.04	0.4	0.84	0.1	-	0.89	3.27	32%
Undetermined conifer	-	-	-	-	-	-	-	0.22	2%
Nonconifers:									
Quercus	-	-	-	-	-	-	-	0.1	1%
Undetermined nonconifer	-	-	-	0.1	-	-	-	0.14	1%
Total	1.2	0.34	0.9	2.34	0.6	0.4	1.39	10.21	100%

Table 132. Flotation plant remains per liter, Ancestral Pueblo component, LA 61289

Feature Number	1	2
Sample Volume	14.26	4.64
Feature Type	Cobble-lined Roasting Pit	Burned Pit
	Cultural	
Annuals:		
Chenopodium	0.07*	-
Cheno-am	0.07*	-
Other:		
Unidentifiable seed	0.07*	-
Unknown taxon	0.07pp*	0.2pp*
Perennials:		
Juniperus	+tpc	-
Pinus	+cs*, +n*	-
	Noncultural	
Annuals:		
Euphorbia	-	0.2
Other:		
Unknown taxon	-	0.4fruit, +leaf
Perennials:		
Juniperus	0.07, +l, +t	+l
Pinus ponderosa	+n	-

+ less than 11; * charred; cs cone scale; l leaflet; pc partially charred; pp plant part; t twig

Table 133. Flotation and macrobotanical wood, Ancestral Pueblo component, LA 61289, (weight in grams)

Feature Number	1		2		Total	
Feature Type	Cobble-lined Roasting Pit		Burned Pit		Weight	%
Sample Type	Flotation	Macrobotanical	Flotation	Macrobotanical		
Conifers:						
Juniperus	0.11	4.6	-	0.1	4.81	15%
Pinus	-	0.5	-	8.1	8.6	27%
Pinus edulis	2.14	6.3	5.3	4.7	18.44	58%
Total	2.25	11.4	5.3	12.9	31.85	100%

piñon, and undetermined conifer wood were the extent of the carbonized floral remains from this unknown component of the site.

Weedy annuals seem to have been the primary component of the diet at LA 61289 during the Early and Middle Archaic occupations. Surprisingly, this pattern extends to the Ancestral Pueblo features, suggesting that weedy annuals were processed in the field for immediate consumption or transport to the village. Diversity appears to be highest in the Middle Archaic, but this is likely a product of sample size differences. There may be some evidence of specialized use of cobble-lined roasting pits during this period because of the isolated occurrences of three perennial taxa. Throughout the occupation sequence of the site, conifers dominate the wood assemblage. With the exception of traces of oak identified in two features associated with the Middle Archaic component, conifers are the only woods recovered from all contexts.

LA 61290

LA 61290 is on the south- and southeast-facing slopes of a broad ridge that divides the Arroyo Gallinas from an unnamed drainage to the north. The site is made up of several areas with components ranging from Middle Archaic to late historic.

Area 9 consisted of a Middle Archaic burned pit (Feature 14) overlying two thermal features (Features 13 and 15) apparently in use during the same period. Uncharred juniper seeds and leaflets were the only floral remains from the burned pit and can be attributed to modern conifer duff. Feature 15 was devoid of any plant remains (Table 134). Charred goosefoot seeds along with juniper, pine, and piñon woods were recovered from Feature 13 (Table 135).

Area 10 was a Middle Archaic base camp with ground stone artifacts, lithic tools, and core-reduction debris. Features 18, 22, and 24 (thermal) and Feature 21 (discard area) were encircled by an intensely stained area that may represent a structure or ramada. Except for one deep roasting pit (Feature 23), the thermal features were basin-shaped burned pits. Seven of the nine thermal features yielded carbonized plant remains. The most common carbonized plant remains were goosefoot seeds and other weedy annuals including purslane, bugseed, and cheno-ams (Table 134). Charred juniper seeds were recovered from the discard area and probably derived from firewood debris. The recovery of prickly pear seeds in the roasting pit may indicate preparation of cactus fruits. Charred pine needles and unknown stem fragments were also present (again, probably debris from fuelwood or tinder use). Flotation wood from all Middle Archaic proveniences was predominately juniper (76 percent by weight) with small amounts of pine, piñon, and unknown conifer (Table 135). The macrobotanical wood assemblage was dominated by piñon (54 percent by weight), and a significant amount of juniper was present (36 percent), along with small quantities of pine and unknown conifer (Table 136).

Four thermal features in Area 1 were associated with the Ancestral Pueblo period. Feature 1, a roasting pit, had the project's only direct evidence of Puebloan piñon nut processing (Table 137). Feature 10, a cobble-lined hearth, was truncated by the construction of Feature 1 and may have also been used for piñon nut roasting. The two features contained piñon nuts, needles, and cone scales, all pointing to the possible processing of nuts in the cone. Ethnographic accounts refer to nuts "gathered in the cone," with the cone later "burned off the nuts near where they were gathered or after the return home" (Reagan 1928:146–147; see also Murphey 1959:23). Goosefoot seeds from Feature 6 (fire-cracked rock lined roasting pit) and unknown plant parts from Feature 1 were the only other carbonized plant remains recovered. Floral remains from Feature 7 (deflated, burned pit) were restricted to uncarbonized juniper and dropseed grass seeds and unknown plant parts. Flotation wood was dominated by pine and piñon (60 percent by weight), and juniper was also present (34 percent; Table 138). Likewise, macrobotanical wood was predominately pine and piñon, with a trace of juniper (Table 139). An isolated burned pit (Feature 11) in Area 7 and a fire-cracked rock filled roasting pit (Feature 27) in Area 8 also date to the Ancestral Pueblo period. Unidentifiable seeds, present in Feature 11, were the only cultural floral remains present.

The site's most diverse array of plant remains, including goosefoot, purslane, juniper, and piñon, comes from a possible roasting pit associated with the late historic period (Table 140). The

Table 134. Flotation plant remains per liter, Middle Archaic component, LA 61290

Feature Number	31N/143E	13	14	15	16	17	18	19	20	21	22	23	24	26
Sample Volume	5.05	10.41	6.42	3.2	5.85	3.78	4.67	3.73	8.56	4.5	3.95	9.24	4.92	4.34
Feature Type		Burned Pit	Unburned Pit	Cobble-lined Hearth	Burned Pit	Burned Pit	Burned Pit	Burned Pit	Burned Pit	Activity Discard Area	Burned Pit	Roasting Pit	Burned Pit	Unburned Pit
Cultural														
Annuals:														
Chenopodium	0.2*	0.11*	-	-	-	-	1.3*	2.4*	0.24*	0.9*	0.3*	0.51*	0.6*	-
Cheno-am	-	-	-	-	0.3*	-	-	-	0.57*	-	0.3*	0.41*	-	-
Corispermum	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-
Portulaca	-	-	-	-	-	-	-	0.3*	0.34*	-	0.3*	0.1*	-	-
Other:														
Unidentifiable seed	-	0.43*								0.2*	-	-	-	-
Unknown taxon	-	-	-	-	0.2 ur*	-	+s*	-	-	0.9 ur*, +s*	-	0.20 ur*	+s*	0.5 pp*
Perennials:														
Juniperus	-	-	-	-	-	-	-	-	-	0.2*	-	-	-	-
Opuntia	-	-	-	-	-	-	-	-	-	-	-	0.41*	-	-
Pinus	+n*	-	-	-	-	-	-	-	-	-	-	-	-	-
Noncultural														
Annuals:														
Chenopodium	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6
Other:														
Unknown taxon	-	-	-	-	0.2 ur	-	-	-	-	-	-	-	-	-
Perennials:														
Juniperus	-	-	0.2	-	0.2	-	-	-	-	-	0.3	2.39, +l	-	-
Pinus	-	-	-	-	-	+n	-	-	-	-	-	-	-	-

Table 135. Flotation wood, Middle Archaic component, LA 61290 (weight in grams)

Feature Number	31N/143E	13	16	18	19	20	21	22	23	24	26	Total	
Feature Type		Burned Pit	Burned Pit	Burned Pit	Burned Pit	Burned Pit	Activity Discard Area	Burned Pit	Roasting Pit	Burned Pit	Unburned Pit	Weight	%
Conifers:													
Juniperus	0.4	0.69	0.57	0.71	0.17	0.39	0.39	0.37	0.37	0.27	0.35	4.68	76%
Pinus	-	0.04	0.01	-	0.01	0.33	0.08	0.04	0.04	0.06	0.05	0.66	11%
Pinus edulis	-	0.18	0.01	-	-	0.42	-	0.03	0.01	-	0.01	0.66	11%
Unknown conifer	-	0.01	-	-	-	0.1	0.02	-	0.01	0.04	-	0.18	3%
Total	0.4	0.92	0.59	0.71	0.18	1.24	0.49	0.44	0.43	0.37	0.41	6.18	100%

Table 136. Macrobotanical wood, Middle Archaic component, LA 61290 (weight in grams)

Feature Number	90N/139E Level 2	15	18	19	20	23	Total	
Feature Type		Cobble-lined Hearth	Burned Pit	Burned Pit	Burned Pit	Roasting Pit	Weight	%
Conifers:								
Juniperus	0.04	0.4	5.3	0.6	2.2	3.4	11.94	36%
Pinus	-	-	1.7	-	-	-	1.7	5%
Pinus edulis	0.4	0.3	4	1.1	10.9	1.6	18.3	54%
Unknown conifer	0.04	0.5	-	0.2	-	0.9	1.64	5%
Total	0.48	1.2	11	1.9	13.1	5.9	33.58	100%

Table 137. Flotation plant remains per liter, Ancestral Pueblo component, LA 61290

Feature Number	1	6	7	10	11	27
Sample Volume	2.1	3.2	2.35	3.25	2.62	4.85
Feature Type	Roasting Pit	Fire-cracked Rock Filled Roasting Pit	Burned Pit	Cobble-lined Hearth	Burned Pit	Fire-cracked Rock Filled Roasting Pit
			Cultural			
Annuals:						
Chenopodium	-	0.3*	-	-	-	-
Other:						
Unidentifiable seed	-	-	-	-	.4*	-
Unknown taxon	2.9 pp*, 0.5 ur*	-	-	-	-	-
Perennials:						
Pinus	+cs*	-	-	+cs*	-	-
Pinus edulis	2.4*	-	-	0.6*, +n*	-	-
			Noncultural			
Grasses:						
Gramineae	-	0.9	-	-	-	0.4
Paniceae	-	0.6	-	-	-	-
Sporobolus	-	-	0.4	-	-	-
Perennials:						
Juniperus	-	-	0.9, +++t	-	-	-
Pinus	-	+n	-	-	-	-
Other:						
Unknown taxon	-	+leaf	1.3	-	-	-

+ less than 11; +++ more than 25; * charred; cs cone scale; l leaflet; n needle; pp plant part; t twig; ur unknown reproductive

Table 138. Flotation wood, Ancestral Pueblo component, LA 61290 (weight in grams)

Feature Number	1	6	10	Total	
Feature Type	Roasting Pit	Fire-cracked Rock Filled Roasting Pit	Cobble-lined Hearth	Weight	%
Conifers:					
Juniperus	0.13	0.14	0.09	0.36	34%
Pinus	0.25	0.03	0.1	0.38	36%
Pinus edulis	0.06	0.13	0.06	0.25	24%
Unknown conifer	-	-	0.06	0.06	6%
Total	0.44	0.3	0.31	1.05	100%

Table 139. Macrobotanical wood, Ancestral Pueblo component, LA 61290 (weight in grams)

Feature Number	10	11	Total	
Feature Type	Cobble-lined Hearth	Burned Pit	Weight	%
Conifers:				
Juniperus	-	0.3	0.3	3%
Pinus	7	0.1	7.1	75%
Pinus edulis	1.9	0.2	2.1	22%
Total	8.9	0.6	9.5	100%

feature may have been used to roast meat and nuts; both piñon nut remains and small mammal bones were mixed with feature fill. Charred conifer duff was also found in the feature, most likely relating to firewood use. Juniper was by far the most common wood taxon identified in late historic samples (Table 141). Traces of pine and piñon were also present.

Features in several other areas of the site could not be linked firmly to a particular time period. An isolated roasting pit (Feature 25) may date to the Late Archaic. The feature produced charred unknown plant parts. Floral remains from a fire-cracked rock lined roasting pit (Feature 5) and a burned pit (Feature 8) consisted of cheno-am seeds and unknown plant parts (Table 142). Wood charcoal was recovered from Features 3 (burned pit), 5, and 25. Juniper, pine, piñon, and traces of undetermined conifer and unknown wood were present (Table 143).

A consistent pattern of weedy annual plant use can be seen from the Middle Archaic through the historic period at LA 61290. Evidence of piñon nut processing was present in both Ancestral Pueblo and historic contexts, suggesting another continuum of use. One instance of cactus seed from Feature 23 suggests the processing of cactus fruits in the Middle Archaic. Wood use focused on conifers and reflects the expedient use of locally available denser woods as opposed to nonconifer shrubs, which would also have been easily accessible.

LA 61293

LA 61293 is on the south-facing slopes of a broad ridge that separates Arroyo Gallinas from an unnamed drainage to the north. This site had Late to Latest Archaic, Ancestral Pueblo, historic, and unknown temporal components.

The foundation of a pit structure (Feature 28), two intramural hearths, several fire-cracked rock filled roasting pits, three burned pits, and a cobble-lined hearth were associated with the Late Archaic. Three of these features yielded carbonized remains (Table 144). Charred groundcherry seeds were identified in Feature 16, a cobble-lined hearth, while the seeds recovered

Table 140. Flotation plant remains per liter, late historic component, LA 61290

Feature Number	4
Sample Volume	3.68
Feature Type	Roasting Pit
Cultural	
Annuals:	
Chenopodium	0.3*
Portulaca	4.3*
Other:	
Unidentifiable seed	0.5*
Unknown taxon	5.2 pp*
Perennials:	
Juniperus	1.4*, +l*
Pinus	+n*
Pinus edulis	5.2*,+n*
Noncultural	
Annuals:	
Chenopodium	6.5
Euphorbia	1.6
Portulaca	0.5
Grasses:	
Sporobolus	3
Other:	
Unidentifiable seed	1.1
Perennials:	
Echinocereus	0.3
Juniperus	2.2
Pinus edulis	2.7
Platyopuntia	0.3

+ less than 11; * charred; l leaflet;
n needle; pp plant part

Table 141. Flotation and macrobotanical wood, late historic component, LA 61290 (weight in grams)

Feature Number	4		Total	
Feature Type	Roasting Pit		Weight	%
Sample Type	Flotation	Macrobotanical		
Conifers:				
Juniperus	0.33	3.6	3.93	99%
Pinus	0.01	-	0.01	<1%
Pinus edulis	0.03	-	0.03	1%
Total	0.37	3.6	3.97	100%

Table 142. Flotation plant remains per liter, unknown

Feature Number	2	3	5	8	9	25	42N/139E, Level 2, Stratum 2	41N/137E W1/2 Stratum 3
Sample Volume	5.1	6.2	4.6	6.18	7.7	4.1	6.35	5.85
Feature Type	Burned Pit	Burned Pit	Fire-cracked Rock Filled Roasting Pit	Burned Pit	Burned Pit	Roasting Pit		
Cultural								
Annuals:								
Cheno-am	-	-	-	0.17*	-	-	-	-
Other:								
Unknown taxon	-	-	0.2 pp*	-	-	1.5 pp*	-	0.3 capsule*
Noncultural								
Annuals:								
Chenopodium	0.2	-	-	-	-	-	-	-
Other:								
Unidentifiable seed	0.2	-	1.1	-	-	-	-	-
Unknown taxon	-	-	-	-	0.12 ur	-	-	-
Perennials:								
Juniperus	-	-	0.4	-	-	++l	-	0.2, +l
Pinus	-	-	+n	-	-	-	-	-
Grasses:								
Gramineae	+leaf	-	+leaf	-	-	-	-	-
Paniceae	-	-	-	-	-	-	0.3	-
Sporobolus	-	-	-	-	0.12	-	-	-

+ less than 11; ++ 11-25; * charred; l leaflet; n needle; pp plant part; ur unknown reproductive

Table 143. Flotation and macrobotanical wood, unknown component, LA 61290 (weight in grams)

Feature Number	3	5	25	Total		5
Feature Type	Burned Pit	Fire-cracked Rock Filled Roasting Pit	Roasting Pit	Weight	%	Fire-cracked Rock Filled Roasting Pit
Sample Type	Flotation	Flotation	Flotation			Macrobotanical
Conifers:						
Juniperus	0.04	0.25	0.03	0.32	47%	0.5
Pinus	-	-	0.13	0.13	19%	-
Pinus edulis	-	-	0.16	0.16	24%	0.6
Unknown conifer	-	0.01	0.02	0.03	4%	-
Other:						
Unknown	-	0.04	-	0.04	6%	-
Total	0.04	0.3	0.34	0.68	100%	1.1

Table 144. Flotation plant remains per liter, Late Archaic component, LA 61293

Feature Number	2	3	4	7	15	16	17	18	28	31	32
Sample volume	12.8	3.63	3.71	2.15	1.6	2.15	5.2	1.54	4.13	4.72	3.93
Feature Type	Fire-cracked Rock Filled Roasting Pit	Fire-cracked Rock Filled Roasting Pit	Fire-cracked Rock Filled Roasting Pit	Burned Pit	Burned Pit	Cobble-lined Hearth	Burned Pit	Possible Roasting Pit with Cobbles	Pit-structure Foundation	Hearth in Feature 28	Hearth in Feature 28
Cultural											
Annuals:											
Physalis	-	-	-	-	-	0.5	-	-	-	-	-
Other:											
Unidentifiable seed	-	-	-	0.5	-	-	-	-	-	-	-
Perennials:											
Pinus	-	-	-	+b*	-	+b*	+b*, +n*	-	-	-	-
Noncultural											
Perennials:											
Juniperus	-	+t	-	-	-	-	+t	-	-	-	-
Pinus	-	+n	-	-	-	-	-	-	-	-	-

from Feature 7, a burned pit, were unidentifiable. Carbonized pine needles and bark were present in both features as well as in Feature 3 (fire-cracked rock filled roasting pit). Juniper was the dominant wood taxon by weight in flotation and macrobotanical samples (Tables 145 and 146). Piñon was also present, but in smaller quantities.

A Latest Archaic component consisted of another pit-structure foundation, four hearths, and a possible storage pit. Weedy annual seeds, juniper seeds, and isolated occurrences of perennial taxa characterize the assemblage from this period (Table 147). Weedy annuals consisted of goosefoot, pigweed, and cheno-ams. A cholla seed was recovered from the pit-structure foundation (Feature 13), and seeds resembling lemonade berry were identified in the possible storage pit (Feature 26), indicating the fruits of both plants could have been processed at the site. Flotation and macrobotanical wood was entirely piñon and juniper (Tables 148 and 149).

A cobble-lined roasting pit, a cobble-lined hearth, and a fire-cracked rock filled roasting pit were associated with the Ancestral Pueblo occupation of the site. Cultural plant material included pine bark and cone scales, legume family, and stickleaf seeds (Table 150). Although macrobotanical and flotation wood was dominated by juniper and piñon, the macrobotanical assemblage was more diverse than in preceding time periods and included mountain mahogany and oak (Tables 151 and 152).

Several roasting pits and undifferentiated burned pits could not be associated with any time period. Goosefoot seeds were the only plant remains recovered that are not directly related to fuel use (Table 153). Juniper, pine, and piñon wood were identified in flotation and macrobotanical samples (Table 154).

The plant assemblage from LA 61293 is dominated by weedy annuals throughout the Latest Archaic and Puebloan occupation of the site. The rare recovery of cholla and possible lemonade berry seeds from Latest Archaic features, and stickleaf from an Ancestral Pueblo roasting pit, suggest a bit more diversity of dietary components. Coniferous woods were the mainstay of fuelwood resources, although small quantities of mountain mahogany and oak were present in Ancestral Pueblo macrobotanical samples.

LA 61299

LA 61299 is at the northern limit of the Arroyo Gallinas drainage system on an east slope of a south-sloping ridge system. Several erosion channels cut through the slope and drain into Arroyo Gallinas.

In one of the few instances in this project, corn was recovered from a kiln (Feature 2) that dates to the Ancestral Pueblo period (Table 155). It may have been an offering. Cushing (1974:312, 314) describes the practice of feeding ceramic vessels during firing so that the life force within the vessel would be honored and thus encouraged to transfer beneficial properties to any food or drink placed inside. The particular instance that Cushing refers to involves bits of dried bread or dough, but considering its attributed transformational characteristics, corn would be a logical candidate for an offering of this type. Several kilns from Montezuma County in Colorado and San Juan County in northwestern New Mexico and southeast Utah contained corncobs and kernels. The cobs may have been used as fuel (Purcell 1993). Also recovered from Feature 2 was charred pine bark, most likely a remnant of fuelwood. Wood from the feature consisted of juniper, piñon, and unknown conifer (Table 156).

Juniper seeds were identified in two shallow, basin-shaped pits (Features 3 and 4) that could not be directly associated with a specific time period (Table 157). A cobble-ringed firepit (Feature 1, also of unknown cultural affiliation) yielded piñon nutshell and pinecone scales, possibly indicating use of the feature to roast piñon nuts. Flotation wood was entirely coniferous. Juniper, pine, and piñon were taken from Features 1 and 3 (Table 158).

Piñon nut roasting likely took place at the site. Juniper seeds and pine bark probably represent debris from firewood use. Local conifer woods were again the preferred sources of fuel.

LA 61302

LA 61302 extends along a ridgetop and onto a southwest-facing hillslope and is bounded on the southwest by a tributary drainage that runs into Arroyo Gallinas. A hearth (Feature 1), a fire-cracked rock filled roasting pit (Feature 2), a burned pit (Feature 3), and two lithic

Table 145. Flotation wood, Late Archaic component, LA 61293 (weight in grams)

Feature Number	2	4	7	Total	
Feature Type	Fire-cracked Rock Filled Roasting Pit	Fire-cracked Rock Filled Roasting Pit	Burned Pit	Weight	%
Conifers:					
Juniperus	2.9	0.6	0.4	3.9	98%
Pinus edulis	-	0.04	0.04	0.08	2%
Total	2.9	0.64	0.44	3.98	100%

Table 146. Macrobotanical wood, Late Archaic component, LA 61293 (weight in grams)

Feature Number	3	4	7	28	Total	
Feature Type	Fire-cracked Rock Filled Roasting Pit	Fire-cracked Rock Filled Roasting Pit	Burned Pit	Pit-structure Foundation	Weight	%
Conifers:						
Juniperus	4.9	0.3	0.8	0.2	6.2	86%
Pinus edulis	0.7	0.1	0.2	0.04	1.04	14%
Total	5.6	0.4	1	0.24	7.24	100%

Table 147. Flotation plant remains per liter, Latest Archaic component, LA 61293

Feature Number	13	14.1	20	21	22	24	26
Sample volume	7.42	8.24	3	5.33	905	4.34	8.57
Feature Type	Pit-structure Foundation	Hearth in Feature 13	Hearth in Feature 13	Hearth in Feature 13	Hearth in Feature 13	Hearth in Feature 13	Possible Storage Pit
Cultural							
Annuals:							
Amaranthus	-	-	-	-	-	-	0.4*
Chenopodium	-	-	-	0.8*	0.2*	-	0.6*
Cheno-am	-	-	0.2*	0.6*	0.2*	-	0.8*
Unidentifiable seed	0.1*						
Perennials:							
Juniperus	-	0.1*, +t*, +tpc	0.2*	0.2*	-	-	-
Pinus	-	+n*	-	-	+n*	-	+n*
Cylindropuntia	-	-	-	-	0.2*	-	-
Rhus	-	-	-	-	-	-	0.2*
Noncultural							
Other:							
Unidentifiable seed	0.1	0.1	-	-	-	-	-
Perennials:							
Juniperus	-	0.1	-	-	-	-	-

+ less than 11; * charred; n needle; pc partially charred; t twig

Table 148. Flotation wood, Latest Archaic component, LA 61293 (weight in grams)

Feature Number	20	21	22	26	Total	
Feature Type	Hearth in Feature 13	Hearth in Feature 13	Hearth in Feature 13	Possible Storage Pit	Weight	%
Conifers:						
Juniperus	0.04	0.5	0.5	0.5	1.54	69%
Pinus edulis	0.2	0.2	0.1	0.2	0.7	31%
Total	0.24	0.7	0.6	0.7	2.24	100%

Table 149. Macrobotanical wood, Latest Archaic component, LA 61293 (weight in grams)

Feature Number	14	21	Total	
Feature Type	Hearth in Feature 13	Hearth in Feature 13	Weight	%
Conifers:				
Juniperus	0.1	0.2	0.3	27%
Pinus edulis	-	0.8	0.8	73%
Total	0.1	1	1.1	100%

Table 150. Flotation plant remains per liter, Ancestral Pueblo component, LA 61293

Feature Number	6	8	9	11
Sample Volume	7.82	5.36	3.4	6.35
Feature Type	Cobble-lined Roasting Pit	Cobble-lined Hearth	Cobble-lined Roasting Pit	Fire-cracked Rock Filled Roasting Pit
Cultural				
Annuals:				
Leguminosae	0.14*	-	-	-
Mentzelia	-	-	-	0.15*
Other:				
Unknown taxon	3.18 pp*	0.7 pp*	0.3 pp*	-
Perennials:				
Pinus	+cs*	+b*	-	+b*
Noncultural				
Perennials:				
Chrysothamnus	-	-	+f, +l	-
Juniperus	+t	-	0.3, +t	-
Pinus	-	-	0.3	-

+ less than 11; * charred; cs cone scale; f flower; l leaf; pp plant part; t twig

Table 151. Flotation wood, Ancestral Pueblo component, LA 61293 (weight in grams)

Feature Number	6	8	11	Totals	
Feature Type	Cobble-lined Roasting Pit	Cobble-lined Hearth	Fire-cracked Rock Filled Roasting Pit	Weight	%
Conifers:					
Juniperus	-	0.04	1.3	1.34	18%
Pinus	-	0.9	-	0.9	12%
Pinus edulis	3.8	0.6	0.54	4.94	66%
Nonconifers:					
Unknown nonconifer	-	0.3	-	0.3	4%
Totals	3.8	1.84	1.84	7.48	100%

Table 152. Macrobotanical wood, Pueblo component, LA 61293 (weight in grams)

Feature Number	6	8	9	11	Total	
Feature Type	Cobble-lined Roasting Pit	Cobble-lined Hearth	Cobble-lined Roasting Pit	Fire-cracked Rock Filled Roasting Pit	Weight	%
Conifers:						
Juniperus	-	2.8	5.3	1	9.1	37%
Pinus edulis	6.5	0.8	0.3	0.3	7.9	33%
Unknown conifer	0.5	-	-	-	0.5	2%
Nonconifers:						
Cercocarpus	-	-	-	0.3	0.3	1%
Quercus	-	6.5	-	-	6.5	27%
Total	7	10.1	5.6	1.6	24.3	100%

Table 153. Flotation plant remains per liter, unknown component, LA 61293

Feature Number	5	10	19	23	29	30
Sample Volume	2.7	4.15	3	3.28	3.17	3.59
Feature Type	Burned Pit	Fire-cracked Rock Filled Roasting Pit	Burned Pit	Burned Pit	Deflated Roasting Pit	Burned Pit
Cultural						
Annuals:						
Chenopodium	-	.2*	-	-	-	-
Perennials:						
Pinus	-	-	+b*	-	-	+n*
Noncultural						
Perennials:						
Juniperus	-	+male c, +t	+t	-	+̣c,+t	+l
Pinus	-		-	+̣c	-	-

+ less than 11; * charred; b bark; c cone; l leaflet; n needle; t twig

Table 154. Flotation and macrobotanical wood, unknown component, LA 61293 (weight in grams)

Feature Number	5	19	10	Total	
Feature Type	Burned Pit	Burned Pit	Fire-cracked Rock Filled Roasting Pit	Weight	%
Sample Type	Flotation		Macrobotanical		
Conifers:					
Juniperus	0.04	0.1	0.2	0.34	41%
Pinus	0.04	-	0.04	0.08	10%
Pinus edulis	0.1	0.3	-	0.4	49%
Total	0.18	0.4	0.24	0.82	100%

Table 155. Flotation plant remains per liter, Ancestral Pueblo component, LA 61299

Feature Number	2
Sample Volume	3.85
Feature Type	Kiln
Cultural	
Cultivars:	
Zea mays	0.5*
Other:	
Pinus ponderosa	+++b*
Noncultural	
Perennials:	
Juniperus	0.3, +++t
Pinus	+b

+++ more than A21; * charred; b bark; t twig

Table 156. Flotation wood, Ancestral Pueblo component, LA 61299 (weight in grams)

Feature Number	2
Feature Type	Kiln
Conifers:	
Juniperus	0.04
Pinus edulis	2.6
Unknown conifer	0.3
Total	2.94

Table 157. Flotation plant remains per liter, unknown component, LA 61299

Feature Number	1	3	4
Sample Volume	5.85	9.18	6.36
Feature Type	Cobble-ringed Fire Pit	Shallow, Basin-shaped Pit	Shallow, Basin-shaped Pit
Cultural			
Perennials:			
Juniperus	-	0.23*	0.31*
Pinus	++cs*	-	-
Pinus edulis	0.35*	-	-
Noncultural			
Grasses:			
Gramineae	-	-	+g
Sporobolus	0.19	-	-
Other:			
Compositae	+leaf	0.12	1.24
Unidentifiable seed	-	0.23	0.14
Unknown taxon	-	+leaf	-
Perennials:			
Juniperus	-	+t	0.14, +t
Pinus	+n	+n	-

+ less than 11; ++ 11 to 25; * charred; b bark; g glume; n needle; t twig

Table 158. Flotation wood, unknown component, LA 61299 (weight in grams)

Feature Number	1	3	Total	
Feature Type	Cobble-ringed Fire Pit	Shallow, Basin-shaped Pit	Weight	%
Conifers:				
Juniperus	-	1.2	1.2	87%
Pinus	0.04	-	0.04	3%
Pinus edulis	-	0.1	0.1	7%
Unknown conifer	0.04	-	0.04	3%
Total	0.08	1.3	1.38	100%

concentrations are associated with Ancestral Puebloan use of the site. Flotation samples from Features 1 and 2 produced a number of modern intrusives including uncharred composite family achenes, juniper seeds and twigs, and grass seeds (Table 159). Juniper wood was the only cultural floral remain and was recovered from Feature 2 (Table 160). A piñon nut was also recovered from the roasting pit, but the specimen is uncharred and probably modern in origin.

LA 67959

LA 67959 is on a south-southeast-facing slope of a ridge on the northern border of the Arroyo de las Trampas floodplain. Three thermal features were located on a prehistoric ground surface protected by a swale, providing an optimal environment for a Middle Archaic temporary campsite. Charred goosefoot and juniper seeds were recovered from an oblong thermal feature (Feature 5), and carbonized unknown plant parts and modern goosefoot seeds were present in the cobble-lined hearth (Feature 4; Table 161). Wood was predominately juniper, with some piñon from Features 4, 5, and 6 (oval thermal feature). A small quantity of oak was also present in Feature 6 (Table 162). No carbonized plant remains were recovered from Features 1 and 2, which were of unknown cultural affiliation. The goosefoot seeds identified in Feature 5 were probably gathered for food, while carbonized juniper seeds may be from the use of locally available fuelwood.

LA 108902

LA 108902 is on a long, broad northwest to southeast sloping ridge separating Arroyo de las Trampas from the Santa Fe River. The site consisted primarily of a high-density concentration of chipped stone debris and Feature 1, a fire-cracked rock filled roasting pit. The feature could not be linked to a particular time period, although artifact distribution and the association of the roasting pit with sherds from the Coalition and Early Classic periods indicate at least three occupations of the area. Charred purslane and hedgehog cactus seeds were recovered from the feature along with a considerable diversity of uncharred noncultural seed taxa (Table 163). The charred seeds suggest the feature was used to roast cactus fruits and that purslane was also processed in the pit. Wood was entirely coniferous; piñon was the most common, and small quantities of juniper also occurred (Table 164). The floral assemblage suggests that cactus and the weedy annual purslane could have been processed in the roasting pit, using local conifers as fuel.

LA 113946

LA 113946 is on the south-southeast-facing slopes of a broad ridge that bounds the Arroyo Gallinas drainage system on the north. The site is degraded and has two shallow drainages that run through the center. The site consists of an artifact concentration, Feature 1 (a partially cobble-lined roasting pit), and Feature 2 (a fire-cracked rock concentration). The cultural affiliation of the site is unknown. A flotation sample from Feature 1 yielded uncharred juniper twigs, dicot leaves, and unknown nutshell (Table 165). Less than a tenth of a gram of piñon charcoal was the sole remaining cultural plant.

Discussion

Beginning in the earliest time period represented at Northwest Santa Fe Relief Route sites and extending through the late historic period, the plant assemblage is dominated by weedy annual seeds. The combined Late and Latest Archaic period deposits at LA 61286 yielded the most diverse assemblage of taxa (8) and included the only occurrences of four-wing saltbush and ricegrass. Ricegrass is commonly recovered from Archaic period sites throughout the central Rio Grande Valley and Colorado Plateau, so its relative scarceness in the Northwest Santa Fe Relief Route archaeobotanical record stands out. The presence of four-wing saltbush fruits, as already mentioned, probably relates to use of the wood for fuel, as does the ubiquitous occurrence of juniper seeds (present in samples from every time period). Other sequestered taxa include groundcherry from Late Archaic samples, lemonade berry from Latest Archaic proveniences, and stickleaf and legume family seeds from Ancestral Pueblo contexts. The limited distribution of these taxa could indicate that they played a minor role in the diet, or it may result

Table 159. Flotation plant remains per liter, Ancestral Pueblo period, LA 61302

Feature Number	1	2
Sample Volume	4.15	10.41
Feature Type	Hearth	Fire-cracked Rock Filled Roasting Pit
Noncultural		
Grasses:		
Gramineae	-	0.39
Other:		
Compositae	0.2	-
Unidentifiable seed	-	0.09
Perennials:		
Juniperus	0.5, +twig	0.38, +twig

+ less than 11

Table 160. Flotation and macrobotanical wood, Ancestral Pueblo period, LA 61302 (weight in grams)

Feature Number	2	
Feature Type	Fire-cracked Rock Filled Roasting Pit	
Sample Type	Flotation	Macrobotanical
Juniperus	2.2	4.9
Total	2.2	4.9

Table 161. Flotation plant remains per liter, Late Archaic component, LA 67959

Feature Number	4	5	6
Sample Volume	3.87	3.76	2.75
Feature Type	Cobble-lined Hearth	Oblong Termal	Oval Thermal
Cultural			
Annuals:			
Chenopodium	-	0.5*	-
Other:			
Unknown taxon	0.25 pp*	-	-
Perennials:			
Juniperus	-	0.3*	-
Noncultural			
Annuals:			
Chenopodium	0.25	-	-

* charred; pp plant part

Table 162. Flotation wood, Late Archaic component, LA 67959 (weight in grams)

Feature Number	4	5	6	Total	
Feature Type	Cobble-lined Hearth	Oblong Termal	Oval Thermal	Weight	%
Conifers:					
Juniperus	0.1	0.4	1.8	2.3	68%
Pinus edulis	0.3	0.04	0.7	1.04	31%
Nonconifers:					
Quercus	-	-	0.04	0.04	1%
Total	0.4	0.44	2.54	3.38	100%

Table 163. Flotation plant remains per liter, unknown component, LA 108902

Feature Number	1
Sample Volume	30.15
Feature Type	Fire-cracked Rock Filled Roasting Pit
Cultural	
Annuals:	
Portulaca	0.07*
Perennials:	
Echinocereus	0.07*
Noncultural	
Annuals:	5.71
Chenopodium	
Euphorbia	0.23
Portulaca	0.19
Grasses:	
Gramineae	0.03
Other:	
Compositae	0.06
Unknown taxon	.03 pp
Perennials:	
Echinocereus	0.15
Juniperus	0.06
Cylindropuntia	0.03
Yucca	0.03

Table 164. Flotation wood, unknown component, LA 108902 (weight in grams)

Feature Number	1
Feature Type	Fire-cracked Rock Filled Roasting Pit
Conifers:	
Juniperus	0.04
Pinus edulis	1.14
Unknown conifer	0.04
Total	1.22

Table 165. Flotation plant remains per liter, unknown component, LA 113946

Feature Number	1
Feature Type	Roasting Pit
Noncultural	
Other:	
Dicot	+leaf
Unknown taxon	+nutshell
Perennials:	
Juniperus	+ twig

+ less than 11

from the vagaries of preservation and sampling.

Perennial food plant remains are not as diverse as weedy annuals. Evidence of use of cactus fruits is present from the Early Archaic through the Latest Archaic period. Intensive piñon nut gathering and processing seem to be restricted to the later occupations of the Pueblo through the late historic periods. Piñon nutshell was recovered from only one roasting pit dating to the Middle Archaic. The paucity of nutshell in earlier contexts may indicate a lower intensity of use early on, and that large-scale nut gathering did not occur until the Early Coalition. However, biases toward preservation of piñon nutshell in deeper interior contexts are always a potential factor.

Charcoal is invariably coniferous throughout the entire prehistoric occupation of the Northwest Santa Fe Relief Route area. Exceptions are small amounts of oak from Middle Archaic, Late Archaic, and Ancestral Pueblo contexts, and mountain mahogany and saltbush/greasewood from Ancestral Pueblo period wood samples at LA 61293 and the Late to Latest Archaic contexts at LA 61286 (Table 166). Mountain mahogany was used to manufacture a number of implements like digging sticks and prayer sticks (Dunmire and Tierney 1995:136–137), and a dye for moccasins and leggings. Saltbush ashes were used to color foods, as leavening for breads, and to make lye to soften the hulls of corn (Dunmire and Tierney 1995:130).

Throughout most of the Archaic period, the Northwest Santa Fe Relief Route pollen record suggests the area was primarily a desert scrub grassland (see Holloway, this report). In the ensuing Late Archaic through Pueblo IV periods, the piñon/juniper woodland community pollen frequencies point to expansion into the area. The macrobotanical record, however, does not corroborate this picture of available wood resources (Table 167). Throughout all time periods, coniferous species make up over 90 percent of the Northwest Santa Fe Relief Route charcoal assemblage. From past experience, we know that at least on the Colorado Plateau, where we can look at thousands of samples from diverse habitats and time periods from Archaic to contemporary contexts, hunter-gatherers tended to limit wood collection to within a very close radius of their campsite. While hunter-gatherers living in the lower elevational reaches of juniper-piñon woodland may burn coniferous woods, those living in desert-scrub grassland produce fuel assemblages consisting almost entirely of local shrubs, primarily saltbush, sage, and rabbitbrush (Toll 1983:336). Considering that juniper was the dominant taxon in the Northwest Santa Fe Relief Route, and pine comprised a considerable percentage of the wood assemblage during the earlier periods, it is doubtful that either was growing at considerable distance from sites. In addition, macrobotanical grass remains were most prevalent in the Late Archaic and Early Developmental periods, when the pollen record suggests that desert scrub grassland was waning.

Looking more broadly at Archaic subsistence remains in the Santa Fe area, two projects stand out as far as richness of taxa richness (Table 168). Six annuals, two grasses, and three perennials were identified at the Santa Fe Relief Route and Tierra Contenta projects. The disparity in taxonomic diversity may be due in large part to characteristics of features that affected preservation. For example, Santa Fe Relief Route features that were deeper as well as features with more fire-cracked rock were more likely to have charred plant remains (Badner and McBride, this volume). Another factor could be site type. There is a similar combination of base camps, specialized activity loci, and habitation sites at the Las Campanas and Santa Fe Relief Route projects, but floral recovery from the two projects is vastly different.

In the Late Archaic and Early Developmental periods, ricegrass appears as an economic artifact, and it occurs at every project compared in Table 168. With the exception of hedgehog cactus, cholla, and possibly four-wing saltbush, perennial plant remains are probably associated with fuelwood use. Piñon is missing from the record, and annual plant diversity is lower in all projects except the Santa Fe Relief Route. In fact, despite the near equality of sample size, the plant assemblage from Santa Fe Relief Route is the richest during this time period.

Cultivars finally appear in the record during the Coalition and Early Classic periods, and along with cheno-ams, they become the most prevalent plant remains in flotation samples. Despite the fact that only five samples were examined from

Table 166. Comparative carbonized wood remains from Santa Fe area sites of the Archaic and other periods (percent composition by weight)

Project/Site	Number of Samples (total weight or pieces)	*Juniperus*	*Pinus*	Other Species/Comments
		Archaic		
Santa Fe Relief Route (LA 61286, LA 61289, LA 61290, LA 61293, LA 67959)	79 (39.7 g)	67%	31%	<1% Quercus, 2% undetermined conifer, <1% undetermined nonconifer
Las Campanas[1] (LA 84787, LA 86139, LA 86159)	9 (17.46 g)	92%	3%	5% undetermined conifer
Airport Road[2]	6 (22.60 g)	37%	54%*	9% undetermined conifer
Tierra Contenta[3]	3	dominant in 2 samples	dominant in 1 sample	
		Late Archaic to Early Developmental		
Santa Fe Relief Route (LA 61286, LA 61293)	20 (22.75 g)	61%	34%	5% *Atriplex/Sarcobatus*
		Coalition to Early Classic		
Las Campanas[1] (LA 84759, LA 84793, LA 86150, LA 86159, LA 98690)	10 (6.81 g)	40%	55%	1% undetermined conifer, 4% unknown
Agua Fria Schoolhouse[4]	4	dominant in 2 samples, codominant in 1	dominant in 1 sample, codominant in 1	
Arroyo Hondo[5]	(1108 pieces)**	21%	37%*	33% ponderosa pine, 4% Douglas fir, 6% other
		Developmental to Mid-Classic		
Dos Griegos[6] (Site 283-3)	5 (108 pieces)	18%	80%*	2% Salicaceae
		Puebloan		
Santa Fe Relief Route (LA 61289, LA 61290, LA 61293, LA 61299, LA 61302)	17 (19.66 g)	23%	74%	1% undetermined conifer, 2% undetermined nonconifer
		Unknown Date		
Santa Fe Relief Route (LA 61289, LA 61290, LA 61293, LA 61299, LA 108902, LA 113946)	13 (7.26 g)	33%	62%	5% undetermined conifer
Las Campanas[1] (LA 86159)	2 (0.44 g)	55%	7%	2% undetermined conifer, 5% undetermined nonconifer, 32% unknown
Santa Fe Bypass[7]	2 (40 pieces)	43%	53%*	4% undetermined conifer
		Late Historic		
Santa Fe Relief Route (LA 61290)	1 (0.37g)	89%	11%	

* *Pinus edulis;* ** construction wood only
[1] Toll and McBride (1996)
[2] Toll (1994)
[3] McBride (1994)
[4] Cummings 1989
[5] Creamer (1993: Table 7.1)
[6] Cummings and Puseman (1992)
[7] Toll (1989: Table 1)

Table 167. Arboreal remains by site compared by time period and analysis method

Site	Pollen[1] (average concentration values)					Flotation Wood[2] (% by weight)				Macrobotanical Wood[2] (% by weight)			
	Number of Samples	Sage	Oak	Juniper	Pine	Number of Samples	Nonconifer	Juniper	Pine	Number of Samples	Nonconifer	Juniper	Pine
Early Archaic													
LA 61286	1C	64.8	-	-	680.4	3	-	14	82	1	-	61	39
LA 61289	3C	-	-	-	249.46	1	-	93	7	-	-	-	-
	1S	-	-	7.13	1650.52	-	-	-	-	-	-	-	-
Middle Archaic													
LA 61286	3C	9.43	5.67	7.56	337.24	23	-	66	33	-	-	-	-
	5S	29.86	6.85	-	9.07	-	-	-	-	-	-	-	-
	1F	58.91	-	-	88.36	-	-	-	-	-	-	-	-
LA 61289	2C	27.53	-	13.97	784.7	15	1 Q	64	32	6	13 Q	48	39
	5S	86.35	-	-	852.51	-	-	-	-	-	-	-	-
LA 61290	3F	-	-	-	560.84	11	-	77	20	-	-	-	-
LA 67959	3C	13.44	-	18.95	463.39	-	-	-	-	-	-	-	-
	3S	16.16	5.43	21.66	778.85	-	-	-	-	-	-	-	-
	2F	-	-	-	204.37	-	-	-	-	-	-	-	-
Late Archaic													
LA 61286	-	-	-	-	-	5	-	74	25	4	-	86	14
LA 61293	-	-	-	-	-	3	-	98	2	-	-	-	-
Latest Archaic													
LA 61286	-	-	-	-	-	8	7	53	40	-	-	-	-
LA 61293	-	-	-	-	-	4	A/S	69	31	-	-	-	-
Late and Latest Archaic													
LA 61286	3F	-	-	-	448.42	-	-	-	-	-	-	-	-
Pueblo													
LA 61289	-	-	-	-	-	2	-	2	98	2	-	19	81
LA 61290	-	-	-	-	-	3	-	34	60	-	-	-	-
LA 61293	-	-	-	-	-	3	4	18	78	4	1 Ce, 27 Q	37	33

[1] Holloway, this volume
[2] This study
C column; S strata; F features; Q *Quercus* (oak); A/S *Atriplex*/*Sarcobatus* (saltbush/greasewood); Ce *Cercocarpus* (mountain mahogany)

Table 168. Carbonized flotation remains from Santa Fe area sites (percent of samples with taxon)

Project/Site	Number of Samples	Annuals	Grasses	Trees	Other Perennials	Cultivars
			Archaic			
Santa Fe Relief Route (LA 61286, LA 61289, LA 61290, LA 61293, LA 67959)	114[a]	*Amaranthus* 2% cheno-am 11% *Chenopodium* 25% *Corispermum* 2% *Physalis* 1% *Portulaca* 6% *Suaeda* 3%	Gramineae <1%	*Juniperus* seeds 17% *Pinus* bark 4%, cone scales 1%, needles 3% *Pinus edulis* nutshell 1%	*Echinocereus* 1% *Platyopuntia* 3%	
Santa Fe Relief Route (Phase 3)[1] (LA 61315, Area 2)	2	*Chenopodium* 50%		*Juniperus* seeds 50% *Pinus* bark 50%, cone scales 50%,		
Las Campanas[2] (LA 84758, LA 84787, LA 86139, LA 86159)	22[b]			conifer bark 9%		
Airport Road[3]	17[c]	undetermined 6%		*Pinus edulis* nutshell (macrobotanical sample)		
Tierra Contenta[4]	40[d]	*Amaranthus* 3% cheno-am 30% *Chenopodium* 28% *Corispermum* 8% *Cycloloma* 10% *Portulaca* 10% *Croton* 3%	Gramineae 3% *Sporobolus* 3%	*Juniperus* seeds 30%, twigs 25% *Pinus edulis* nutshell 3%, umbos 8%	*Platyopuntia* 5%	
			Latest Archaic to Early Developmental			
Santa Fe Relief Route (LA 61286, LA 61293)	37[e]	*Amaranthus* 14% cheno-am 32% *Chenopodium* 46% *Corispermum* 3% *Plantago* 3% *Suaeda* 3%	*Oryzopsis* 3%	*Atriplex canescens* 3% *Juniperus* 30% *Pinus* bark 8%, cone scales 8%, needles 8%	*Echinocereus* 3% *Cylindropuntia* 3% Rhus *3%*	
Santa Fe Relief Route (Phase 3)[1] (LA 61315, Area 1)	20[f]	cheno-am 15% *Chenopodium* 10%	*Oryzopsis* 5%	*Juniperus* seeds 40% *Pinus edulis* needles 10%		
Veteran's Cemetery[5]	18[g]	cheno-am 6% *Chenopodium* 61% *Corispermum* 6% *Helianthus* 6%	Gramineae 6% Oryzopsis 6%	*Juniperus* berry 6%, seed 67%, twig 6% *Pinus* bark 11%		
			Coalition			
Las Campanas[2] (LA 84793, LA 86150, LA 86159, LA 98690)	24[h]	*Corispermum* 4%				
			Coalition to Early Classic			
Santa Fe Relief Route (Phase 3)[1] (LA 61315 Area 3)	3			*Juniperus* seeds 33% *Pinus* cone scales 33%, needles 33%		
Agua Fria[6]	5	cheno-am 80% *Chenopodium* 40% *Portulaca* 20% *Cycloloma* 20% *Cleome* 20% undetermined 40%	Gramineae 20%	*Juniperus* twigs 100% *Pinus* needles 80%, nutshell 40%, umbos 60% *Pseudotsuga* needle 20% *Quercus* acorn cap 20%	*Echinocactus* 20% *Equisetum* stem 20%	*Zea* 80% (Cucurbita pollen)
Arroyo Hondo[7]	174	cheno-am 34% *Portulaca* 16% *Cycloloma* 9% *Physalis* 5% *Cleome* 5% *Helianthus* 3%	*Oryzopsis* 7%	*Juniperus* berry 1% *Pinus* nutshell 4%, umbos also present	*Echinocereus* 10% *Mammillaria* 2% *Opuntia* 2% *Yucca* 3% *Prunus* 1%	*Zea* 82% *Cucurbita* 5% *Phaseolus* 7%
			Developmental to Mid-Classic			
Dos Griegos[8]	5[i]			*Pinus* bark scales 60%		*Zea* 40%
			Puebloan			
Santa Fe Relief Route (LA 61289, LA 61290, LA 61293, LA 61299, LA 61302)	25[j]	cheno-am 4% *Chenopodium* 8% *Mentzelia* 4%		*Juniperus* seeds 4% *Pinus* bark 4%, cone scales 12%, needles 8% *Pinus edulis* nutshell 16% *Pinus ponderosa* bark 4%		*Zea* 4%

Table 168 (continued). Carbonized flotation remains from Santa Fe area sites (percent of samples with taxon)

Project/Site	Number of Samples	Annuals	Grasses	Trees	Other Perennials	Cultivars
			Unknown Age			
Santa Fe Relief Route (LA 61289, LA 61290, LA 61293, LA 61299, LA 108902, LA 113946)	32[k]	cheno-am 3% *Chenopodium* 6% *Portulaca* 6%		*Juniperus* seeds 6% *Pinus* bark 3%, cone scales 3%, needles 3% *Pinus ponderosa* bark 3%	*Echinocereus* 3%	
Santa Fe ByPass[9]	4			*Pinus* bark 25% (unburned) *Juniperus* twigs 75%, seeds or berries 50%		*Zea* 25%
Arroyo Frijoles[10]	2			*Pinus edulis* needles 50% *Juniperus* scale leaves 50%		
			Late Historic			
Santa Fe Relief Route (LA 61290)	1	*Chenopodium* 100%P		*Juniperus* seeds 100% *Pinus* needles 100% *Pinus edulis* needles 100%, nutshell 100%		

Specimens are seeds unless otherwise specified.

[a] Includes 18 samples with uncharred remains and 56 samples that lacked floral remains.

[b] Includes 12 samples that lacked floral remains and 8 with unburned plant parts only.

[c] Includes 5 samples with uncharred remains and eleven that lacked floral remains.

[d] Includes 16 samples that lacked floral remains.

[e] Includes 4 samples with uncharred remains and 14 samples that lacked floral remains.

[f] Includes 9 samples with uncharred remains.

[g] Includes 4 samples that lacked charred floral remains.

[h] Includes 12 samples with uncharred remains.

[i] Includes 2 samples with uncharred remains.

[j] Includes 6 samples with uncharred remains and 4 samples that lacked floral remains.

[k] Includes 12 samples with uncharred remains and 3 samples that lacked floral remains.

[1] McBride and Toll (2000)

[2] Toll and McBride (1996)

[3] Toll (1994)

[4] McBride (1994)

[5] McBride (1998)

[6] Cummings (1989)

[7] Wetterstrom (1986: Table 34)

[8] Cummings and Puseman (1992)

[9] Toll (1989: Table 1)

[10] Dean (1993b)

this component at the Agua Fria Schoolhouse, taxonomic diversity is nearly as high as that found at Arroyo Hondo, where 174 samples were analyzed. No plant remains were related to firewood use at LA 61315. Only one thermal feature was associated with this time period in the Santa Fe Relief Route Phase 3 project, in contrast to the large, complex pueblos of Agua Fria and Arroyo Hondo.

The pattern of plant use apparent at Northwest Santa Fe Relief Route is repeated again and again in the Santa Fe area. Annual plants dominate the record along with a few perennials like piñon and several species of cacti until the Developmental period and later, when cultivars seem to take a more prominent role in the diet of inhabitants. However, we need more floral data from Late Developmental, Classic, and Pueblo period sites to confirm this change in focus.

Wood from all periods throughout the Santa Fe area is almost entirely coniferous. Nonconiferous woods used include small quantities of oak and mountain mahogany at Northwest Santa Fe Relief Route sites from Archaic and Puebloan period contexts, and an equally small percentage of willow family wood from one pit at Dos Griegos, in use during the Developmental to Middle Classic periods. While acknowledging the small sample sizes of the majority of projects compared in Table 168, there is a recognizable shift in the dominance of juniper versus pine use that begins in the Developmental period and continues into the Pueblo period.

Continuity of prehistoric fuelwood taxa

through time in the Santa Fe area indicates a consistent source of these coniferous wood taxa. The increase in the percentage of pine in the Developmental period might be explained by a change in cultural preference or some unknown factor, but a change in vegetation type is unlikely.

Summary

Flotation samples analyzed from Archaic, Late to Latest Archaic, and Pueblo period sites produced evidence of a continuous focus on annual seeds, with collection and processing of several perennial taxa. We have rare evidence of piñon nut processing from a Pueblo period roasting pit at LA 61290. Roasting nuts in the cone, a practice documented by Reagan (1928) and others, is suggested by numerous carbonized nut and cone fragments in primary deposits. The recovery of prickly pear and cholla seeds from Archaic and Latest Archaic thermal features indicates the fruits were an important seasonal foraging target during the early occupation of the region. Isolated occurrences of lemonade berry and groundcherry add these resources to the utilization repertoire. Grasses were also present in low frequencies, but collection of these resources would have been more profitable at lower altitude locations or in habitats with more widespread grass dominance. In contrast to the San Juan Basin and Four Corners region, corn and other cultivars are completely absent until the Pueblo occupation of the relief route area. Conifers were the dominant woods recovered in flotation and wood samples, with limited incidents of mountain mahogany, oak, and four-wing saltbush. This general pattern of plant and wood use is repeated throughout the occupation of the region. Sites were occupied at least from the spring through the fall, but many were seasonal camps used as staging grounds for multiple tasks, including plant collection and processing.

Pollen Samples from LA 61286, LA 61289, LA 61290, and LA 67959

Richard G. Holloway, Ph.D.

Thirty-two samples from LA 61286, LA 61289, LA 61290, and LA 67959 were sent to Quaternary Services for pollen extraction and analysis. Samples were taken from archaeological contexts as well as from pollen profiles. LA 61286 is a complex multicomponent site dating between 4500 BC and AD 400. Samples were taken from three spatially discrete areas. LA 61289 is a multicomponent site dating from 4200 BC to AD 1600. LA 61290 dated to the Middle Archaic (2500–1700 BC). LA 67959 also dated to the Middle Archaic (2000–1500 BC).

Methods and Materials

Chemical extraction of pollen samples was conducted at the Palynology Laboratory at Texas A&M University using a procedure designed for semiarid Southwestern sediments. The method, detailed below, specifically avoids use of such reagents as nitric acid and bleach, which have been demonstrated experimentally to be destructive to pollen grains (Holloway 1981).

From each pollen sample submitted, 25 g of soil were subsampled. Prior to chemical extraction, three tablets of concentrated *Lycopodium* spores (Batch 307862, Department of Quaternary Geology, Lund, Sweden; 13,500 ± 500 marker grains per tablet) were added to each subsample. The addition of marker grains permits calculation of pollen concentration values and provides an indicator for accidental destruction of pollen during the laboratory procedure.

The samples were treated with 35 percent hydrochloric acid (HCl) overnight to remove carbonates and to release the *Lycopodium* spores from their matrix. After neutralizing the acid with distilled water, the samples were allowed to settle for at least three hours before the supernatant liquid was removed. Additional distilled water was added to the supernatant, and the mixture was swirled and then allowed to settle for five seconds. The suspended fine fraction was decanted through 150µ mesh screen into a second beaker. This procedure, repeated at least three times, removed lighter materials, including pollen grains, from the heavier fractions. The fine material was concentrated by centrifugation at 2,000 revolutions per minute (rpm).

The fine fraction was treated with concentrated hydrofluoric acid (HF) overnight to remove silicates. After the acid was completely neutralized with distilled water, the samples were treated with a solution of Darvan and sonicated in a Delta D-9 Sonicator for 30 seconds. The Darvan solution was removed by repeated washing with distilled water and centrifuged (2,000 rpm) until the supernatant liquid was clear and neutral. This procedure removed fine charcoal and other associated organic matter and effectively deflocculated the sample.

The samples were dehydrated in glacial acetic acid in preparation for acetolyis. Acetolysis solution (acetic anhydride: concentrated sulfuric acid in 9:1 ratio) was added to each sample (Erdtman 1960). Centrifuge tubes containing the solution were heated in a boiling water bath for eight minutes and then cooled for an additional eight minutes before centrifugation and removal of the acetolysis solution with glacial acetic acid followed by distilled water. Centrifugation at 2,000 rpm for 90 seconds dramatically reduced the size of the sample, yet, as determined from periodic examination of the residue, did not remove fossil palynomorphs.

Heavy-density separation ensued using zinc bromide ($ZnBr_2$), with a specific gravity of 2.00, to remove much of the remaining detritus from the pollen. The light fraction was diluted with distilled water (10:1) and concentrated by centrifugation. The samples were washed repeatedly in distilled water until neutral. The residues were rinsed in a 1-percent solution of potassium hydroxide (KOH) for less than one minute, which was effective in removing the majority of the unwanted alkaline soluble humates.

The material was rinsed in ethanol (ETOH) stained with safranin-O, rinsed twice with ETOH, and transferred to 1-dram vials with tertiary butyl alcohol (TBA). The samples were mixed with a small quantity of glycerine and allowed to stand overnight for evaporation of the TBA. The storage vials were capped and returned to the Office of Archaeological Studies after the project.

A drop of the polliniferous residue was mounted on a microscope slide for examination under an 18 by 18 mm cover slip sealed with fingernail polish. The slide was examined using 200x or 100x magnification under an aus-Jena Laboval 4 compound microscope. Occasionally, pollen grains were examined using either 400x or 1,000x oil immersion to obtain a positive identification to either the family or genus level.

Abbreviated microscopy was performed on each sample in which either 20 percent of the slide (four transects at 200x magnification) or a minimum of 50 marker grains were counted. If warranted, full counts were conducted by counting to a minimum of 200 fossil grains. Regardless of which method was used, the uncounted portion of each slide was completely scanned at a magnification of 100x for larger grains of cultivated plants such as *Zea mays* and *Cucurbita,* two types of cactus (*Platyopuntia* and *Cylindropuntia*), and other large pollen types such as members of the Malvaceae or Nyctaginaceae families. Because maize pollen was very common in many of these samples, maize grains were tabulated during the scans only if an unequal distribution of this taxon on the microscope slide were observed.

For those samples warranting full microscopy, a minimum of 200 pollen grains per sample were counted), which allows the analyst to inventory the most common taxa in the sample (Barkley 1934). All transects were counted completely (Brookes and Thomas 1967), resulting in various numbers of grains counted beyond 200. Pollen taxa encountered on the uncounted portion of the slide during the low-magnification scan are tabulated separately.

Total pollen concentration values were computed for all taxa. In addition, the percentage of indeterminate pollen was computed. Statistically, pollen concentration values provide a more reliable estimate of species composition within the assemblage. Traditionally, results have been presented by relative frequencies (percentages) where the abundance of each taxon is expressed in relation to the total pollen sum (200+ grains) per sample. With this method, rare pollen types tend to constitute less than 1 percent of the total assemblage. Pollen concentration values provide a more precise measurement of the abundance of even these rare types. The pollen data are reported here as pollen concentration values using the following formula:

$$PC = \frac{K * \Sigma_p}{\Sigma_L * S}$$

where:
PC = pollen concentration
K = *Lycopodium* spores added
Σ_p = fossil pollen counted
Σ_L = *Lycopodium* spores counted
S = sediment weight

The following example should clarify this approach. Taxon X may be represented by 10 grains (1 percent) in a sample consisting of 1,000 grains, and by 100 grains (1 percent) in a second sample consisting of 10,000 grains. Taxon X is 1 percent of each sample, but the difference in actual occurrence of the taxon is obscured when pollen frequencies are used. The use of "pollen concentration values" is preferred because it accentuates the variability between samples in the occurrence of the taxon. The variability, therefore, is more readily interpretable when comparing cultural activity to noncultural distribution of the pollen rain.

Variability in pollen concentration values can also be attributed to deterioration of the grains through natural processes. In his study of sediment samples collected from a rockshelter, Hall (1981) developed the "1000 grains/g" rule to assess the degree of pollen destruction. This approach has been used by many palynologists working in other contexts as a guide to determine the degree of preservation of a pollen assemblage and, ultimately, to aid in the selection of samples to be examined in greater detail. A pollen concentration value below 1,000 grains/g indicates that forces of degradation may have severely altered the original assemblage. However, a pollen concentration value of fewer than 1,000 grains/g can indicate the restriction of the natural pollen rain. Samples from pit structures or floors within enclosed rooms, for example, often yield pollen concentration values below 1,000 grains/g.

Pollen degradation also modifies the pollen assemblage because pollen grains of different taxa degrade at variable rates (Holloway 1981, 1989; Bryant and Holloway 1983). Some taxa are more resistant to deterioration than others and remain in assemblages after other types have deteriorated completely. Many commonly occurring taxa degrade beyond recognition in only a short time. For example, most (ca. 70 percent) angiosperm pollen has either tricolpate (three furrows) or tricolporate (three furrows each with pores) morphology. Because surfaces erode rather easily, once deteriorated, these grains tend to resemble each other and are not readily distinguishable. Other pollen types (e.g., cheno-am) are so distinctive that they remain identifiable even when almost completely degraded.

Pollen grains were identified to the lowest taxonomic level whenever possible. The majority of these identifications conformed to existing levels of taxonomy with a few exceptions. For example, cheno-am is an artificial, pollen-morphological category including pollen of the family Chenopodiaceae (goosefoot) and the genus *Amaranthus* (pigweed), which are indistinguishable from each other (Martin 1963). All members are wind pollinated (anemophilous) and produce very large quantities of pollen. In many sediment samples from the American Southwest, this taxon often dominates the assemblage.

Pollen of the Asteraceae (sunflower) family was divided into four groups. The high-spine and low-spine groups were identified on the basis of spine length. High-spine Asteraceae contains those grains with spine length greater than or equal to 2.5µ, while the low-spine group have spines less than 2.5µ long (Bryant 1969; Martin 1963). *Artemisia* pollen is identifiable to the genus level because of its unique morphology of a double tectum in the mesocopial region (between furrows) of the pollen grain. Pollen grains of the Liguliflorae are also distinguished by their fenestrate morphology. Grains of this type are restricted to the tribe Cichoreae, which includes such genera as *Taraxacum* (dandelion) and *Lactuca* (lettuce).

Pollen of the Poaceae (grass) family are generally indistinguishable below the family level, with the single exception of *Zea mays*, identifiable by its large size (ca. 80µ), relatively large pore annulus, and the internal morphology of the exine. All members of the family contain one pore, are spherical, and have simple wall architecture. Identification of nonmaize pollen is dependent on the presence of the single pore. Only complete or fragmented grains containing this pore were tabulated as Poaceae.

Clumps of four or more pollen grains (anther fragments) were tabulated as single grains to avoid skewing the counts. Clumps of pollen grains (anther fragments) from archaeological contexts are interpreted as evidence of the presence of flowers at the sampling locale (Bohrer 1981). This enables the analyst to infer possible human behavior.

Finally, pollen grains in the final stages of disintegration but retaining identifiable features such as furrows, pores, complex wall architecture, or a combination of these attributes, were assigned to the indeterminate category. The potential exists to miss counting pollen grains without identifiable characteristics. For example, a grain that is so severely deteriorated that no distinguishing features exist closely resembles many spores. Pollen grains and spores are similar in size and are composed of the same material (sporopollenin). So that spores are not counted as deteriorated pollen, only those grains containing identifiable pollen characteristics are assigned to the indeterminate category. Thus, the indeterminate category contains a minimum estimate of degradation for any assemblage. If the percentage of indeterminate pollen is between 10 and 20 percent, relatively poor preservation of the assemblage is indicated, whereas indeterminate pollen in excess of 20 percent indicates severe deterioration to the assemblage.

In samples where the total pollen concentration values are approximately at or below 1,000 grains/g and the percentage of indeterminate pollen is 20 percent or greater, counting was terminated at the completion of the abbreviated microscopy phase. In some cases, the assemblage was so deteriorated that only a small number of taxa remained. Statistically, the concentration values may have exceeded 1,000 grains/gm. If the species diversity was low (generally, these samples contained only pine, cheno-am, members of the Asteraceae family, and the indeterminate category), counting was also terminated after abbreviated microscopy, even if the pollen concentration values slightly exceeded 1,000 grains/g.

Results

Table 169 is a list of the scientific and common names of plant taxa used in this report. Table 170 contains the raw pollen counts, and Table 171 contains the calculated pollen concentration values of taxa.

Features, LA 61286

LA 61286 was a multicomponent site dating from 4500 BC to AD 400. Samples were submitted from three spatially discrete occupation areas. Area 1 was dated to the Latest Archaic period (AD 200–400) and had the majority of samples from archaeological features. Area 2 contained multicomponent occupations dating from 3300 to 200 BC. Feature 34 (a roasting pit) was the only sampled cultural context from this area and was associated with the Middle Archaic occupation (3300–2300 BC). Area 3 dates from 4500 to 4300 BC and was potentially an Early Archaic component.

Feature 11 (Area 1). All three samples were associated with Feature 11, a pit structure. Bag 154 was taken from the floor of this pit structure. The assemblage contained 1,710 grains/g total pollen concentration values, based on a pollen sum of 57 grains. *Pinus* (270 grains/g) was very low, and no other arboreal taxa were present. Cheno-am pollen (1,410 grains/g) clearly dominated the assemblage. Low-spine Asteraceae (30 grains/g) was the only other taxon present.

Feature 16 (Area 1). This storage feature was within Feature 11. The assemblage contained 778 grains/g total pollen concentration values based on a pollen sum of 61 grains. *Pinus* (408 grains/g) was very low, and no other arboreal taxa were present. Cheno-am (281 grains/g) was very low, along with low to moderate amounts of high-spine (38 grains/g) and low-spine (26 grains/g) Asteraceae and indeterminate pollen (26 grains/g).

Feature 15 (Area 1). This roasting pit was intrusive in the upper fill of the pit structure and is thought to have been used shortly after abandonment of the pit structure. The assemblage contained 2,445 grains/g total pollen concentration values based on a pollen sum of 77 grains. *Pinus* (667 grains/g) was very low, and no arboreal taxa were present. Cheno-am (1271 grains/g) was moderate, with moderate amounts of high-spine Asteraceae and *Ephedra* (32 grains/g), indeterminate (64 grains/g), and a large amount of Poaceae (95 grains/g) and low-spine Asteraceae (191 grains/g). *Eriogonum* and *Cylindropuntia* pollen concentrations were moderate to high (32 grains/g).

Feature 34 (Area 2). This roasting pit, affiliated with the Middle Archaic period, was the only cultural component sampled from Area 2. The assemblage contained 1,354 grains/g total pollen concentration values based on a pollen sum of 46 grains. *Pinus* (353 grains/g) was very low, and the sample contained no other arboreal taxa. Cheno-am (766 grains/g) pollen was very low but contained high amounts of Poaceae (88 grains/g) and moderate *Artemisia* (59 grains/g).

Pollen Column, LA 61286

Five samples (FS 460B464) were taken from four strata in Area 2.

Stratum 1 (Area 2). Stratum 1 (FS 464), a poorly consolidated sandy loam, was contemporary with the Late Archaic to Pueblo IV occupation, probably between 300 BC and AD 1600. FS 464 contained 3,140 grains/g total pollen concentration values based on a pollen sum of 190 grains. *Pinus* (2,331 grains/g) was high but contained low amounts of cheno-am (479 grains/g) pollen. High-spine Asteraceae (116 grains/g) was high, with moderate amounts of low-spine Asteraceae (66 grains/g). *Ephedra* (17 grains/g) pollen was low, but a fairly high amount of Poaceae pollen (50 grains/g) was present. *Zea mays* pollen was present (33 grains/g). *Cylindropuntia* pollen (2.64 grains/g) was also observed in the low-magnification scan of the slide.

Strata 3 and 4 (Area 2). Strata 3 and 4 correlate with the Middle Archaic occupation and date between 2900 and 2300 BC. FS 460, from Stratum 3, contained only 350 grains/g total pollen concentration values based on a pollen sum of only 24 grains. *Pinus*, cheno-am, high-spine Asteraceae, *Cylindropuntia*, *Ephedra*, and indeterminate pollen were the only taxa present.

Table 169. Plants identified in the pollen analysis

Family	Scientific Name	Common Name
Amaranthaceae	*Amaranthus*	Pigweed
Asteraceae		Composite family
	Artemisia	Sagebrush
	Helianthus	Sunflower
	Lactuca	Lettuce
	Taraxacum	Dandelion
	Chichoreae	Tribe of Asteraceae (heads comprised entirely of ligulate flowers)
	Liguliflorae	Pollen morphological group (fenestrate pollen)
	Low spine	Pollen morphological group, spines <2.5 high
	High spine	Pollen morphological group, spines >2.5 high
Cactaceae		Cactus family
	Opuntia	Prickly pear or cholla cactus
	Opuntia polycantha	Prickly pear cactus
	Cylindropuntia	Subgenus of *Opuntia* (cholla cactus)
	Platyopuntia	Subgenus of *Opuntia* (prickly pear cactus)
Chenopodiaceae		Goosefoot family
	Sarcobatus vermiculatus	Greasewood
	Cheno-am	Pollen morphological group (Chenopodiaceae and *Amaranthus*)
Cucurbitaceae		Gourd family
	Cucurbita	Squash, gourd
	Cucurbita foetidissima	Buffalo gourd
Cupressaceae	*Juniperus*	Juniper
Ephedraceae		Joint fir family
	Ephedra	Mormon tea
Fagaceae		Oak family
	Quercus sp.	Oak
Lycopodiaceae		Club-moss family
	Lycopodium	Club moss
Malvaceae		Cotton family
	Arbutilon sp.	Indian mallow
	Gossypium sp.	Cotton family
	Malva sp.	Cheese weed
	Sphaeralcea	Globemallow
Nyctaginaceae		Desert four o'clock family
	Allionia incarnata	Trailing four o'clock
Onagraceae		Evening primrose family
Pinaceae		Pine family
	Picea	Spruce
	Pinus	Pine
Poaceae		Grass family
	Zea mays	Corn
Polygonaceae		Buckwheat family
	Eriogonum	Wild buckwheat
Salicaceae		Willow family
	Populus sp.	cottonwood

Table 170. Raw pollen counts

Site	Bag No.	Provenience	Area	Structure	Stratum	Level	Feature	Type
LA 61286	150	N111/E82	1	pit structure	-	72 cm	15	roasting pit
LA 61286	154	N110/E82	1	pit structure	-	3 (62 cm)	11	floor
LA 61286	158	N111/E83	1	pit structure	-	4	16	intramural storage
LA 61286	382	N220/E40	2	extramural	-	80-97 cm	34	roasting pit
LA 61286	428	N236/E97	3	-	1	40 cm thick	-	modern colluvium
LA 61286	429	N236/E97	3	-	2	20-60 cm thick	-	low-energy colluvium
LA 61286	430	N236/E97	3	-	3	20-35 cm thick	-	low-energy sandy loam
LA 61286	431	N236/E97	3	-	4	20-40 cm thick	-	coarse sand
LA 61286	432	N236/E97	3	-	5	-	-	low-energy sandy loam
LA 61286	464	N223/E32	2	-	1	8 cm	-	poorly consolidated sandy loam
LA 61286	460	N226/E32	2	-	3	26 cm	-	consolidated sandy loam
LA 61286	461	N217/E38	2	-	3, 4	-	-	consolidated sandy loam
LA 61286	463	N220/E32	2	-	3, 4	42 cm	-	consolidated sandy loam
LA 61286	462	N220/E35	2	-	4	-	-	consolidated sandy loam
LA 61289	197	N73/E39	-	-	-	2 cm	-	poorly consolidated sandy loam
LA 61289	198	N73/E39	-	-	-	20 cm	-	poorly consolidated sandy loam
LA 61289	202	N73/E39	-	-	-	97 cm	-	thin stable sandy clay loam
LA 61289	118	N60/E42	-	-	2	52-55 cm	-	poorly consolidated sandy loam
LA 61289	120	N60/E42	-	-	4	96 cm	-	fine sandy loam
LA 61289	122	N60/E42	-	-	6	137 cm	-	lightly consolidated sandy loam
LA 61289	209	N53/E43	-	-	-	-	-	poorly consolidated sandy loam
LA 61289	212	N53/E43	-	-	-	-	-	sandy loam
LA 61289	213	N53/E43	-	-	-	-	-	sandy loam
LA 61290	217	N31/E143	-	occupation surface	2	2 (25 cm)	16	metate fragment
LA 61290	227	N31/E141	-	occupation surface	2	2 (17 cm)	-	metate fragment
LA 61290	234	N31/E146	-	occupation surface	2	2 (35 cm)	-	metate
LA 67959	17	-	-	-	1	-	-	modern sandy loam
LA 67959	17	-	-	-	3	-	-	-
LA 67959	17	-	-	-	5	-	-	colluvial sandy loam
LA 67959	17	-	-	-	7	140 cm bgs	-	-
LA 67959	17	-	-	extramural	-	-	5	thermal
LA 67959	17	-	-	extramural	-	-	4	thermal

Table 170 (continued)

Site	Bag No.	Period	Date	*Pinus*	*Juniperus*	*Picea*	*Quercus*	*Eriogonum*	Poaceae	Cheno-am
LA 61286	150	Late Archaic/BM II	A.D. 200-400	21	-	-	-	1	3	40
LA 61286	154	Late Archaic/BM II	A.D. 200-400	9	-	-	-	-	-	47
LA 61286	158	Late Archaic/BM II	A.D. 200-400	32	-	-	-	-	-	22
LA 61286	382	Archaic (San Jose)	3300-2300 B.C.	12	-	-	-	-	3	26
LA 61286	428	Late Archaic/BM II	A.D. 1-present	26	-	-	-	-	-	21
LA 61286	429	Late Archaic/BM II	2300 B.C.- A.D. 1	31	-	-	-	1	-	61
LA 61286	430	Archaic (San Jose)	2900-2300 B.C.	20	1	-	-	-	2	56
LA 61286	431	Archaic (San Jose)	2900-2300 B.C.	33	2	-	1	-	-	35
LA 61286	432	Archaic (Bajada)	4500-4300 B.C.	21	-	-	-	-	2	42
LA 61286	464	Late Archaic/BM II	300 B.C.-A.D. 1600	141	-	-	-	-	3	29
LA 61286	460	Archaic (San Jose)	2900-2300 B.C.	6	-	-	-	-	-	13
LA 61286	461	Archaic (San Jose)	2900-2300 B.C.	15	-	-	1	1	4	68
LA 61286	463	Archaic (San Jose)	2900-2300 B.C.	20	-	-	-	-	2	34
LA 61286	462	Archaic (San Jose)	2900-2300 B.C.	9	-	-	-	-	-	23
LA 61289	197	Late Archaic/Pueblo IV	A.D. 1-1600	188	1	1	-	-	-	49
LA 61289	198	Late Archaic/Pueblo IV	A.D. 1-1600	189	-	-	1	1	-	61
LA 61289	202	Archaic (San Jose)	3600-2900 B.C.	12	-	-	-	-	-	12
LA 61289	118	Late Archaic/Pueblo IV	A.D. 1-1600	54	-	-	-	1	-	37
LA 61289	120	Archaic (San Jose)/ Late Archaic	3200 B.C.-A.D. 1	48	1	-	-	1	-	1
LA 61289	122	Archaic (Bajada/San Jose)	4200-3200 B.C.	3	-	-	-	1	-	28
LA 61289	209	Late Archaic/Pueblo IV	A.D. 1-1600	36	-	-	-	-	-	38
LA 61289	212	Archaic (Bajada/San Jose)	4200-3200 B.C.	28	-	-	-	-	-	43
LA 61289	213	Archaic (Bajada)	4600-3900 B.C.	6	-	-	-	-	1	8
LA 61290	217	Archaic (San Jose)	2500-1700 B.C.	16	-	-	-	-	-	17
LA 61290	227	Archaic (San Jose)	2500-1700 B.C.	42	-	-	-	-	-	33
LA 61290	234	Archaic (San Jose)	2500-1700 B.C.	18	-	-	-	-	1	17
LA 67959	17	Late Archaic/Pueblo IV	A.D. 1-1600	135	1	1	2	-	-	13
LA 67959	17	Archaic (San Jose)	2000-1500 B.C.	18	-	-	-	-	2	40
LA 67959	17	Archaic (San Jose)	2000-1500 B.C.	36	2	-	-	-	3	70
LA 67959	17	Archaic (San Jose)	Predates 2400 B.C.	13	-	-	-	-	-	12
LA 67959	17	Archaic (San Jose)	2000-1500 B.C.	34	-	-	-	-	6	19
LA 67959	17	Archaic (San Jose)	2000-1500 B.C.	5	-	-	-	-	1	4

Table 170 (continued)

Site	Bag No.	High-spine Asteraceae	Low-spine Asteraceae	*Artemisia*	*Cylindropuntia*	*Ephedra*	Indeterminate	*Zea mays*	Sum	% Indeterminate
LA 61286	150	1	6	-	1	1	2	-	76	2.63
LA 61286	154	-	1	-	-	-	-	-	57	0
LA 61286	158	3	2	-	-	-	2	-	61	3.28
LA 61286	382	-	-	2	-	-	3	-	46	6.52
LA 61286	428	5	4	1	1	-	2	-	60	3.33
LA 61286	429	6	7	1	1	2	7	-	117	5.98
LA 61286	430	2	4	1	-	1	8	-	95	8.42
LA 61286	431	5	6	-	-	-	7	-	89	7.87
LA 61286	432	1	3	2	1	-	1	-	73	1.37
LA 61286	464	4	7	-	-	1	3	2	190	1.58
LA 61286	460	2	-	-	1	1	1	-	24	4.17
LA 61286	461	2	7	1	-	-	7	-	106	6.6
LA 61286	463	2	4	-	-	-	5	-	67	7.46
LA 61286	462	3	-	-	-	-	4	-	39	10.26
LA 61289	197	13	4	1	-	-	6	-	263	2.28
LA 61289	198	8	1	2	-	2	5	-	270	1.85
LA 61289	202	8	1	1	-	1	3	-	38	7.89
LA 61289	118	9	4	4	-	-	6	-	115	5.22
LA 61289	120	4	3	7	-	2	14	-	81	17.28
LA 61289	122	3	-	2	-	-	4	-	41	9.76
LA 61289	209	9	4	-	1	2	7	-	97	7.22
LA 61289	212	5	6	-	2	-	9	-	93	9.68
LA 61289	213	5	1	-	-	-	6	-	27	22.22
LA 61290	217	-	3	-	-	1	-	-	37	0
LA 61290	227	5	2	-	2	-	9	-	93	9.68
LA 61290	234	1	4	-	-	-	5	-	46	10.87
LA 67959	17	4	2	1	1	1	5	1	167	2.99
LA 67959	17	-	2	1	-	-	7	-	70	10
LA 67959	17	8	1	1	-	2	13	-	136	9.56
LA 67959	17	1	-	-	-	-	4	-	64	6.25
LA 67959	17	3	-	-	-	-	3	-	16	18.75

Table 170 (continued). Based on counts and low-magnification scan of slide

Site	Bag No.	*Picea*	*Zea mays*	*Cylindropuntia*	Onagraceae
LA 61286	150	-	-	-	-
LA 61286	154	-	-	-	-
LA 61286	158	-	-	-	-
LA 61286	382	-	-	-	-
LA 61286	428	-	-	3	1
LA 61286	429	-	-	-	-
LA 61286	430	-	-	-	-
LA 61286	431	-	-	1	-
LA 61286	432	-	-	1	-
LA 61286	464	-	2	1	-
LA 61286	460	-	-	2	-
LA 61286	461	-	-	-	-
LA 61286	463	-	-	1	-
LA 61286	462	-	-	-	-
LA 61289	197	-	-	1	-
LA 61289	198	-	-	2	-
LA 61289	202	-	-	-	-
LA 61289	118	-	-	-	-
LA 61289	120	-	-	-	-
LA 61289	122	-	-	-	-
LA 61289	209	-	-	2	-
LA 61289	212	-	-	3	-
LA 61289	213	-	-	-	-
LA 61290	217	-	-	-	-
LA 61290	227	-	-	-	-
LA 61290	234	-	-	-	-
LA 67959	17	3	1	-	-
LA 67959	17	-	-	-	-
LA 67959	17	-	-	-	-
LA 67959	17	-	-	-	-
LA 67959	17	-	-	-	-
LA 67959	17	-	-	-	-

Table 171. Pollen concentration values

Site	Bag No.	Provenience	Area	Structure	Stratum	Level	Feature	Type
LA 61286	150	N111/E82	1	pit structure 11	-	72 cm	15	roasting pit
LA 61286	154	N110/E82	1	pit structure 11	-	3 (62 cm)	11	floor
LA 61286	158	N111/E83	1	pit structure 11	-	4	16	intramural storage
LA 61286	382	N220/E40	2	extramural	-	80-97 cm	34	roasting pit
LA 61286	428	N236/E97	3	-	1	40 cm thick	-	modern colluvium
LA 61286	429	N236/E97	3	-	2	20-60 cm thick	-	low-energy colluvium
LA 61286	430	N236/E97	3	-	3	20-35 cm thick	-	low-energy sandy loam
LA 61286	431	N236/E97	3	-	4	20-40 cm thick	-	coarse sand
LA 61286	432	N236/E97	3	-	5	-	-	low-energy sandy loam
LA 61286	464	N223/E32	2	-	1	8 cm	-	poorly consolidated sandy loam
LA 61286	460	N226/E32	2	-	3	26 cm	-	consolidated sandy loam
LA 61286	461	N217/E38	2	-	3 and 4	-	-	consolidated sandy loam
LA 61286	463	N220/E32	2	-	3 and 4	42 cm	-	consolidated sandy loam
LA 61286	462	N220/E35	2	-	4	-	-	consolidated sandy loam
LA 61289	197	N73/E39	-	-	-	2 cm	-	poorly consolidated sandy loam
LA 61289	198	N73/E39	-	-	-	20 cm	-	poorly consolidated sandy loam
LA 61289	202	N73/E39	-	-	-	97 cm	-	thin, stable sandy clay loam
LA 61289	118	N60/E42	-	-	2	52-55 cm	-	poorly consolidated sandy loam
LA 61289	120	N60/E42	-	-	4	96 cm	-	fine sandy loam
LA 61289	122	N60/E42	-	-	6	137 cm	-	lightly consolidated sandy loam
LA 61289	209	N53/E43	-	-	-		-	poorly consolidated sandy loam
LA 61289	212	N53/E43	-	-	-		-	sandy loam
LA 61289	213	N53/E43	-	-	-		-	sandy loam
LA 61290	217	N31/E143	-	occupation	2	2:25 cm	16	metate fragment
				surface	-		-	-
LA 61290	227	N31/E141	-	occupation	2	2:17 cm	-	metate fragment
				surface	-		-	-
LA 61290	234	N31/E146	-	occupation	2	2 (35 cm)	-	metate
				surface	-	-	-	-
LA 67959	17	-	-	-	1	-	-	modern sandy loam
LA 67959	17	-	-	-	3	-	-	-
LA 67959	17	-	-	-	5	-	-	colluvial sandy loam
LA 67959	17	-	-	-	7	140 cm bgs	-	-
LA 67959	17	-	-	extramural	8	-	5	thermal
LA 67959	17	-	-	extramural	9	-	4	thermal

Table 171 (continued)

Site	Bag No.	Period	Date	*Pinus*	*Juniperus*	*Picea*	*Quercus*	*Eriogonum*	Poaceae	Cheno-am
LA 61286	150	Late Archaic/BMII	A.D. 200-400	667	-	-	-	32	95	1271
LA 61286	154	Late Archaic/BMII	A.D. 200-400	270	-	-	-	-	-	1410
LA 61286	158	Late Archaic/BMII	A.D. 200-400	408	-	-	-	-	-	281
LA 61286	382	Archaic (San Jose)	3300-2300 B.C.	353	-	-	-	-	88	766
LA 61286	428	Late Archaic/BMII	A.D. 1-present	453	-	-	-	-	-	366
LA 61286	429	Late Archaic/BMII	B.C. 2300- A.D. 1	866	-	-	-	28	-	1704
LA 61286	430	Archaic (San Jose)	2900-2300 B.C.	600	30	-	-	-	60	1680
LA 61286	431	Archaic (San Jose)	2900-2300 B.C.	253	15	-	8	-	-	269
LA 61286	432	Archaic (Bajada)	4500-4300 B.C.	680	-	-	-	-	65	1361
LA 61286	464	Late Archaic/BMII	300 B.C.-A.D. 1600	2331	-	-	-	-	50	479
LA 61286	460	Archaic (San Jose)	2900-2300 B.C.	88	-	-	-	-	-	190
LA 61286	461	Archaic (San Jose)	2900-2300 B.C.	398	-	-	27	27	106	1806
LA 61286	463	Archaic (San Jose)	2900-2300 B.C.	456	-	-	-	-	46	776
LA 61286	462	Archaic (San Jose)	2900-2300 B.C.	228	-	-	-	-	-	582
LA 61289	197	Late Archaic/Pueblo IV	A.D. 1-1600	4834	26	26	-	-	-	1260
LA 61289	198	Late Archaic/Pueblo IV	A.D. 1-1600	4860	-	-	26	26	-	1569
LA 61289	202	Archaic (San Jose)	3600-2900 B.C.	229	-	-	-	-	-	229
LA 61289	118	Late Archaic/Pueblo IV	A.D. 1-1600	1651	-	-	-	31	-	1131
LA 61289	120	Archaic (San Jose)/	3200 B.C.-1 A.D.	1341	28	-	-	28	-	28
LA 61289	122	Archaic (Bajada/San Jose)	4200-3200 B.C.	95	-	-	-	32	-	889
LA 61289	209	Late Archaic/Pueblo IV	A.D. 1-1600	1122	-	-	-	-	-	1184
LA 61289	212	Archaic (Bajada/San Jose)	4200-3200 B.C.	483	-	-	-	-	-	741
LA 61289	213	Archaic (Bajada)	4600-3900 B.C.	171	-	-	-	-	28	227
LA 61290	217	Archaic (San Jose)	2500-1700 B.C.	350	-	-	-	-	-	372
LA 61290	227	Archaic (San Jose)	2500-1700 B.C.	782	-	-	-	-	-	614
LA 61290	234	Archaic (San Jose)	2500-1700 B.C.	550	-	-	-	-	31	520
LA 67959	17	Late Archaic/Pueblo IV	A.D. 1-1600	1099	8	8	16	-	-	106
LA 67959	17	Archaic (San Jose)	2000-1500 B.C.	214	-	-	-	-	24	476
LA 67959	17	Archaic (San Jose)	2000-1500 B.C.	1023	57	-	-	-	85	1989
LA 67959	17	Archaic (San Jose)	Pre-dates 2400 B.C.	153	-	-	-	-	-	141
LA 67959	17	Archaic (San Jose)	2000-1500 B.C.	264	-	-	-	-	47	148
LA 67959	17	Archaic (San Jose)	2000-1500 B.C.	145	-	-	-	-	29	116

Table 171 (continued)

Site	Bag No.	High-spine Asteraceae	Low-spine Asteraceae	*Artemisia*	Cylindropuntia	*Ephedra*	Indeterminate	*Zea mays*	Sum	Total
LA 61286	150	32	191	0	32	32	64	0	77	2445.88
LA 61286	154	0	30	0	0	0	0	0	57	1710
LA 61286	158	38	26	0	0	0	26	0	61	778.11
LA 61286	382	0	0	59	0	0	88	0	46	1354.91
LA 61286	428	87	70	17	17	0	35	0	60	1045.16
LA 61286	429	168	196	28	28	56	196	0	117	3267.93
LA 61286	430	60	120	30	0	30	240	0	95	2850
LA 61286	431	38	46	0	0	0	54	0	89	683.32
LA 61286	432	32	97	65	32	0	32	0	73	2365.2
LA 61286	464	66	116	0	0	17	50	33	190	3140.82
LA 61286	460	29	0	0	15	15	15	0	24	350.27
LA 61286	461	53	186	27	0	0	186	0	106	2815.08
LA 61286	463	46	91	0	0	0	114	0	67	1528.73
LA 61286	462	76	0	0	0	0	101	0	39	987.19
LA 61289	197	334	103	26	0	0	154	0	263	6762.86
LA 61289	198	206	26	51	0	51	129	0	270	6942.86
LA 61289	202	152	19	19	0	19	57	0	38	724.24
LA 61289	118	275	122	122	0	0	183	0	115	3515.09
LA 61289	120	112	84	196	0	56	391	0	81	2262.41
LA 61289	122	95	0	64	0	0	127	0	41	1302.35
LA 61289	209	280	125	0	31	62	218	0	97	3021.92
LA 61289	212	86	103	0	34	0	155	0	93	1602.77
LA 61289	213	142	28	0	0	0	171	0	27	767.37
LA 61290	217	0	66	0	0	22	0	0	37	810
LA 61290	227	93	37	0	37	0	168	0	93	1731.72
LA 61290	234	31	122	0	0	0	153	0	46	1406.04
LA 67959	17	33	16	8	8	8	41	8	167	1359.5
LA 67959	17	0	24	12	0	0	83	0	70	833.82
LA 67959	17	227	28	28	0	57	369	0	136	3865.26
LA 67959	17	12	0	0	0	12	12	0	28	328.7
LA 67959	17	8	0	0	0	0	31	0	64	497.12
LA 67959	17	87	0	0	0	0	87	0	16	462.86

Table 171 (continued)

Site	Bag No.	Marker	% Indeterminate	Transects	Total Transects	Marker/ Slide	*Lycopodium Added*	Weight/ Area
LA 61286	150	51	2.6	10	27	137.7	40500	25
LA 61286	154	54	-	8	25	168.75	40500	25
LA 61286	158	127	3.28	4	24	762	40500	25
LA 61286	382	55	6.52	8	26	178.75	40500	25
LA 61286	428	93	3.33	4	26	604.5	40500	25
LA 61286	429	58	5.98	4	24	348	40500	25
LA 61286	430	54	8.42	6	24	216	40500	25
LA 61286	431	211	7.87	4	26	1371.5	40500	25
LA 61286	432	50	1.37	6	26	216.67	40500	25
LA 61286	464	98	1.58	4	25	612.5	40500	25
LA 61286	460	111	4.17	4	24	666	40500	25
LA 61286	461	61	6.6	6	24	244	40500	25
LA 61286	463	71	7.46	6	24	284	40500	25
LA 61286	462	64	10.26	27	27	64	40500	25
LA 61289	197	63	2.28	8	1	7.88	40500	25
LA 61289	198	63	1.85	2	27	850.5	40500	25
LA 61289	202	85	7.89	4	24	510	40500	25
LA 61289	118	53	5.22	6	26	229.67	40500	25
LA 61289	120	58	17.28	6	28	270.67	40500	25
LA 61289	122	51	9.76	8	24	153	40500	25
LA 61289	209	52	7.22	4	27	351	40500	25
LA 61289	212	94	9.68	4	26	611	40500	25
LA 61289	213	57	22.22	4	26	370.5	40500	25
LA 61290	217	74	0	4	27	499.5	40500	25
LA 61290	227	87	9.68	4	26	565.5	40500	25
LA 61290	234	53	10.87	12	24	106	40500	25
LA 67959	17	199	2.99	4	25	1243.75	40500	25
LA 67959	17	136	10	4	25	850	40500	25
LA 67959	17	57	9.56	8	25	178.13	40500	25
LA 67959	17	138	3.57	4	24	828	40500	25
LA 67959	17	237	6.25	4	26	1540.5	40500	22
LA 67959	17	56	18.75	6	26	242.67	40500	25

Table 171 (continued). Based on counts and low-magnification scan of slide

Site	Bag No.	*Picea*	*Zea mays*	*Cylindropuntia*	Onagraceae	Maximum Potential Concentration
LA 61286	150	-	-	-	-	11.76
LA 61286	154	-	-	-	-	9.6
LA 61286	158	-	-	-	-	2.13
LA 61286	382	-	-	-	-	9.06
LA 61286	428	-	-	8.04	2.68	2.68
LA 61286	429	-	-	-	-	4.66
LA 61286	430	-	-	-	-	7.5
LA 61286	431	-	-	1.18	-	1.18
LA 61286	432	-	-	7.48	-	7.48
LA 61286	464	-	5.29	2.64	-	2.64
LA 61286	460	-	-	4.86	-	2.43
LA 61286	461	-	-	-	-	6.64
LA 61286	463	-	-	5.7	-	5.7
LA 61286	462	-	-	-	-	25.31
LA 61289	197	-	-	7.91	-	7.91
LA 61289	198	-	-	3.81	-	1.9
LA 61289	202	-	-	-	-	3.18
LA 61289	118	-	-	-	-	7.05
LA 61289	120	-	-	-	-	5.99
LA 61289	122	-	-	-	-	10.59
LA 61289	209	-	-	9.23	-	4.62
LA 61289	212	-	-	7.95	-	2.65
LA 61289	213	-	-	-	-	4.37
LA 61290	217	-	-	-	-	3.24
LA 61290	227	-	-	-	-	2.86
LA 61290	234	-	-	-	-	15.28
LA 67959	17	3.91	1.3	-	-	1.3
LA 67959	17	-	-	-	-	1.91
LA 67959	17	-	-	-	-	9.09
LA 67959	17	-	-	-	-	1.96
LA 67959	17	-	-	-	-	1.2
LA 67959	17	-	-	-	-	6.68

FS 461 and FS 463 were also taken from Strata 3 and 4. FS 461 contained 2,815 grains/g total pollen concentration values based on a pollen sum of 106 grains. *Pinus* (398 grains/g) was very low, and the sample contained a small amount (27 grains/g) of *Quercus* pollen. Cheno-am (1,806 grains/g) pollen was high, with high amounts of Poaceae (106 grains/g), low-spine Asteraceae, and indeterminate (186 grains/g each). Low-spine Asteraceae (53 grains/g) was moderate, with low amounts of Artemisia and a moderate amount of *Eriogonum* (27 grains/g each).

FS 463 contained 1,528 grains/g total pollen concentration values based on a pollen sum of only 67 grains. *Pinus* (456 grains/g) was very low, with no additional arboreal pollen. Cheno-am (776 grains/g) was low, with moderate amounts of Poaceae and high-spine Asteraceae (46 grains/g each). Low-spine Asteraceae (91 grains/g) was fairly high. *Cylindropuntia* pollen (5.70 grains/g) was also observed in the low-magnification scan of the slide.

Stratum 4 (Area 2). FS 462 contained 987 grains/g total pollen concentration values based on a pollen sum of 39 grains. *Pinus* (228 grains/g) was very low. Cheno-am (528 grains/g) was very low, with high amounts of high-spine Asteraceae (76 grains/g).

Five pollen samples were taken from a column at N236/E97, representing five stratigraphically distinct layers. This component dates from 4500 to 4300 BC (potentially Early Archaic).

Stratum 1 (Area 3). Stratum 1 (FS 428) is similar to Stratum 1 from Area 2, which places it in the Late Archaic–Pueblo IV period, dating between AD 1 to1600. FS 428 contained 1,045 grains/g total pollen concentration values based on a pollen sum of 60 grains. *Pinus* (453 grains/g) was very low, but no other arboreal taxa were present. Cheno-am (366 grains/g) was low, with high amounts of both high-spine (87 grains/g) and low-spine (76 grains/g) Asteraceae. *Artemisia* and *Cylindropuntia* pollen (17 grains/g each) were low to moderate. Onagraceae (2.68 grains/g) was also present in the low-magnification scan of the slide.

Stratum 2 (Area 3). Stratum 2 (FS 429) may also be contemporary with Stratum 1 in Area 2, or perhaps slightly earlier. FS 429 contained 3,267 grains/g total pollen concentration values. *Pinus* (866 grains/g) was very low. Cheno-am (1704 grains/g) was high, with high amounts of high-spine (168 grains/g) and low-spine (196 grains/g) Asteraceae. *Artemisia* (28 grains/g) and *Ephedra* (56 grains/g) pollen were low to moderate. *Eriogonum* and *Cylindropuntia* (28 grains/g each) pollen were both present in moderate amounts.

Stratum 3 (Area 3). Stratum 3 (FS 430) is similar to Stratum 3 from Area 2 and is probably affiliated with the San Jose phase occupation between 2900 and 2300 BC. FS 430 contained 2,850 grains/g total pollen concentration values. *Pinus* (600 grains/g) was very low, but the assemblage also contained a trace of *Juniperus* pollen (30 grains/g). Cheno-am (1680 grains/g) was high, with moderate to high amounts of Poaceae, high-spine Asteraceae (60 grains/g each), low-spine Asteraceae(120 grains/g), and *Artemisia* (30 grains/g) pollen.

Stratum 4 (Area 3). Stratum 4 (FS 431) was also contemporary with the San Jose occupation (2900–2300 BC). FS 431 contained only 683 grains/g total pollen concentration values based on a pollen sum of 89 grains. *Pinus* (253 grains/g) was very low, and the assemblage contained a trace of both *Juniperus* (15 grains/g) and *Quercus* (8 grains/g) pollen. Cheno-am (269 grains/g) was very low, with low to moderate amounts of high-spine (38 grains/g) and low-spine (46 grains/g) Asteraceae. A small amount of *Cylindropuntia* (1.18 grains/g) was present in the low-magnification scan of the slide.

Stratum 5 (Area 3). Stratum 5 (FS 432) dated between 4500 and 4300 BC, which places it within the Bajada phase of the Archaic. FS 432 contained 2,365 grains/g total pollen concentration values. *Pinus* (680 grains/g) was very low, but no other arboreal taxa were present. Cheno-am (1,361 grains/g) pollen was moderate to high, with moderate amounts of Poaceae (65 grains/g). High-spine Asteraceae (32 grains/g) was low to moderate, with moderate to high amounts of low-spine Asteraceae (97 grains/g) and *Artemisia* (65 grains/g). *Cylindropuntia* (32 grains/g) was present in moderate amounts.

LA 61289

Three pollen columns were taken from this site. All three represent distinct stratigraphic layers that are relatively dated to the Late Archaic and radiocarbon-dated to the Middle and Early Archaic periods.

73N/39E Column. FS 197 was taken from the upper portion of Stratum 2, relatively dated to the Late Archaic–Pueblo IV period. This assemblage contained 6,762 grains/g total pollen concentration values based on a count of 263 grains. *Pinus* (4,834 grains/g) was very high, with traces (26 grains/g each) of *Juniperus* and *Picea* pollen. Cheno-am (1260 grains/g) pollen was high, with high amounts of high-spine (334 grains/g) and low-spine (103 grains/g) Asteraceae. *Artemisia* (26 grains/g) pollen was low to moderate. *Cylindropuntia* pollen (7.91 grains/g) was present in the low-magnification scan of the slide.

FS 198 was taken from the low portion of Stratum 2 and contained 6,942 grains/g total pollen concentration values based on a pollen sum of 270 grains. *Pinus* (4860 grains/g) was very high, with traces of *Quercus* (26 grains/g). Cheno-am (1,569 grains/g) pollen was high, with high amounts of high-spine Asteraceae (206 grains/g) and moderate to high amounts of low-spine Asteraceae (26 grains/g) and *Artemisia* and *Ephedra* pollen (51 grains/g each). *Eriogonum* (26 grains/g) was present in moderate amounts. *Cylindropuntia* (3.81 grains/g) was also present in the low-magnification scan of the slide.

FS 202 was dated to the Middle Archaic period. The assemblage contained only 724 grains/g total pollen concentration values. *Pinus*, cheno-am, high-spine and low-spine Asteraceae, *Artemisia, Ephedra*, and indeterminate pollen were the only taxa present.

60N/42E Column. FS 118, from the Late Archaic–Pueblo IV period, contained 3,515 grains/g total pollen concentration values based on a pollen sum of 115 grains. *Pinus* (1,651 grains/g) was low to moderate. Cheno-am (1,131 grains/g) was low to moderate, with high amounts of high-spine (275 grains/g) and low-spine Asteraceae and *Artemisia* (122 grains/g each). A moderate amount of *Eriogonum* (31 grains/g) was also present.

FS 120, from the Middle Archaic level, contained 2,262 grains/g total pollen concentration values based on a pollen sum of 81 grains. *Pinus* (1341 grains/g) was low to moderate, with a trace of *Juniperus* (28 grains/g) pollen. Cheno-am (28 grains/g) was present in trace amounts only, with high amounts of high-spine (122 grains/g) and low-spine (84 grains/g) Asteraceae, *Artemisia* (196 grains/g), and *Ephedra* (56 grains/g). *Eriogonum* (28 grains/g) was present in moderate amounts.

FS 122 was taken from the Middle Archaic level and contained 1,302 grains/g total pollen concentration values. *Pinus* (95 grains/g) was present in trace amounts only. Cheno-am (889 grains/g) was low, with high amounts of high-spine Asteraceae (95 grains/g) and *Artemisia* (64 grains/g). *Eriogonum* (32 grains/g) was present in moderate amounts.

53N/43E Column. FS 209 was taken from the Late Archaic–Pueblo IV level and contained 3,021 grains/g total pollen concentration values. *Pinus* (1122 grains/g) was low. Cheno-am (1,184 grains/g) was moderate, along with high amounts of high-spine (280 grains/g) and low-spine (125 grains/g) Asteraceae. *Cylindropuntia* (31 grains/g) was moderate.

The other two samples were taken in conjunction with the Middle and Early Archaic occupations. FS 212 was taken from a thin layer dated between 4200 and 3200 BC. The assemblage contained 1,602 grains/g total pollen concentration values. *Pinus* (483 grains/g) was very low. Cheno-am (741 grains/g) was low, with high amounts of high-spine (86 grains/g) and low-spine (103 grains/g) Asteraceae. *Cylindropuntia* (34 grains/g) was moderate.

FS 213, Early Archaic level, was taken from a thin layer associated with the 4600 to 3900 BC level. The assemblage contained 767 grains/g total pollen concentration values based on a pollen sum of 27 grains. *Pinus*, Poaceae, cheno-am, high-spine and low-spine Asteraceae, and indeterminate pollen were the only taxa present.

LA 61290

The three samples taken from this site were all associated with metate or metate fragments from the Middle Archaic period. FS 217 contained only 810 grains/g total pollen concentration values based on a pollen sum of 37 grains. *Pinus* (350 grains/g) was very low. Cheno-am (372 grains/g) was very low, with moderate low-spine Asteraceae (66 grains/g) and low *Ephedra* (22 grains/g) pollen.

FS 227 contained 1,731 grains/g total pollen concentration values based on a pollen sum of 93 grains. *Pinus* (782 grains/g) was very low. Cheno-am (614 grains/g) was very low, with high amounts of high-spine Asteraceae (93 grains/g) and low to moderate amounts of low-spine Asteraceae (37 grains/g). *Cylindropuntia* (37 grains/g) was present in moderate amounts.

FS 234 contained 1,406 grains/g total pollen concentration values based on a pollen sum of 46 grains. *Pinus* (550 grains/g) was very low. Cheno-am (520 grains/g) was low, with low to moderate Poaceae and high-spine Asteraceae (31 grains/g each). Low-spine Asteraceae (122 grains/g) was high.

LA 67959

Four stratigraphic levels were sampled from this site. Stratum 1 was relatively dated to AD 1 to 1600, Strata 3 and 5 were relatively dated between 2000 BC and AD 1, and Stratum 7 was radiocarbon dated to pre-2400 BC. All samples were denoted as FS 17.

Stratum 1. Stratum 1 was a modern sandy loam and contained 1,359 grains/g total pollen concentration values. *Pinus* (1,009 grains/g) was very low, with traces of *Juniperus* and *Picea* (8 grains/g each). Cheno-am (520 grains/g) was very low, with low amounts of Poaceae (31 grains/g), high-spine (33 grains/g) and low-spine (16 grains/g) Asteraceae, *Artemisia*, and *Ephedra* (8 grains/g each). *Cylindropuntia* and *Zea mays* (8 grains/g each) were also present.

Stratum 3. Stratum 3 contained 833 grains/g total pollen concentration values. *Pinus* (214 grains/g) and cheno-am (476 grains/g) were very low, with low amounts of Poaceae (24 grains/g), low-spine Asteraceae (24 grains/g), and *Artemisia* (12 grains/g).

Stratum 5. Stratum 5 contained 3,865 grains/g total pollen concentration values. *Pinus* (1,023 grains/g) was low, with a small amount of *Juniperus* (57 grains/g). Cheno-am (1,989 grains/g) was high, along with Poaceae (85 grains/g), high-spine Asteraceae (227 grains/g), and low to moderate amounts of low-spine Asteraceae, *Artemisia* (28 grains/g each), and *Ephedra* (57 grains/g).

Stratum 7. Stratum 7 contained 328 grains/g total pollen concentration values based on a pollen sum of only 28 grains. *Pinus*, cheno-am, high-spine Asteraceae, *Ephedra*, and indeterminate pollen were present.

Samples were taken from Features 4 and 5, which were thermal features dug into the prehistoric surface corresponding to Stratum 7. These contexts postdated deposition of Stratum 7. The features from which these samples were collected were radiocarbon-dated to 2400B2100 BC. Feature 4 contained 497 grains/g total pollen concentration values and *Pinus*, Poaceae, cheno-am, high-spine Asteraceae, and indeterminate pollen. Feature 5 contained 462 grains/g total pollen concentration values and *Pinus*, Poaceae, cheno-am, high-spine Asteraceae, and indeterminate pollen.

Discussion

In general, the pollen assemblages were very well preserved and contained good pollen recovery, or they contained very little pollen at all. In spite of this bimodal distribution, the pollen concentration values were fairly high throughout the assemblages. The mean number of pollen grains counted in an assemblage was 86.9, but the median number was 71.5. The median is fairly low, which indicates that the majority of these assemblages contained relatively little pollen.

The archaeological samples were distributed throughout the Archaic and represented Early, Middle, and Late Archaic–Pueblo IV period materials. They were collected from contexts associated with or overlying specific manifestations of cultural adaptations from the Archaic and Ancestral Pueblo periods.

The second group of samples consisted of pollen columns taken from several locations within the sites and representing depositional events correlating with several occupational levels. These were taken to provide paleoenvironmental data and potentially economic plant taxa available within the area for exploitation. Because of the nature of the two sets of samples, I will discuss them separately.

Archaeological Samples

Pinus was the only arboreal taxon in the pollen samples from the archaeological features. *Pinus* pollen was extremely low throughout all archaeological features, which might have been expected at LA 61286. At that site, all the samples were taken from within a pit structure, which might have blocked ambient pollen deposition.

However, in the other, external features, the low pollen concentration values strongly argue for the lack of *Pinus* in the immediate, local plant community. The extremely low concentration values suggest that a source of pine was some distance from the site. Alternatively, the total pollen concentration values are generally low to moderate, which suggests that extensive weathering of these assemblages has occurred.

Latest Archaic period. Very little information was obtained from the pollen samples from features dated to the Latest Archaic period (Table 172). The sample from the floor of the pit structure at LA 61286 contained no economic taxa, and the assemblage consisted entirely of background pollen types. This suggests that not much plant material was being stored within the pit structure or that the habitation area was occupied for a fairly short time. In this later period, storage may have moved from habitations to specialized areas. Given the paucity of pollen data, either interpretation is probable.

Likewise, the storage feature within the pit structure offers little explanation. This sample contained very little pollen, and no evidence of economic taxa was present. Based on the pollen assemblages, no interpretation of function is possible.

The roasting pit (Feature 15) does supply a few indicators. It was built into the fill of the abandoned pit structure. The pollen assemblage consists primarily of Poaceae, cheno-am, composites, and *Ephedra*. These indicate smaller woody plants that may have been stored within the pit structure for fuel. Both *Eriogonum* and *Cylindropuntia* pollen are present within this assemblage. The roasting pit was found within the upper fill of the pit structure, which could simply indicate their presence in the local plant community. Alternatively, they could have been processed within the roasting pit. The flotation and macrobotanical data may give additional clues, but based solely on the palynologic data, I cannot determine which is more likely.

Middle Archaic period. One roasting pit from the Middle Archaic component of LA 61286 (Feature 34) was sampled. While no economic pollen taxa are present from this feature, there are several similarities to the other roasting pit feature. In both cases, Poaceae and cheno-am pollen are slightly elevated. This might suggest potential fuel sources but may also suggest that these taxa were being processed, possibly as food. Again, it is not possible to determine if these results indicate food-preparation activities, but the possibility exists. Interestingly, no pollen of *Ephedra* or Asteraceae was recovered from this feature, but a significant amount of *Artemisia* pollen was present. This might suggest a difference in the locally available plants between the Middle and Latest Archaic periods.

The samples associated with metates were all taken from the Middle Archaic component of LA 61290. Again, the dominant taxa are Poaceae, cheno-am, and Asteraceae. Cheno-am pollen, although in low amounts, are consistently present in all three samples. While it is possible that these metates functioned in processing cheno-am plants, there is no clear indication that this pollen taxon was not just the product of the local plant community. Poaceae and *Cylindropuntia* pollen are present from single, separate metates and could certainly indicate a selection of wild taxa for processing. In both cases, however, the pollen concentration values could easily have been produced by members of the local plant community.

A pollen wash sample from a metate was analyzed previously from LA 127578, also in Santa Fe County (Holloway 2000). This sample dated to the late period (1500 to 800 BC), somewhat later than the present samples. The pollen assemblages were remarkably similar, containing no obligate economic taxa but small amounts of *Pinus*, Poaceae, cheno-am, Asteraceae, and *Artemisia*. This supports the interpretation of a rather stable desert scrub vegetation.

The two thermal features which had been dug into the Middle Archaic ground surface at LA 67959 contained extremely low pollen concentration values. No economic taxa were present, and even the background pollen concentration values do not lend themselves to speculation.

In general, the archaeological samples provide no clear-cut examples of plant-processing activities. The taxa present are quite common and may or may not indicate a gathering subsistence strategy. However, the prehistoric population *could* have been relying on these locally available wild plants.

Table 172. Pollen concentration values from feature samples

Date	Period	Site	Feature Number	Feature Type	*Pinus*	Poaceae	*Cheno-am*	High-spine Asteraceae	Low-spine Asteraceae	*Artemisia*	*Ephedra*
A.D. 200-400	Late Archaic/BM II	LA 61286	11	pit-structure floor	270	0	1410	0	30	0	0
		LA 61286	15	roasting pit	667.06	95.29	1270.59	31.76	190.59	0	31.76
		LA 61286	16	intramural storage	408.19	0	280.63	38.27	25.51	0	0
	Total Late Archaic/BM II				448.42	31.76	987.07	23.34	82.03	0	10.59
2000-1500 B.C.	Archaic (San Jose)	LA 67959	4	thermal	144.64	28.93	115.71	86.79	0	0	0
		LA 67959	5	thermal	264.1	46.61	147.58	7.77	0	0	0
	Total Archaic (San Jose)				204.37	37.77	131.65	47.28	0	0	0
2500-1700 B.C.	Archaic (San Jose)	LA 61290	16	metate fragment	350.27	0	372.16	0	65.68	0	21.89
		LA 61290	16a	metate fragment	782.07	0	614.48	93.1	37.24	0	0
		LA 61290	16b	metate	550.19	30.57	519.62	30.57	122.26	0	0
	Total Archaic (San Jose)				560.84	10.19	502.09	41.22	75.06	0	7.3
3300-2300 B.C.	Archaic (San Jose)	LA 61286	34	roasting pit	353.45	88.36	765.82	0	0	58.91	0
	Total Archaic (San Jose)				353.45	88.36	765.82	0	0	58.91	0

Table 172 (continued)

Date	Period	Site	Feature Number	Feature Type	*Zea mays*	*Eriogonum*	*Cylindropuntia*	Total
A.D. 200-400	Late Archaic/BM II	LA 61286	11	pit-structure floor	0	0	0	1710
		LA 61286	15	roasting pit	0	31.76	31.76	2445.88
		LA 61286	16	intramural storage	0	0	0	778.11
	Total Late Archaic/BM II				0	10.59	10.59	1644.66
2000-1500 B.C.	Archaic (San Jose)	LA 67959	4	thermal	0	0	0	462.86
		LA 67959	5	thermal	0	0	0	497.12
	Total Archaic (San Jose)				0	0	0	479.99
2500-1700 B.C.	Archaic (San Jose)	LA 61290	16	metate fragment	0	0	0	810
		LA 61290	16a	metate fragment	0	0	37.24	1731.72
		LA 61290	16b	metate	0	0	0	1406.04
	Total Archaic (San Jose)				0	0	12.41	1315.92
3300-2300 B.C.	Archaic (San Jose)	LA 61286	34	roasting pit	0	0	0	1354.91
	Total Archaic (San Jose)	LA 61286			0	0	0	1354.91

Profile Samples

LA 61286. The Late Archaic–Pueblo IV period is represented by Strata 1 and 2 (Table 173). *Pinus* concentration values are moderate to high. No other arboreal pollen taxa are present from this site. *Cylindropuntia*, Onagraceae, and *Eriogonum* pollen are present from these strata but not completely ubiquitous. These plants are common in the area and thus are expected. *Zea mays* pollen was present in the 300 BC to AD 1600 level. The low pollen concentration values of this agricultural plant suggest that it was in use only during this later period and that Ancestral Pueblo populations were farming along the northern tributaries of the Santa Fe River.

During the earlier Middle Archaic period, there appears to be a marked decline in the pollen concentration values from this site. *Eriogonum* and *Zea mays* pollen disappears, and the concentration values for *Cylindropuntia* likewise decrease. This may reflect a change in the number of plants of economically important taxa, but more likely it is the result of poor preservation. Likewise, in the earlier Early Archaic period, there is a marked increase in *Artemisia*, Poaceae, and cheno-am pollen, and *Eriogonum* pollen is again present. Again, I believe this is more indicative of preservation variation than of the relative proportions of these taxa. While the percentage of indeterminate pollen remains small to moderate (below 10 percent), the amount of pollen is relatively low, suggesting a strong weathering effect.

Alternatively, this could reflect a patchy biotic setting in which vegetation was dominated by a desert scrub grassland in some areas of the piedmont. This vegetational community produces much less pollen, which could account for the lower pollen concentration values. Also, the presence of a desert scrub grassland community in the immediate vicinity indicates that pines were some distance from the site. However, a patchy plant distribution could account for low pine values, even if small stands of piñon and juniper were no more than a few hundred meters from the site. This appears to change after AD 1, when pine is more abundant.

LA 61289. The upper Late Archaic–Pueblo IV level contained much higher pollen concentration values than the lower, older strata. *Pinus* pollen again was high (3,116 grains/g), and there were traces of other arboreal components, including *Juniperus*, *Picea*, and *Quercus* (6.43 grains/g each). This site was the farthest north in the project area, which may explain the presence of this taxon. While Picea pollen was undoubtedly the result of long-distance transport, the other taxa are common members of a piñon-juniper association, which again indicates the establishment of this community and the dominant plant association within the last two millennia.

Asteraceae and *Artemisia* pollen are ubiquitous in all four strata from this site, but *Artemisia* disappears from the two thin lenses dated to the Early and Middle Archaic periods. *Eriogonum* pollen is slightly higher in the earlier periods and decreases in the Late Archaic. *Cylindropuntia* is highest in the lens between 4200 and 3200 BC and absent from all other layers except the Late Archaic. This reflects essentially the same sequence observed at LA 62186—a stable desert scrub plant community with an increase in pines after AD 1.

LA 67959. This site contained only Late Archaic/Pueblo IV period and Middle Archaic sediments. Again, the Late Archaic/Pueblo IV period showed a slight increase in *Pinus* pollen (moderate to low at 1,098 grains/g) and contained traces of *Juniperus*, *Picea* (8.14 grains/g each), and *Quercus* (16.28 grains/g). Poaceae, cheno-am, Asteraceae, and *Artemisia* are generally high throughout the Middle Archaic period. However, no economic pollen types are present in the Middle Archaic sediments. A trace of *Zea mays* pollen was present again in the Late Archaic–Pueblo IV period, suggesting that the tributary arroyos that drained the piedmont may have been farmed by the Ancestral Pueblo population.

The lack of economic pollen from this site is somewhat surprising and may be a result of poor preservation. However, many of the economic pollen types are insect pollinated and thus produce much smaller amounts of pollen. It is rare for pollen of insect-pollinated taxa to be naturally incorporated into sediments.

Late Archaic–Pueblo IV. The strata dating to this time period contained slightly elevated arboreal pollen concentration values, particularly for *Pinus* (Table 174). *Picea* was present only from LA 61289 and LA 67959, the sites at either end of the project area. However, since there is only 40

Table 173. Pollen concentration values from column samples

Site	Stratum	Date	Period	*Pinus*	*Juniperus*	*Picea*	*Quercus*	Poaceae	Cheno-am
LA 61286	1	300 B.C.-A.D. 1600	Late Archaic/Pueblo IV	2330.82	0	0	0	49.59	479.39
		A.D. 1-present	Late Archaic/Pueblo IV	452.9	0	0	0	0	365.81
	Stratum 1 (total)			1391.86	0	0	0	24.8	422.6
	2	A.D. 1-present	Late Archaic/Pueblo IV	865.86	0	0	0	0	1703.79
	3	2900-2300 B.C.	Archaic (San Jose)	343.78	15	0	0	30	934.86
	3 and 4	2900-2300 B.C.	Archaic (San Jose)	427.35	0	0	13.28	75.93	1290.84
	4	2900-2300 B.C.	Archaic (San Jose)	240.59	7.68	0	3.84	0	425.45
	5	4500-4300 B.C.	Archaic (Bajada)	680.4	0	0	0	64.8	1360.8
LA 61289	2	A.D. 1-1600	Late Archaic/Pueblo IV	3116.6	6.43	6.43	6.43	0	1285.84
	4	3200 B.C.-A.D. 1	Archaic (San Jose)	1340.69	27.93	0	0	0	27.93
	5	3600-2900 B.C.	Archaic (San Jose)	228.71	0	0	0	0	228.71
	6	4200-3200 B.C.	Archaic (Bajada)	95.29	0	0	0	0	889.41
	Lens 1	4200-3200 B.C.	Archaic (Bajada)	482.55	0	0	0	0	741.06
	Lens 2	4600-3900 B.C.	Archaic (Bajada)	170.53	0	0	0	28.42	227.37
LA 67959	1	A.D. 1-1600	Late Archaic/Pueblo IV	1098.99	8.14	8.14	16.28	0	105.83
	3	2000-1500 B.C.	Archaic (San Jose)	214.41	0	0	0	23.82	476.47
	5	2000-1500 B.C.	Archaic (San Jose)	1023.16	56.84	0	0	85.26	1989.47
	7	Before 2400 B.C.	Archaic (San Jose)	152.61	0	0	0	0	140.87

Table 173 (continued)

Site	Stratum	Date	Period	High-spine Asteraceae	Low-spine Asteraceae	*Artemisia*	*Ephedra*	Indeterminate
LA 61286	1	300 B.C.-A.D. 1600	Late Archaic/Pueblo IV	66.12	115.71	0	16.53	49.59
		A.D. 1-present	Late Archaic/Pueblo Iv	87.1	69.68	17.42	0	34.84
	Stratum 1 (total)			76.61	92.7	8.71	8.27	42.22
	2	A.D. 1-present	Late Archaic/Pueblo IV	167.59	195.52	27.93	55.86	195.52
	3	2900-2300 B.C.	Archaic (San Jose)	44.59	60	15	22.3	127.3
	3 and 4	2900-2300 B.C.	Archaic (San Jose)	49.37	138.58	13.28	0	149.99
	4	2900-2300 B.C.	Archaic (San Jose)	57.16	23.03	0	0	77.5
	5	4500-4300 B.C.	Archaic (Bajada)	32.4	97.2	64.8	0	32.4
LA 61289	2	A.D. 1-1600	Late Archaic/Pueblo IV	273.87	93.86	49.85	28.43	171.08
	4	3200 B.C.-A.D. 1	Archaic (San Jose-) Late Archaic)	111.72	83.79	195.52	55.86	391.03
	5	3600-2900 B.C.	Archaic (San Jose)	152.47	19.06	19.06	19.06	57.18
	6	4200-3200 B.C.	Archaic (Bajada-San Jose)	95.29	0	63.53	0	127.06
	Lens 1	4200-3200 B.C.	Archaic (Bajada-San Jose)	86.17	103.4	0	0	155.11
	Lens 2	4600-3900 B.C.	Archaic (Bajada)	142.11	28.42	0	0	170.53
LA 67959	1	A.D. 1-1600	Late Archaic/Pueblo IV	32.56	16.28	8.14	8.14	40.7
	3	2000-1500 B.C.	Archaic (San Jose)	0	23.82	11.91	0	83.38
	5	2000-1500 B.C.	Archaic (San Jose)	227.37	28.42	28.42	56.84	369.47
	7	Before 2400 B.C.	Archaic (San Jose)	11.74	0	0	11.74	11.74

Table 173 (continued)

Site	Stratum	Date	Period	*Zea mays*	*Eriogonum*	*Cylindropuntia*	Onagraceae	Total
LA 61286	1	300 B.C.-A.D. 1600	Late Archaic/Pueblo IV	33.06	0	0	0	3140.82
		A.D. 1-present	Late Archaic/Pueblo Iv	0	0	17.42	2.68	1045.16
	Stratum 1 (total)			16.53	0	8.71	1.34	2092.99
	2	A.D. 1-present	Late Archaic/Pueblo IV	0	27.93	27.93	0	3267.93
	3	2900-2300 B.C.	Archaic (San Jose)	0	0	7.3	0	1600.14
	3 and 4	2900-2300 B.C.	Archaic (San Jose)	0	13.28	0	0	2171.91
	4	2900-2300 B.C.	Archaic (San Jose)	0	0	0	0	835.25
	5	4500-4300 B.C.	Archaic (Bajada)	0	0	32.4	0	2365.2
LA 61289	2	A.D. 1-1600	Late Archaic/Pueblo IV	0	14.07	7.79	0	5060.68
	4	3200 B.C.-A.D. 1	Archaic: San Jose-Late Archaic	0	27.93	0	0	2262.41
	5	3600-2900 B.C.	Archaic (San Jose)	0	0	0	0	724.24
	6	4200-3200 B.C.	Archaic: Bajada-San Jose	0	31.76	0	0	1302.35
	Lens 1	4200-3200 B.C.	Archaic: Bajada-San Jose	0	0	34.47	0	1602.77
	Lens 2	4600-3900 B.C.	Archaic (Bajada)	0	0	0	0	767.37
LA 67959	1	A.D. 1-1600	Late Archaic/Pueblo IV	8.14	0	8.14	0	1359.5
	3	2000-1500 B.C.	Archaic (San Jose)	0	0	0	0	833.82
	5	2000-1500 B.C.	Archaic (San Jose)	0	0	0	0	3865.26
	7	Before 2400 B.C.	Archaic (San Jose)	0	0	0	0	328.7

Table 174. Pollen concentration values from stratum samples

				Arboreal Pollen				Nonarboreal Pollen	
Period	Date	Stratum	Site	*Pinus*	*Juniperus*	*Picea*	*Quercus*	Poaceae	Cheno-am
Late Archaic/Pueblo IV	A.D. 1-1600	1	LA 61286	2330.82	0	0	0	49.59	479.39
		3	LA 61286	87.57	0	0	0	0	189.73
		3 and 4	LA 61286	456.34	0	0	0	45.63	775.77
			LA 61289	2671.28	0	0	12.86	0	1154.82
	Total A.D. 1-1600			1643.46	0	0	5.14	19.05	750.91
	300 B.C. -A.D. 1600	1	LA 61286	452.9	0	0	0	0	365.81
Total Late Archaic/Pueblo IV				1445.03	0	0	4.29	15.87	686.72
Archaic (San Jose/Late Archaic)	3200 B.C.-1 A.D.	4	LA 61286	227.81	0	0	0	0	582.19
Archaic (San Jose)	2000-1500 B.C.	1	LA 67959	1098.99	8.14	8.14	16.28	0	105.83
		3	LA 67959	214.41	0	0	0	23.82	476.47
		5	LA 67959	1023.16	56.84	0	0	85.26	1989.47
			LA 61289	170.53	0	0	0	28.42	227.37
	Total 2000-1500 B.C.			626.77	16.25	2.04	4.07	34.38	699.79
	2400+ B.C.	7	LA 67959	152.61	0	0	0	0	140.87
	2500-1700 B.C.	4	LA 61289	1340.69	27.93	0	0	0	27.93
		6	LA 61289	95.29	0	0	0	0	889.41
			LA 61289	1121.54	0	0	0	0	1183.85
	2900-2300 B.C.	2	LA 61286	865.86	0	0	0	0	1703.79
		3	LA 61286	600	30	0	0	60	1680
		4	LA 61286	253.36	15.36	0	7.68	0	268.72
		5	LA 61286	680.4	0	0	0	64.8	1360.8
	3600-2900 B.C.	3 and 4	LA 61286	398.36	0	0	26.56	106.23	1805.9
Archaic (Bajada/San Jose)	4200-3200 B.C.		LA 61289	2531.5	12.86	12.86	0	0	744.35
Archaic (Bajada)	4600-3900 B.C.	2	LA 61289	1650.57	0	0	0	0	1130.94
Grand total				1027.25	7.13	1.47	3.31	20.16	834.03

Table 174 (continued)

Period	Date	Stratum	Site	Nonarboreal Pollen				Economic Taxa	
				Low-spine Asteraceae	*Artemisia*	*Ephedra*	Indeterminate	*Zea mays*	*Eriogonum*
Late Archaic/Pueblo IV	A.D. 1-1600	1	LA 61286	115.71	0	16.53	49.59	33.06	0
		3	LA 61286	0	0	14.59	14.59	0	0
		3 and 4	LA 61286	91.27	0	0	114.08	0	0
			LA 61289	64.56	25.71	25.71	141.84	0	12.86
	Total A.D. 1-1600			67.22	10.29	16.51	92.39	6.61	5.14
	300 B.C. -A.D. 1600	1	LA 61286	69.68	17.42	0	34.84	0	0
Total Late Archaic/Pueblo IV				67.63	11.47	13.76	82.8	5.51	4.29
Archaic (San Jose/Late Archaic)	3200 B.C.-1 A.D.	4	LA 61286	0	0	0	101.25	0	0
Archaic (San Jose)	2000-1500 B.C.	1	LA 67959	16.28	8.14	8.14	40.7	8.14	0
		3	LA 67959	23.82	11.91	0	83.38	0	0
		5	LA 67959	28.42	28.42	56.84	369.47	0	0
			LA 61289	28.42	0	0	170.53	0	0
	Total 2000-1500 B.C.			24.24	12.12	16.25	166.02	2.04	0
	2400+ B.C.	7	LA 67959	0	0	11.74	11.74	0	0
	2500-1700 B.C.	4	LA 61289	83.79	195.52	55.86	391.03	0	27.93
		6	LA 61289	0	63.53	0	127.06	0	31.76
			LA 61289	124.62	0	62.31	218.08	0	0
	2900-2300 B.C.	2	LA 61286	195.52	27.93	55.86	195.52	0	27.93
		3	LA 61286	120	30	30	240	0	0
		4	LA 61286	46.07	0	0	53.74	0	0
		5	LA 61286	97.2	64.8	0	32.4	0	0
	3600-2900 B.C.	3 and 4	LA 61286	185.9	26.56	0	185.9	0	26.56
Archaic (Bajada/San Jose)	4200-3200 B.C.		LA 61289	60.96	22.39	9.53	105.73	0	0
Archaic (Bajada)	4600-3900 B.C.	2	LA 61289	122.26	122.26	0	183.4	0	30.57
Grand total				69.57	30.12	16.62	135.32	1.79	7.41

Table 174 (continued)

Period	Date	Stratum	Site	Economic Taxa		
				Cylindropuntia	Onagraceae	Total Concentration
Late Archaic/Pueblo IV	A.D. 1-1600	1	LA 61286	0		3140.82
		3	LA 61286	14.59		350.27
		3 and 4	LA 61286	0		1528.73
			LA 61289	17.23		4272.81
	Total A.D. 1-1600			9.81		2713.09
	300 B.C. -A.D. 1600	1	LA 61286	17.42	2.68	1045.16
Total Late Archaic/Pueblo IV				11.08		2435.1
Archaic (San Jose/Late Archaic)	3200 B.C.-1 A.D.	4	LA 61286	0		987.19
Archaic (San Jose)	2000-1500 B.C.	1	LA 67959	8.14		1359.5
		3	LA 67959	0		833.82
		5	LA 67959	0		3865.26
			LA 61289	0		767.37
	Total 2000-1500 B.C.			2.04		1706.49
	2400+ B.C.	7	LA 67959	0		328.7
	2500-1700 B.C.	4	LA 61289	0		2262.41
		6	LA 61289	0		1302.35
			LA 61289	31.15		3021.92
	2900-2300 B.C.	2	LA 61286	27.93		3267.93
		3	LA 61286	0		2850
		4	LA 61286	0		683.32
		5	LA 61286	32.4		2365.2
	3600-2900 B.C.	3 and 4	LA 61286	0		2815.08
Archaic (Bajada/San Jose)	4200-3200 B.C.		LA 61289	0		3743.55
Archaic (Bajada)	4600-3900 B.C.	2	LA 61289	0		3515.09
Grand total				7.22		2274.91

ft difference in elevation between any of the three sites, elevation is probably not a viable explanation for the deposition of this higher-elevation pollen type. LA 61289 and LA 67959 may have been somewhat closer to higher-elevation forests, the source of the *Picea* pollen. Alternatively, since the presence of *Picea* was based on only 1–2 grains, it is likely that it represents long-distance transport.

There appear to be increases in cheno-am in the two most northern sites (LA 61286 and LA 61289), particularly in Stratum 2. Interestingly, *Zea mays* pollen was present only in Stratum 1, the surface stratum. This argues for the presence of maize pollen as a much later development. It may represent contamination from a younger occupation, or it may be evidence of Ancestral Pueblo farming in the lower piedmont settings. *Artemisia* pollen was present in only two samples dated to this time period. Interestingly, it was present in the older, dated portion of this period (300 BC–AD 1600). It is interesting to speculate that *Artemisia* may have decreased along with the development of the piñon-juniper community sometime after AD 1.

Petersen (1985) argued the same sequence for southwestern Colorado. He interpreted the pollen record from Montezuma County, Colorado, as a repeated pattern of expansion and retreat of the piñon-juniper association. According to his data, the piñon-juniper community was poorly developed between 5750 and 4300 BP, expanded between 3400 and 2800 BP, and then retreated after 2800 BP. He also found evidence of piñon-juniper expansion between AD 800 and 1250, which coincides with Anasazi development. These fluctuations were brought about by alternating periods of weak and strong summer monsoons. The growth of piñon pines was likely to be limited to areas of strong summer monsoons and more frequent late afternoon rains (Petersen 1985).

A similar sequence of events may have taken place in the project area. Pollen from the Early and Middle Archaic periods may have been deposited under weaker monsoons, allowing the expansion of desert scrub grassland conditions at the expense of the dominant piñon-juniper plant community. The changes associated with the Late Archaic/Pueblo IV period may coincide with the later period of more intense summer monsoonal activity proposed for the southwestern Colorado area (Petersen 1985). The dating episodes, ranging from AD 1 to1600, were not precise enough for an accurate comparison, but the general nature of the sequence is extremely interesting. The earlier wetter period may not have occurred in the Santa Fe area, or did occur but was not detected because of poor preservation.

Middle Archaic. Strata correlated with this period were present at all three sites. *Pinus* pollen occurred in moderate to low quantities. *Juniperus* pollen was fairly ubiquitous in these strata, although not present in all samples, while traces of *Quercus* pollen were more intermittent. Cheno-am and high-spine and low-spine Asteraceae were more abundant than in the later period. Poaceae pollen disappeared during the middle portion of this period, and *Artemisia* pollen contained the highest levels in the earlier portion. While this may reflect preservation of the assemblages, it may also suggest changing conditions leading to a different distribution of grassland/scrubland plants and the piñon-juniper community.

The youngest example of Middle Archaic sediments was taken from LA 67959 (Strata 5 and 7). These strata were mostly devoid of economic pollen except for the single occurrence of *Cylindropuntia* pollen, probably the result of poor preservation.

Early Archaic. This dated period, including 4600–3900 BC and the Early to Middle Archaic transition (4200–3200 BC), was represented only at LA 61289. The pollen concentrations were extremely low, although *Eriogonum* pollen was present, and *Artemisia* was fairly high in the older portion. *Picea* pollen (12.86 grains/g) was also present from this level, again suggesting long-distance transport.

In general, the earlier levels (comprising both the Early and Middle Archaic periods) all indicate the presence of a well-developed desert scrub vegetation, including several taxa that could have played a role in subsistence. This does not mean that stands of piñon-juniper were not within range for fuel and construction material, only that they may not have been abundant in the immediate vicinity of the sites. The distance to the woodlands may have been less than 0.5 km, even as little as 0.2 km.

These profile samples indicated a generally stable vegetational community throughout the Archaic. The major change seems to have occurred sometime after AD 1 with the establishment of piñon-juniper communities closer to these sites.

Conclusions

Based on the pollen taxa recovered, the question always arises: Are economic taxa absent from these assemblages because they are truly not present, or are they present in such small amounts that they were missed during sampling? In order to assess the likelihood of their being missed, the estimated maximum potential concentration values of target taxa were computed. Since the entire slide was examined (either by count or low-magnification scan of the slide), the estimated number of marker grains per slide was computed by averaging the number of marker grains per transect, counted, and multiplied by the total number of transects examined. Assuming that the first grain observed on a hypothetical second slide was one of the target taxa, the maximum potential concentration value is computed (Dean 1999). Thus, the number of the fossil grains is one, and the number of marker grains per slide is substituted for the number of marker grains counted in the pollen concentration formula. These data indicate that the estimated potential pollen concentration values fall between 1.18 and 25.31 grains/g. Without examining the total of the pollen residues, we can never be absolutely sure that target taxa are indeed absent from the assemblage. Given the low estimated potential pollen concentration values, however, I concluded that it is more likely that the missing taxa were indeed absent from these assemblages.

The general preservation of the pollen assemblages from this project was poor, in spite of the pollen concentration values obtained. Throughout most of the Archaic period, the areas nearest the sites was probably dominated by a desert scrub grassland. Pines and other trees were likely some distance removed from the site in what can be characterized as a patchy distribution. During the Late Archaic–Pueblo IV period, trees may have encroached, been this change was more regional than local.

The pollen data also suggest a correspondence to the alternating expansion and reduction of piñon-juniper plant communities as suggested by pollen data from southwestern Colorado. The general pattern of expanding piñon-juniper communities as a function of stronger summer rains appears to be applicable here. Further refinements of the chronology is need before a precise comparison can be made.

The pollen assemblages suggest that a variety of wild plant materials were available for exploitation during the Archaic period. The evidence from the archaeological samples, while meager, does suggest that these plants were exploited. During the Archaic, people seem to have relied heavily upon these gathered plant resources in the area. Maize may have been available during the Ancestral Pueblo period. Alternatively, maize may not have been present locally, but maize pollen may have been deposited later as a contaminant during the most recent depositional event.

Obsidian Artifacts

M. Steven Shackley, Ph.D.

Ninety-one obsidian artifacts from three sites north of Santa Fe (LA 61286, LA 61290, and LA 108902) underwent geochemical analysis. All of the artifacts were made of obsidian from one of the domes and chemical groups in the Toledo and Valles Caldera collapse phases of the Jemez Mountain Volcanic Field.

Laboratory Analysis, Sampling, and Instrumentation

All samples were analyzed whole, with little or no formal preparation. The results presented here are quantitative in that they are derived from "filtered" intensity values ratioed to the appropriate X-ray continuum regions through a least squares fitting formula rather than plotting the proportions of the net intensities in a ternary system (McCarthy and Schamber 1981; Schamber 1977). These data allow for interinstrument comparison with a predictable degree of certainty (Hampel 1984).

The trace element analyses were performed in the Department of Geology and Geophysics, University of California, Berkeley, using a Philips PW 2400 wavelength X-ray fluorescence spectrometer with an LiF 200 crystal for all measurements. This crystal spectrometer uses specific software written by Philips (SuperQ/quantitative) and modifies the instrument settings between elements of interest. Practical detection limits have not been calculated for this new instrument, but the variance from established standards is shown in Table 175. Sample selection is automated and controlled by the Philips software. X-ray intensity Kα-line data with the scintillation counter were measured for rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), and niobium (Nb). X-ray intensities for barium (Ba) were measured with the flow counter from the Lα-line. Trace element intensities were converted to concentration estimates by employing a least-squares calibration line established for each element from the analysis of international rock standards certified by the National Institute of Standards and Technology (NIST), the US Geological Survey (USGS), the Canadian Centre for Mineral and Energy Technology, and the Centre de Recherches Pétrographiques et Géochimiques (Govindaraju 1994). Specific standards used for the best fit regression calibration for elements Ti through Nb include G-2 (basalt), AGV-1 (andesite), GSP-1 and SY-2 (syenite), BHVO-1 (hawaiite), STM-1 (syenite), QLM-1 (quartz latite), RGM-1 (obsidian), W-2 (diabase), BIR-1 (basalt), SDC-1 (mica schist), TLM-1 (tonalite), SCO-1 (shale), all US Geological Survey standards, and BR-N (basalt) from the Centre de Recherches Pétrographiques et Géochimiques (Govindaraju 1994).

The data from the SuperQ software were translated directly into Excel® for Windows software for manipulation and on into SPSS® for Windows for statistical analyses. In order to evaluate these quantitative determinations, machine data were compared to measurements of known standards during each run. An analysis of RGM-1 is included in Table 175. Source nomenclature follows Baugh and Nelson (1987), Glascock et al. (1998), and Shackley (1988, 1995, 1998a). Further information on the laboratory instrumentation can be found at: http://obsidian.pahma.berkeley.edu/ and Shackley (1998a). Trace element data exhibited in Table 175 are reported in parts per million (ppm), a quantitative measure by weight. Two samples were too small for confident analysis (Davis et al. 1998).

Silicic Volcanism in the Jemez Mountains

Due to their proximity and relationship to the Rio Grande Rift System, potential uranium ore, geothermal possibilities, an active magma chamber, and a number of other geological issues, the Jemez Mountains and the Toledo and Valles Calderas particularly have been the subject of intensive structural and petrological study, particularly since the 1970s (Bailey et al. 1969; Gardner et al. 1986; Heiken et al. 1986; Ross et

Table 175. Concentration of elements (parts per million)

Sample Number	Rb	Sr	Y	Zr	Nb	Ba	Source
LA108902-10	209	7	64	181	97	2	Cerro Toledo rhyolite
LA108902-113	206	7	64	180	95	-1	Cerro Toledo rhyolite
LA108902-129	207	6	64	186	99	48	Cerro Toledo rhyolite
LA108902-139	208	7	63	176	94	36	Cerro Toledo rhyolite
LA108902-153	205	7	62	179	95	9	Cerro Toledo rhyolite
LA108902-165	199	7	61	174	94	25	Cerro Toledo rhyolite
LA108902-173	209	6	63	182	95	7	Cerro Toledo rhyolite
LA108902-184	208	6	61	179	94	-2	Cerro Toledo rhyolite
LA108902-192	209	7	64	185	99	14	Cerro Toledo rhyolite
LA108902-29	154	10	43	167	53	56	Valle Grande
LA108902-37	211	6	65	182	97	30	Cerro Toledo rhyolite
LA108902-40	209	6	63	185	98	29	Cerro Toledo rhyolite
LA108902-43	149	11	41	166	52	92	Valle Grande
LA108902-44	194	8	59	170	88	17	Cerro Toledo rhyolite
LA108902-46	203	6	61	179	95	12	Cerro Toledo rhyolite
LA108902-68-1	208	7	64	184	98	12	Cerro Toledo rhyolite
LA108902-68-2	208	7	65	182	98	9	Cerro Toledo rhyolite
LA108902-71-1	158	10	44	170	54	43	Valle Grande
LA108902-71-2	209	8	61	180	95	-1	Cerro Toledo rhyolite
LA108902-76	197	6	62	177	94	5	Cerro Toledo rhyolite
LA108902-79	206	6	64	181	96	15	Cerro Toledo rhyolite
LA108902-83	145	11	23	77	45	48	El Rechuelos
LA108902-84	200	6	60	175	94	7	Cerro Toledo rhyolite
LA108902-85	178	7	54	163	85	18	Cerro Toledo rhyolite
LA108902-98	156	10	44	171	55	27	Cerro Toledo rhyolite
LA61286-208	206	7	62	177	95	17	Cerro Toledo rhyolite
LA61286-267	216	7	64	187	100	-2	Cerro Toledo rhyolite
LA61286-301-1	211	7	63	181	97	-5	Cerro Toledo rhyolite
LA61286-301-2	206	7	64	180	98	2	Cerro Toledo rhyolite
LA61286-302	206	7	62	177	93	22	Cerro Toledo rhyolite
LA61286-307-1	209	7	62	179	97	44	Cerro Toledo rhyolite
LA61286-307-2	204	7	64	182	98	-3	Cerro Toledo rhyolite
LA61286-311-1	214	6	65	185	100	16	Cerro Toledo rhyolite
LA61286-311-2	199	6	60	179	94	39	Cerro Toledo rhyolite
LA61286-311-3	205	7	62	179	95	25	Cerro Toledo rhyolite
LA61286-311-4	199	8	61	185	93	36	Cerro Toledo rhyolite
LA61286-311-5	209	7	64	181	96	25	Cerro Toledo rhyolite
LA61286-311-6	199	5	59	171	88	37	Cerro Toledo rhyolite
LA61286-312-1	208	7	63	178	94	28	Cerro Toledo rhyolite
LA61286-312-10	213	7	64	177	95	24	Cerro Toledo rhyolite
LA61286-312-2	202	7	61	174	93	8	Cerro Toledo rhyolite
LA61286-312-3	185	7	56	164	85	38	Cerro Toledo rhyolite
LA61286-312-4	197	7	59	179	91	94	Cerro Toledo rhyolite
LA61286-312-5	206	6	64	177	97	2	Cerro Toledo rhyolite
LA61286-312-6	201	8	61	174	93	56	Cerro Toledo rhyolite
LA61286-312-7	215	8	58	165	87	83	Cerro Toledo rhyolite
LA61286-312-8	220	7	64	184	96	27	Cerro Toledo rhyolite
LA61286-312-9	209	7	64	181	98	7	Cerro Toledo rhyolite
LA61286-313-1	212	7	65	185	98	11	Cerro Toledo rhyolite
LA61286-313-2	205	6	63	179	97	3	Cerro Toledo rhyolite
LA61286-313-3	203	6	62	180	96	-6	Cerro Toledo rhyolite
LA61286-313-4	214	6	62	168	90	14	Cerro Toledo rhyolite
LA61286-313-5	208	7	64	182	97	22	Cerro Toledo rhyolite
LA61286-313-6	207	7	63	182	96	29	Cerro Toledo rhyolite
LA61286-313-7	206	7	63	182	98	3	Cerro Toledo rhyolite
LA61286-315	202	7	63	176	95	6	Cerro Toledo rhyolite
LA61286-317	192	7	59	167	89	1	Cerro Toledo rhyolite
LA61286-318-1	207	6	62	178	94	52	Cerro Toledo rhyolite
LA61286-318-2	214	7	61	169	92	-4	Cerro Toledo rhyolite

Table 175 (continued).

Sample Number	Rb	Sr	Y	Zr	Nb	Ba	Source
LA61286-318-3	212	7	65	183	98	11	Cerro Toledo rhyolite
LA61286-318-4	205	7	61	177	94	24	Cerro Toledo rhyolite
LA61286-318-5	206	7	63	180	96	20	Cerro Toledo rhyolite
LA61286-318-6	201	7	60	173	92	20	Cerro Toledo rhyolite
LA61286-319	186	6	59	168	91	25	Cerro Toledo rhyolite
LA61286-320-1	208	6	64	180	96	23	Cerro Toledo rhyolite
LA61286-320-2	202	7	60	171	90	7	Cerro Toledo rhyolite
LA61286-337	212	6	62	177	95	0	Cerro Toledo rhyolite
LA61286-339	197	6	59	176	92	21	Cerro Toledo rhyolite
LA61286-349	206	6	62	180	97	6	Cerro Toledo rhyolite
LA61286-374	208	7	63	181	97	8	Cerro Toledo rhyolite
LA61286-380	203	7	59	171	90	55	Cerro Toledo rhyolite
LA61286-403	188	8	56	166	87	40	Cerro Toledo rhyolite
LA61286-407	202	6	62	181	96	6	Cerro Toledo rhyolite
LA61286-415	202	7	62	180	95	13	Cerro Toledo rhyolite
LA61286-419	199	7	59	169	91	3	Cerro Toledo rhyolite
LA61286-435	204	6	63	183	97	5	Cerro Toledo rhyolite
LA61286-507	222	7	66	189	100	18	Cerro Toledo rhyolite
LA61286-66	163	10	44	167	55	73	Valle Grande
LA61286-91	170	9	46	173	58	21	Valle Grande
LA61286-92	152	10	40	149	47	77	Valle Grande
LA61286-96	166	10	45	175	57	34	Valle Grande
LA61286-98	182	11	44	191	55	61	Valle Grande
LA61286-99	163	10	44	173	54	60	Valle Grande
LA61290-110	155	10	41	166	53	57	Valle Grande
LA61290-34	162	10	42	171	54	52	Valle Grande
LA61290-49	163	10	44	174	56	48	Valle Grande
LA61290-54-1	166	11	44	177	56	17	Valle Grande
LA61290-54-2	165	10	44	173	53	25	Valle Grande
LA61290-58	176	10	45	178	57	38	Valle Grande
LA61290-68	214	7	65	188	100	14	Cerro Toledo rhyolite
LA61290-9	166	11	44	169	53	27	Valle Grande
RGM-1	145	102	24	218	9	803	standard
RGM-1	145	103	25	217	9	806	standard
RGM-1	145	103	25	216	9	809	standard

al. 1961; Smith et al. 1970; Fig. 273). Half of the 1986 *Journal of Geophysical Research*, volume 91, was devoted to the then current research on the Jemez Mountains. More useful to archaeologists is Baugh and Nelson's (1987) article on the relationship between northern New Mexico archaeological obsidian sources and procurement on the southern Plains.

Due to continuing tectonic stress along the Rio Grande, a lineament down into the mantle has produced a great amount of mafic volcanism during the last 13 million years. Earlier eruptive events during the Tertiary, more likely related to the complex interaction of the Basin and Range and Colorado Plateau provinces, produced bimodal andesite-rhyolite fields, of which the Paliza Canyon (Keres Group) and probably the Polvadera Group are a part (Smith et al. 1970). While both groups appear to have produced artifact-quality obsidian, the nodule sizes are relatively small due to hydration and devitrification over time (Hughes and Smith 1993; Shackley 1990, 1998b). Later, during rifting along the lineament and other processes not well understood, first the Toledo Caldera (1.45 Ma) and then the Valles Caldera (1.12 Ma) collapsed, causing the ring-eruptive events that were dominated by crustally derived silicic volcanisim and dome formation. The Cerro Toledo rhyolite and Valles Grande member obsidian are grouped within the Tewa Group because of similar magmatic origins. The slight difference in trace-element chemistry is probably a result of the evolution of the magma through time from the Cerro Toledo event to the Valle Grande events (Hildreth 1981; Mahood and Stimac 1990; Shackley 1998c; Fig.

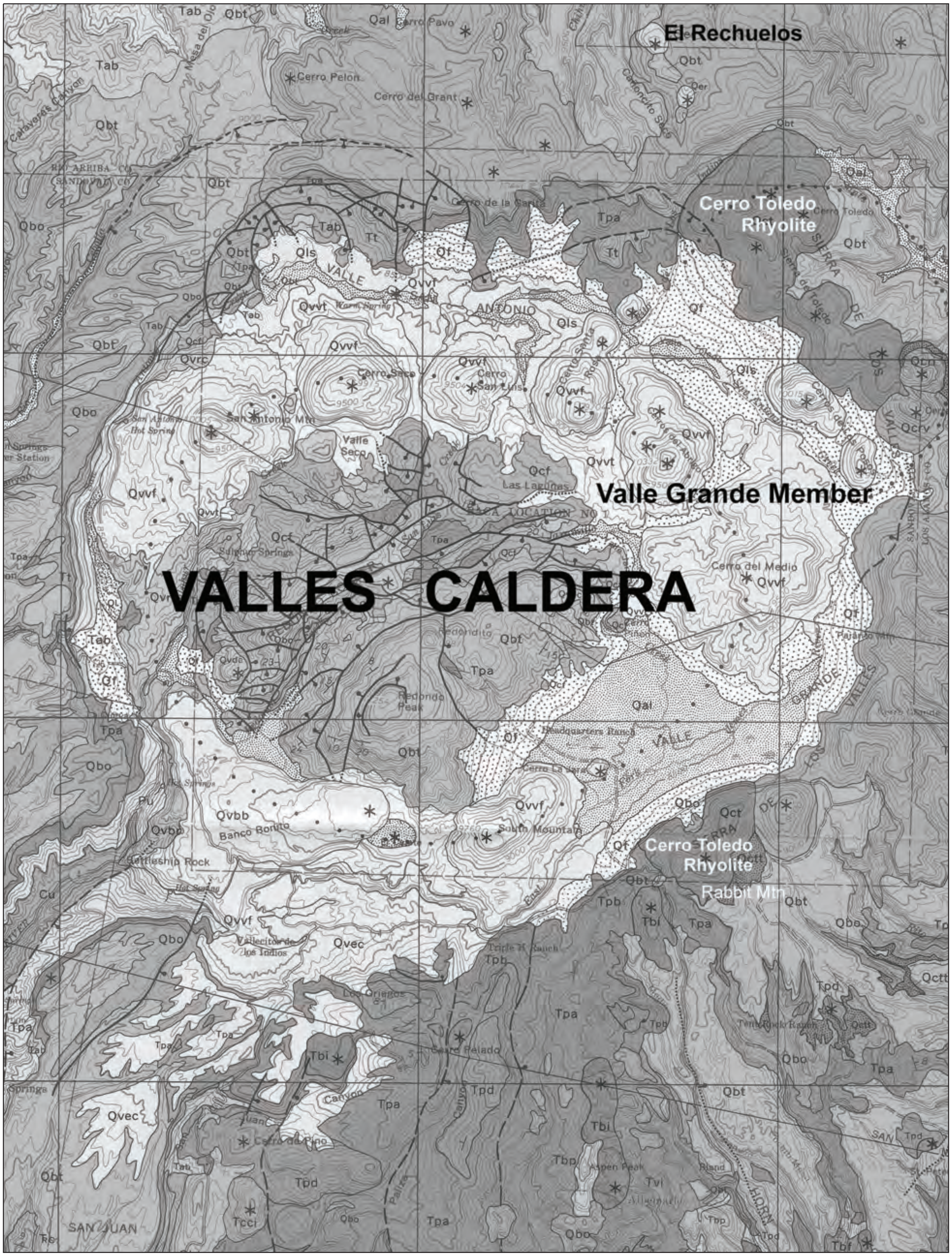


Figure 273. Topographical rendering of a portion of the Jemez Mountains, Valles Caldera, and relevant features (from Baugh and Nelson 1987; Smith et al. 1970).

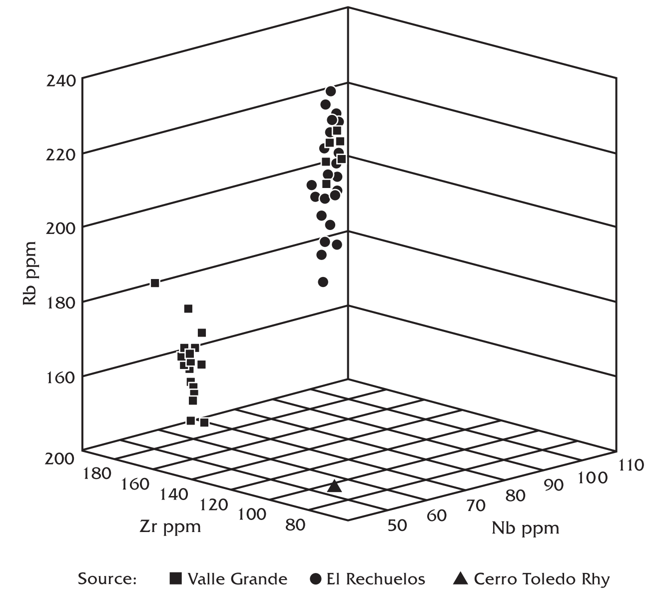


Figure 274. Rb, Zr, Nm plot of archaeological samples from all sites.

274). This evolutionary process has recently been documented in the Mount Taylor field (Shackley 1998c). Given the relatively recent events in the Tewa Group, nodule size is large, and hydration and devitrification minimal, yielding the best natural glass for tool production in the Jemez Mountains.

Recent study of the secondary depositional context of these sources and their relationship to the Rio Grande Rift has indicated that only two of the major sources enter that stream system (Shackley 2000). Cerro Toledo rhyolite erodes from the domes in the Sierra de Toledo along the northeast scarp of the caldera and in much greater quantity because of the ash flow tuff eruptive event associated with the Rabbit Mountain dome on the southeast margin of the caldera. This eruption created large quantities of glass that have continually eroded into the Rio Grande system. Most likely the Cerro Toledo obsidian in these sites was procured directly from Rio Grande alluvium or the Puye formation, northeast of Santa Fe. El Rechuelos obsidian is present on a number of minor domes northeast of the caldera and eroded north into the Rio Chama and ultimately into the Rio Grande. The one artifact from LA 108902 could have been produced from raw material in the Rio Grande system.

Obsidian from the Valle Grande member does not leave the caldera floor. Although some small nodules have been recovered from the East Jemez River, it does not erode outside the caldera area (Shackley 2000), probably because of the recent event that occurred as a resurgence on the caldera floor. Importantly, this would indicate that Valle Grande obsidian was procured from the caldera floor proper (e.g., at Cerro del Medio) directly or through exchange with groups with direct access. Cerro Toledo rhyolite and El Rechuelos obsidian could also have been procured in this way, but they are also available in smaller nodules from the Santa Fe area in the Rio Grande alluvium.

Conclusion

All three sites exhibit artifacts produced from obsidian procured from the Cerro Toledo and Valle Grande members of the Valles Caldera (Table 176). While the sample is quite small, LA 61290 exhibits a distribution of these two sources opposite to that of the other two sites. In the absence of corollary data, the sample size limits our ability to arrive at further conclusions.

Table 176. Source of material by site

Count % within Site % within Source % of Total	Cerro Toledo Rhyolite	El Rechuelos	Valle Grande	Total
LA 108902	21	1	3	25
	84.0%	4.0%	12.0%	100.0%
	28.4%	100.0%	18.8%	27.5%
	23.1%	1.1%	3.3%	27.5%
LA 61286	52	-	6	58
	89.7%	-	10.3%	100.0%
	70.3%	-	37.5%	63.7%
	57.1%	-	6.6%	63.7%
LA 61290	1	-	7	8
	12.5%	-	87.5%	100.0%
	1.4%	-	43.8%	8.8%
	1.1%	-	7.7%	8.8%
Total	74	1	16	91
	81.3%	1.1%	17.6%	100.0%
	100.0%	100.0%	100.0%	100.0%
	81.3%	1.1%	17.6%	100.0%

Radiocarbon Samples

Jesse B. Murrell

Radiocarbon dating analyses were conducted on 34 samples of wood charcoal. The wood includes piñon, juniper, oak, and indeterminate conifer. The samples were collected from six sites: LA 61286, LA 61287, LA 61289, LA 61290, LA 61293, and LA 67959. All are composite samples collected from structures or thermal features that contain material that is believed to be in primary context. The analyses, which included radiometric and AMS (accelerated mass spectrometry) standard delivery, were conducted by Beta Analytic, Inc. Age determinations are distributed across a broad time range of over five millennia, from 5640 ± 50 BP to 520 ± 70 BP (Table 177).

Analyses yielded multiple age determinations from all sites except LA 61287. A cursory review of these determinations by site reveals that there is some overlap. If multiple determinations overlap, then there is a measurable probability that the determinations are estimating the same age (Smiley 1985:77). Researchers have employed a variety of statistical tests to measure the probability of the contemporaneity of multiple determinations (Berry 1982:9–10; Smiley 1985:76–86). Although it is possible that the suite of radiocarbon determinations from a site simply represents multiple distinct occupations, it is equally plausible that if there is not a statistically significant difference between multiple determinations, a weighted average or pooled mean conventional age can be calculated that represents one occupation and provides a more accurate reflection of the occupational chronology of the project area (Dello-Russo 1999:115–116).

To determine if statistically significant differences exist between or among multiple conventional radiocarbon ages, a standard chi-square test was conducted with the aid of CALIB Rev 4.2, a radiocarbon calibration program that was written and distributed by the University of Washington's Quaternary Isotope Laboratory. This testing was conducted at the intrasite level. It cannot be assumed that all tested groups of determinations are estimating the same true age because each determination was obtained from a different object. The possibility of sampling error is acknowledged. These assumptions are comparable to Wilson and Ward's (1981:22, cited in Smiley 1985:81) Case IIb. Groups were defined by sorting the determinations by decreasing age and testing an increasingly larger number of successively younger determinations until the test resulted in statistically significant differences at the .05 level.

CALIB was also used for the calibration of the conventional radiocarbon ages that are presented in Table 177. The INTCAL98.14C dataset and calculation Method B, which employs a probability distribution, were selected for calibration. The relative area that each calibrated age range occupies under the probability distribution is also presented. The larger an area occupied by a two-sigma range, the greater the likelihood that the true age falls within that range. In each case, the total area under the probability distribution was normalized to equal one.

Chi-square testing identified ten distinct groups made up of one or more radiocarbon determinations that are statistically related within the group but statistically different from other groups. A weighted average conventional age, which takes into account the standard deviation of the constituent conventional radiocarbon ages, was calculated and then calibrated for each of these groups. Table 177 presents the CALIB-generated testing results, weighted average conventional ages, and the two-sigma calibrations of the weighted average conventional ages. Statistically significant differences do exist between nine determinations and other single determinations and groups of determinations. Despite the fact that these determinations stand alone, they were assigned a group number. Each group, which consists of either single or multiple determinations, may represent one distinct occupation or occupations that occurred within a short span of years. A two-sigma calibration midpoint was calculated for each group and presented in Table 177. Other researchers (Smiley 1997:18; Dello-Russo 1999:116) have used a similarly calculated midpoint instead of the often confusing multiple calibration intercepts

Table 177. Radiocarbon data

Lab Code (Beta)	Sample Code (LA-Feature-FS)	Conventional Radiocarbon Age (BP)	2-Sigma Calibration / Relative Area under Probability	Group Number	Test Statistic T' / Chi Square Value	Weighted Average Conventional Age (BP)	2-Sigma Calibration of Weighted Average Conventional Age / Relative Area under Probability Distribution	Midpoint of Total Range of 2-Sigma Calibration
143393	61286-56-427	5630±40	BC 4538-4505/.110 BC 4505-4425/.514 BC 4425-4361/.376	61286-1	0.02 3.84	5634±33	BC 4538-4505/.111 BC 4505-4433/.551 BC 4423-4362/.338	BC 4450
132619	61286-55-424	5640±50	BC 4584-4564/.020 BC 4554-4353/.980					
132620	61286-44-411	4350±80	BC 3337-3208/.135 BC 3194-3150/.034 BC 3139-2864/.803 BC 2806-2779/.017 BC 2771-2760/.006 BC 2718-2708/.005	61286-2	0.31 3.84	4316±53	BC 3095-2870/.981 BC 2803-2783/.016 BC 2767-2764/.002 BC 2715-2714/.001	BC 2905
143394	61286-57-442	4290±70	BC 3097-2835/.751 BC 2819-2663/.239 BC 2648-2630/.010					
132623	61286-25-299	4090±80	BC 2876-2472/1.00	61286-3	0.77 5.99	4074±33	BC 2858-2812/.142 BC 2743-2724/.020 BC 2698-2552/.670 BC 2540-2491/.167	BC 2675
132621	61286-39-402	4090±40	BC 2864-2807/.201 BC 2778-2771/.008 BC 2760-2718/.084 BC 2706-2555/.614 BC 2538-2493/.093					
132618	61286-60-445	4020±70	BC 2863-2808/.077 BC 2777-2773/.002 BC 2759-2719/.034 BC 2705-2395/.837 BC 2393-2337/.048 BC 2318-2312/.003					
143392	61286-52-417	3910±40	BC 2548-2543/.005 BC 2490-2476/.014 BC 2475-2285/.962 BC 2248-2234/.015 BC 2216-2213/.003	61286-4	0.5 3.84	3900±40	BC 2472-2280/.965 BC 2251-2231/.025 BC 2219-2209/.010	BC 2341
143391	61286-30-354	3820±120	BC 2577-1936/.996 BC 1934-1921/.004					
143390	61286-22-280	2240±80	BC 481-468/.006 BC 448-442/.002 BC 412-48/.993	61286-5	0.69 3.84	2189±54	BC 386-106/.997 BC 98-95/.003	BC 241
132624	61286-18-269	2150±70	BC 381-40/.991 BC 26-24/.002 BC 9-2/.007					
132625	61286-19-279	1980±60	BC 165-128/.031 BC 122-AD 133/.964 AD 164-167/.002 AD 202-206/.002	61286-6	*	*	*	AD 21
132626	61286-11-140	1720±40	AD 240-415/1.000	61286-7	0.28 3.84	1706±35	AD 253-416/1.000	AD 335
132622	61286-15-150	1680±60	AD 239-474/.921 AD 476-532/.079					

Table 177 (continued).

Lab Code (Beta)	Sample Code (LA-Feature-FS)	Conventional Radiocarbon Age (BP)	2-Sigma Calibration / Relative Area under Probability	Group Number	Test Statistic T' / Chi Square Value	Weighted Average Conventional Age (BP)	2-Sigma Calibration of Weighted Average Conventional Age / Relative Area under Probability Distribution	Midpoint of Total Range of 2-Sigma Calibration
143395	61287-1-39	1100±60	AD 780-794/.028 AD 798-1024/.972	61287-1	*	*	*	AD 902
143398	61289-29-203	5450±200	BC 4687-4628/.023 BC 4624-3893/.940 BC 3881-3799/.037	61289-1	*	*	*	BC 4243
132608	61289-26-191	4650±100	BC 3642-3256/.823 BC 3248-3098/.177	61289-2	2.41 5.99	4536±35	BC 3363-3261/.351 BC 3241-3100/.649	BC 3232
132610	61289-17-126	4540±40	BC 3367-3256/.371 BC 3247-3098/.629					
143397	61289-22-186	4450±80	BC 3349-2919/1.000					
143396	61289-2-15	910±50	AD 1022-1221/1.000	61289-3	*	*	*	AD 1122
132611	61289-1-16	560±60	AD 1299-1375/.539 AD 1375-1439/.461	61289-4	*	*	*	AD 1369
143402	61290-23-239	3870±70	BC 2558-2537/.015 BC 2495-2138/.985	61290-1	7.29 7.81	3776±25	BC 2288-2137/.989 BC 2077-2070/.011	BC 2179
132613	61290-13-208	3830±40	BC 2457-2418/.056 BC 2407-2195/.888 BC 2173-2143/.056					
143400	61290-15-198	3730±40	BC 2281-2251/.048 BC 2231-2219/.014 BC 2209-2025/.917 BC 1995-1981/.021					
132614	61290-20-229	3660±70	BC 2277-2253/.015 BC 2229-2221/.004 BC 2206-1877/.962 BC 1841-1826/.011 BC 1796-1781/.008					
143401	61290-18-225	3570±70	BC 2134-2080/.062 BC 2052-1739/.931 BC 1707-1696/.008	61290-2	*	*	*	BC 1915
143399	61290-6-132	820±60	AD 1040-1099/.121 AD 1116-1141/.059 AD 1152-1290/.820	61290-3	*	*	*	AD 1165
143404	61293-3-89	3300±50	BC 1727-1723/.005 BC 1689-1489/.948 BC 1480-1450/.047	61293-1	2.183.84	3243±37	BC 1615-1606/.017 BC 1605-1431/.983	BC 1523
132616	61293-28-158	3190±50	BC 1601-1559/.047 BC 1533-1374/.928 BC 1337-1319/.024					
132615	61293-21-158	1920±50	BC 38-30/.011 BC 21-11/.017 BC 1-AD 224/.972	61293-2	*	*	*	AD 93
132617	61293-6-90	850±50	AD 1039-1103/.189 AD 1115-1142/.086 AD 1151-1277/.725	61293-3	*	*	*	AD 1158
143403	61293-8-82	520±70	AD 1294-1494/.990 AD 1504-1504/.001 AD 1604-1613/.010	61293-4	*	*	*	AD 1454
143405	67959-5-14	3820±40	BC 2456-2445/.012 BC 2432-2422/.012 BC 2404-2360/.086 BC 2354-2140/.891	67959-1	3.093.84	3786±37	BC 2396-2388/.006 BC 2338-2318/.020 BC 2313-2130/.924 BC 2081-2044/.050	BC 2220
132609	67959-6-11	3660±80	BC 2286-2247/.028 BC 2234-2216/.012 BC 2214-1870/.918 BC 1843-1810/.025 BC 1801-1776/.017					

* Testing revealed that there are statistically significant differences if the sample is included in a tested batch; therefore the sample stands alone and is not included in weighted average ages.

derived from one conventional radiocarbon age. Regarding the calculation of the midpoint, Dello-Russo (1999:116) uses the portion of the two-sigma calibration that occupies the greatest area under the probability distribution. Here, the midpoint was calculated by using the maximum and minimum values of the total two-sigma calibration age range. The two-sigma calibration of the conventional radiocarbon age was used for groups composed of one determination, while the two-sigma calibration of the weighted average of conventional ages was used for groups composed of multiple determinations.

No attempt was made to adjust determinations to control built-in age and cross-section effect error. Both are potential error sources that result in age overestimation (Smiley 1985:39). Built-in age, or the old-wood effect, refers to a disparity between the death date of the tree or tree part and the cultural event with which it is associated, while the cross-section effect refers to a disparity between the death date of the tree or tree part and the dated material (Smiley 1985:39). For example, dating wood that was collected as deadwood and then used a fuel results in built-in age error, while dating wood from the older interior rings of a tree or tree part results in cross-section effect error (Smiley 1985:39,102). In a recent attempt to control built-in age error, Dello-Russo (1999:126–128) contends that Smiley's (1985) Black Mesa model can be extended to radiocarbon data produced during a data recovery project on Ceja Mesa in Rio Rancho, New Mexico. He simply adds 250 years to the midpoint calibrated dates recovered from structures and adds 413 years to midpoint calibrated dates recovered from hearths, roasting pits, ash lenses, middens, and activity areas (Dello-Russo 1999:128). These numbers of years are means of overestimate ranges reported by Smiley (1985:235, 256). This was not attempted in the current analysis due to potential differences in the wood-age distribution and wood-use behavior (Smiley 1985:98) between Black Mesa and the Northwest Santa Fe Relief Route project area and between the cultural groups occupying these areas.

A high-low chart (Fig. 275) was constructed to show how the groups relate to one another. Most conspicuous is the lack of determinations within the range of cal. 1400 to 400 BC, which falls within the Late Archaic period. At least two shorter discontinuities are also apparent in this array of age determinations: between cal. 3750 to 3375 BC, which falls within the Early Archaic period; and between cal. AD 425 to 750, which falls in the Latest Archaic period of the Santa Fe area. The chart displays multiple occupation episodes for four sites: LA 61286, LA 61289, LA 61290, and LA 61293. The closely clustered determinations from these sites may represent periodic reoccupation of the site within a relatively short time range. For instance, Groups 2, 3, and 4 from LA 61286 may represent three distinct occupations within a 900-year time span or one occupation in which some or all of the groups are the product of age biases. It is also evident from the chart that there are contemporaneous occupations at the intersite level.

Other researchers (Berry and Berry 1986:307–311; Dello-Russo 1999:110, 135, 137) have used probability distributions to detect occupational modes and hiatuses in the radiocarbon data. CALIB was used to generate histograms that display a composite distribution of the summed age range probabilities. The total area under each of these composite probability distributions was normalized to equal one.

Figure 276 includes all 34 individual determinations from the current Northwest Santa Fe Relief Route project area. Obvious in this distribution are at least five occupational modes of fairly comparable relative frequency. These modes occur between cal. 4500 and 4450 BC, cal. 2650 and 2600 BC, cal. 2450 and 2200 BC, cal. AD 250 and 400, and cal. AD 1150 and 1250. Several temporal discontinuities in the radiocarbon data are apparent in this probability distribution. These occur between cal. 3800 and 3700 BC, cal. 1300 and 450 BC, cal. AD 550 and 1000, and cal. AD 1600 and the present. This discontinuous record is consistent with intermittent occupations of the project area. However, an overall gradual increase in occupational intensity can be suggested for cal. 3700 to 2400 BC, which falls in the Early and Middle Archaic periods.

The project yielded important radiocarbon data associated with the Archaic period in the Santa Fe area. The majority of determinations (28 of 34, or 82 percent) precede cal. AD 600. A probability distribution that excludes the determinations postdating cal. AD 600 was generated (Fig. 277). The excluded determinations consist of sample

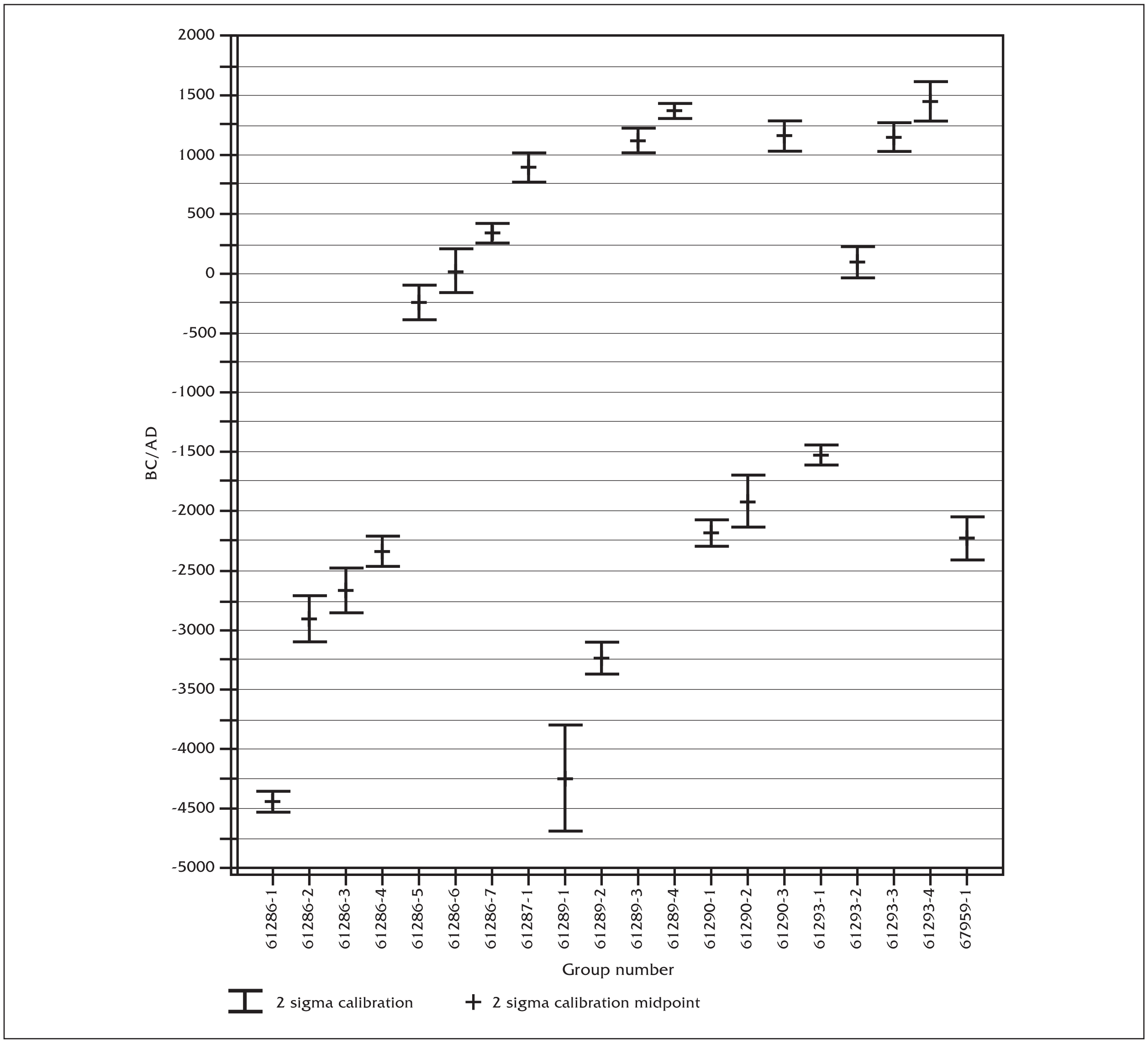


Figure 275. Northwest Santa Fe Relief Route radiocarbon date groups plotted as a hi-lo chart.

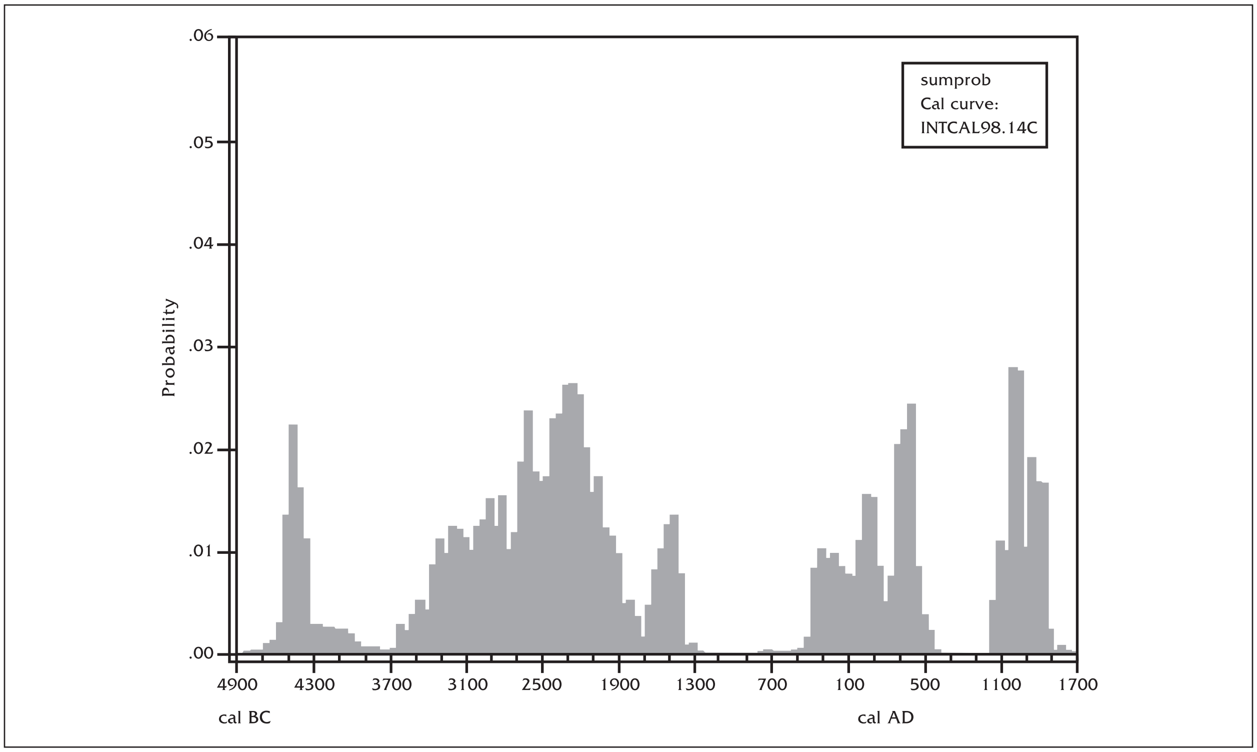


Figure 276. Northwest Santa Fe Relief Route two-sigma calibrated ages probability distribution.

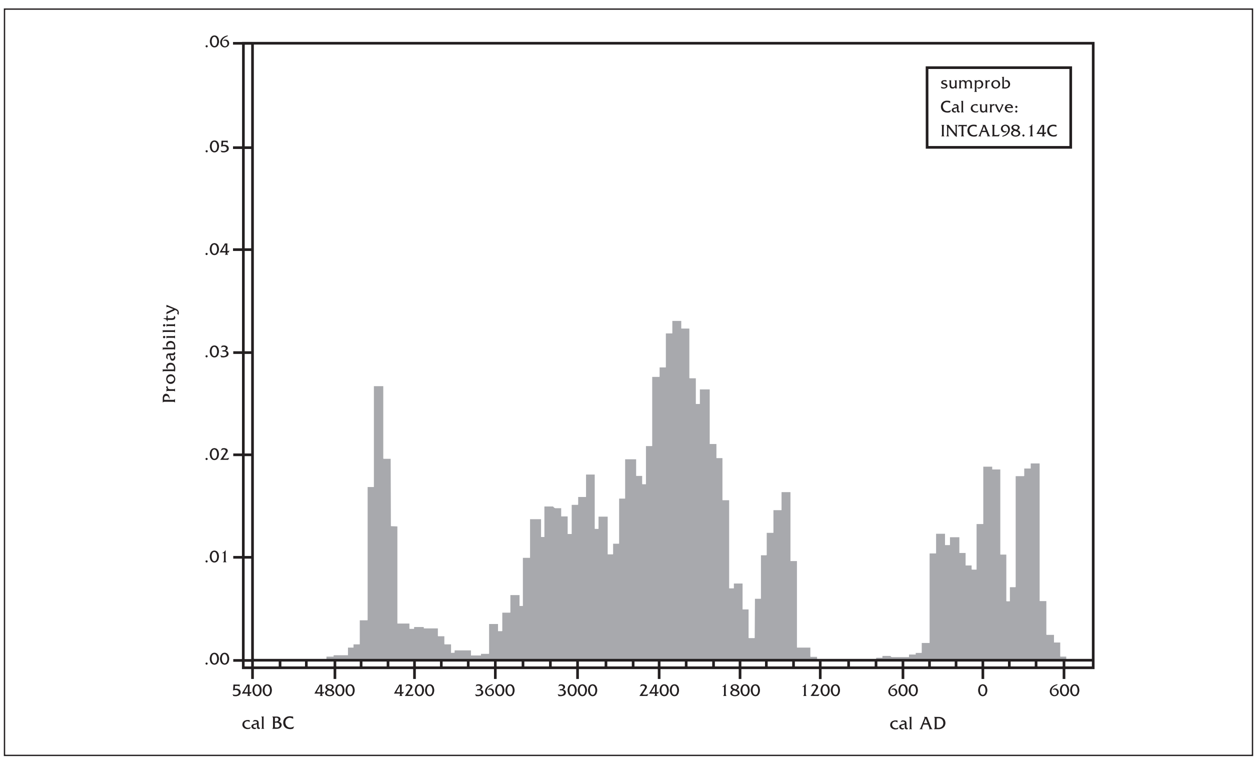


Figure 277. Northwest Santa Fe Relief Route Archaic two-sigma calibrated ages probability distribution.

numbers 61287-1-39, 61289-2-15, 61289-1-16, 61290-6-132, 61293-6-90, and 61293-8-82. For comparison, another probability distribution was generated using 28 previously reported Archaic period radiocarbon determinations from the Santa Fe area (Fig. 278; Table 178). In this distribution, a long temporal discontinuity occurs between cal. 4950 and 2500 BC, and another shorter discontinuity occurs between cal. 400 and 200 BC. Both of the temporal gaps are partially filled by the currently reported Northwest Santa Fe Relief Route data, and obvious gaps in the Northwest Santa Fe Relief Route data are partially occupied by the extant record. Two modes with comparatively high relative frequencies occur between cal. 1800 and 1500 BC and between cal. AD 150 and 400. A fourth probability distribution (Fig. 279) was generated using the 56 Archaic period radiocarbon determinations from the Santa Fe area including the currently reported Northwest Santa Fe Relief Route determinations. Two modes have higher and roughly comparable relative frequencies. These correspond to the modes previously mentioned for the probability distribution of the extant Santa Fe area Archaic period record. At least two temporal discontinuities are apparent in this composite probability distribution. These both occur in the Early Archaic period between cal. 5000 and 4700 BC and between cal. 3800 and 3550 BC. As exemplified by the Northwest Santa Fe Relief Route radiocarbon data and further fleshed out with the inclusion of the previously reported Santa Fe area Archaic period data, an overall gradual increase in occupational intensity can be posited that begins in the Early Archaic at cal. 3700 BC and terminates in the Late Archaic period at cal. 1750 BC. From cal. 1750 to 450 BC, an overall decrease in occupational intensity is suggested with a minor mode occurring between cal. 1250 to 850 BC.

To further explore the relationships among the 56 Archaic period radiocarbon determinations, contemporaneity testing was conducted at the intersite level within portions of the study area (Table 179). The western portion of the study area is comprised of the Airport Road and Tierra Contenta project areas; the eastern portion is comprised of the Northwest Santa Fe Relief Route (Phase 3), the Santa Fe Cemetery, and the North Ridgetop Road project areas; the central portion is comprised of the Northwest Santa Fe Relief Route (Phase 2) and the College Hills project areas; and the Rancho Viejo and the Santa Fe Ranch project areas are considered

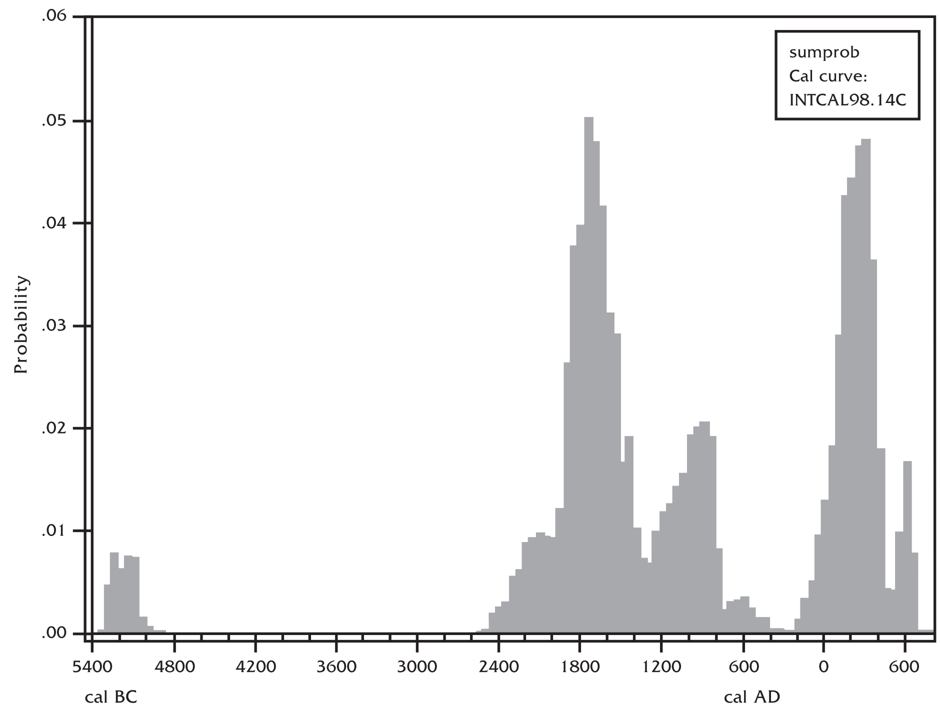


Figure 278. Santa Fe area Archaic two-sigma calibrated ages probability distribution.

Table 178. Radiocarbon determinations, Archaic period, Santa Fe area

Project	Reference	Laboratory	Site	Feature or Structure	Conventional Radiocarbon Age (BP)
Northwest Santa Fe Relief Route (Phase 3)	Post (2000b)	Beta Analytic	LA 61315	Feature 1	1840±100
				Feature 13	6220±50
				Feature 6	2710±80
				Feature 8	1760±80
				Feature 9	2000±70
Airport Road	Post (2000a)	Beta Analytic	LA 61282	Feature 10	3390±60
				Feature 21	2640±120
				Feature 9	3480±60
				Feature 3	3600±50
				Feature 12	3330±60
Tierra Contenta	Schmader (1994:92)	Beta Analytic	LA 54749	Feature 10	3070±60
				Feature 5	2980±60
				Feature 9	2900±60
			LA 54751	Structure 1	3440±80
				Structure 3	2820±60
				Structure 5	2840±70
			LA 54752	Structure 3	2060±60
College Hills	Anschuetz (1998:87-96)	Desert Research Institute	LA 113958	Feature 2f	4112±127
				Feature 2g	3786±103
		Rafter Radiocarbon La	LA 115598	Feature 1	6492±61
Santa Fe Cemetery	Kennedy (1998:68)	Beta Analytic	LA 108286	Feature 1	1760±100
			LA 65497	Feature 3	1760±70
				Feature 4	1690±60
				Feature 8	1840±70
Ridgetop Road	Post and Lakatos (2000)	Beta Analytic	LA 127578	Feature 11	2840±90
				Feature 9	3150±40
Rancho Viejo	Post (1998)	Beta Analytic	LA 116420	Feature 2	1440±50
Santa Fe Ranch	Post et al. (1999)	Beta Analytic	LA 115218	Feature 2	3270±50

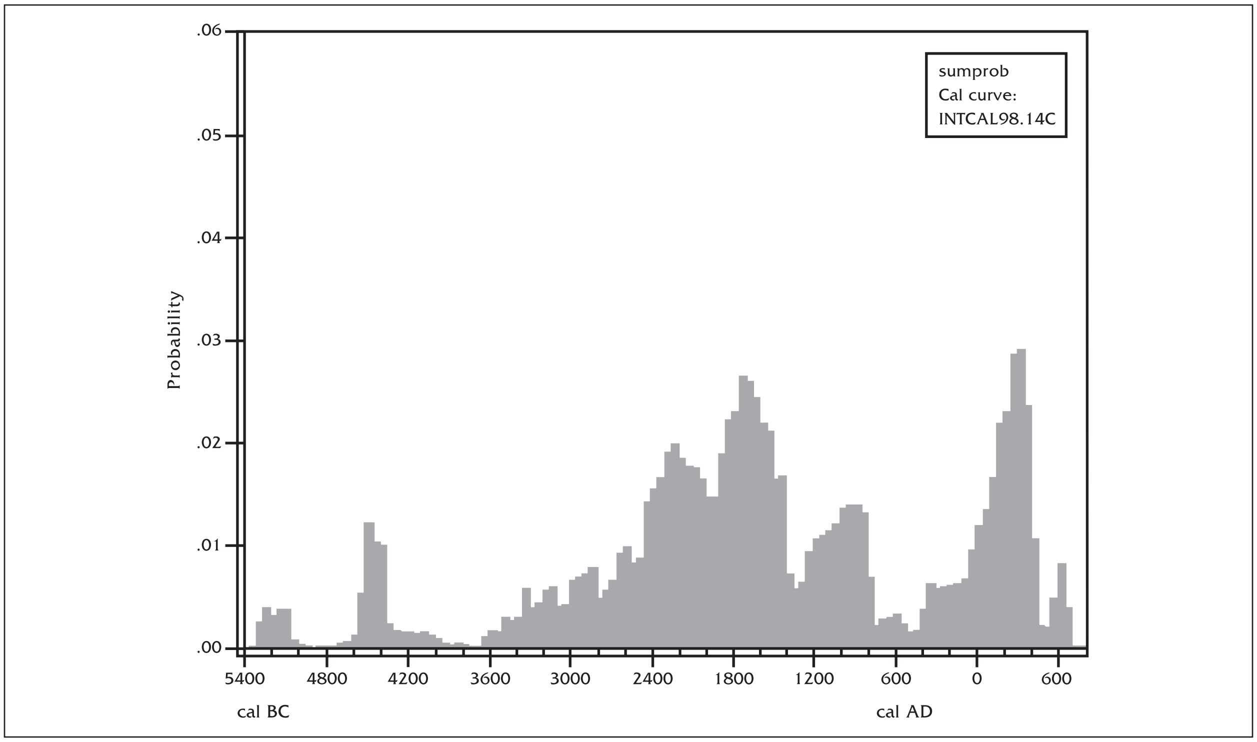


Figure 279. Two-sigma calibrated ages probability distribution, Archaic period, Northwest Santa Fe Relief Route and Santa Fe area.

Table 179. Radiocarbon data, Archaic period, Santa Fe area

Sample Code (LA-Feature or FS)	Conventional Radiocarbon Age (BP)	Group Number	Test Statistic T' / Chi Square Value	Weighted Average Conventional Age (BP)	2-Sigma Calibration of Weighted Average Conventional Age / Relative Area under Probability Distribution	Midpoint of Total Range of 2-Sigma Calibration (BC)
Western Portion of Study Area						
61282-3	3600±50	west-1	7.56	3496±31	BC 1891-1738/.979	1793
			7.81		BC 1709-1694/.021	
61282-9	3480±60					
54751-1	3440±80					
61282-10	3390±60					
61282-12	3330±60	west-2	*	*	BC 1744-1491/.978	1600
					BC 1478-1455/.022	
54749-10	3070±60	west-3	6.94	2954±32	BC 1292-1277/.021	1159
			7.81		BC 1263-1042/.976	
54749-5	2980±60				BC 1027-1025/.003	
54749-9	2900±60					
54751-5	2840±70					
54751-3	2820±60	west-4	1.76	2783±55	BC 1108-1102/.005	961
			3.84		BC 1070-1063/.005	
61282-21	2640±120				BC 1051-813/.990	
54752-3	2060±60	west-5	*	*	BC 345-323/.019	137
					BC 225-225/.001	
					BC 203-AD 71/.980	
Eastern Portion of Study Area						
61315-13	6220±50	east-1	*	*	BC 5302-5044/1.000	5173
127578-9	3150±40	east-2	*	*	BC 1517-1371/.903	1417
					BC 1357-1352/.008	
					BC 1341-1317/.089	
127578-11	2840±90	east-3	1.13	2768±61	BC 1107-1103/.002	955
			3.84		BC 1066-1065/.001	
					BC 1051-803/.997	
61315-6	2710±80					
61315-9	2000±70	east-4	12.28	1804±29	AD 130-259/.860	AD 226
			12.6		AD 281-291/.026	
					AD 298-322/.114	
65497-8	1840±70					
61315-1	1840±100					
108286-1	1760±100					
61315-8	1760±80					
65497-3	1760±70					
65497-4	1690±60					

Table 179 (continued).

Sample Code (LA-Feature or FS)	Conventional Radiocarbon Age (BP)	Group Number	Test Statistic T' / Chi Square Value	Weighted Average Conventional Age (BP)	2-Sigma Calibration of Weighted Average Conventional Age / Relative Area under Probability Distribution	Midpoint of Total Range of 2-Sigma Calibration (BC)
Central Portion of Study Area						
115598-1	6492±61	central-1	*	*	BC 5604-5592/.020	BC 5463
					BC 5556-5547/.015	
					BC 5540-5336/.943	
					BC 5334-5322/.022	
61286-55	5640±50	central-2	0.84	5629±33	BC 4536-4528/.018	BC 4449
61286-56	5630±40		5.99		BC 4524-4507/.055	
61289-29	5450±200				BC 4504-4428/.537	
					BC 4425-4361/.391	
61289-26	4650±100	central-3	6.91	4508±32	BC 3350-3255/.358	BC 3224
61289-17	4540±40		7.81		BC 3254-3098/.642	
61289-22	4450±80					
61286-44	4350±80					
61286-57	4290±70	central-4	8.31	4113±29	BC 2864-2807/.269	BC 2685
113958-2f	4112±127		9.49		BC 2778-2771/.009	
61286-25	4090±80				BC 2760-2718/.121	
61286-39	4090±40				BC 2705-2576/.599	
61286-60	4020±70				BC 2506-2505/.001	
61286-52	3910±40	central-5	9.79	3825±19	BC 2396-2387/.015	BC 2298
61290-23	3870±70		12.6		BC 2339-2318/.047	
61290-13	3830±40				BC 2314-2200/.937	
61286-30	3820±120					
67959-5	3820±40					
113958-2g	3786±103					
61290-15	3730±40					
61290-20	3660±70	central-6	1.01	3628±43	BC 2135-2079/.153	BC 1985
67959-6	3660±80		5.99		BC 2065-2065/.001	
61290-18	3570±70				BC 2062-1883/.845	
					BC 1836-1834/.001	
61293-3	3300±50	central-7	2.18	3244±37	BC 1615-1607/.017	BC 1523
61293-28	3190±50		3.84		BC 1605-1431/.983	
61286-22	2240±80	central-8	0.69	2189±54	BC 386-106/.996	BC 241
61286-18	2150±70		3.84		BC 99-95/.004	
61286-19	1980±60	central-9	0.55	1945±40	BC 43-6/.080	AD 45
61293-21	1920±50		3.84		BC 4-AD 133/.920	
61286-11	1720±40	central-10	0.28	1707±35	AD 253-416/1.000	AD 335
61286-15	1680±60		3.84			
Outlying Portions of Study Area						
115218-2	3270±50	outlying-1	*	*	BC 1682-1668/.036	BC 1588
					BC 1661-1649/.025	
					BC 1641-1433/.940	
116420-2	1440±2	outlying-2	*	*	AD 444-446/.001	AD 565
					AD 471-479/.006	
					AD 532-686/.993	

* Testing revealed that there are statistically significant differences if the sample is included in a tested batch; therefore the sample stands alone and is not included in weighted average ages.

spatial outliers. Compared to the central portion of the study area, the western portion is lower in elevation and closer to the Santa Fe River, while the eastern portion is higher in elevation and in the piedmont of the Sangre de Cristo Mountains. Testing revealed that there are no statistically significant differences within fourteen groups of multiple radiocarbon determinations. Statistically significant differences do exist between seven determinations and other single determinations and groups of determinations. In at least one case, testing methods led to group divisions between determinations from one site, but if tested together, they revealed no statistically significant differences. For instance, sample numbers 54751-5 and 54751-3 can be considered contemporaneous ($T' = .04$, $X^2 = 3.84$), obtaining a weighted average conventional age of 2829 ± 47 BP with two-sigma ranges of cal. 1186–1184 BC/.002, cal. 1127–893 BC/.948, and cal. 878–840 BC/.049.

A high-low chart (Fig. 280) was constructed to show how the intersite groups relate to one another. It is noteworthy that with the exception of the East-1 group, all groups from western, eastern, and outlying portions of the study area postdate cal. 1875 BC, while the central portion has several antecedent groups. The Early Archaic period, represented by groups from the eastern (East-1) and central portions (Central-1 and Central-2) of the study area, is the least well represented and does not exhibit temporal continuity. The Middle Archaic period is represented by Groups 3B6 in the central portion of the study area and by Group 1 in the western portion. The Late Archaic period is represented by groups from all portions of the study area. A Late Archaic period temporal break occurs from cal. 775 to 375 BC. The break between cal. 1400 and 400 BC for the central portion of the study area, also in the Northwest Santa Fe Relief Route data (see Fig. 275), is partially filled by groups from the western and eastern portions of the study area.

The Northwest Santa Fe Relief Route data has made a significant contribution to the archaeological radiocarbon record of the Santa Fe area. This is especially true of the Archaic period. The Santa Fe area Archaic period radiocarbon record has doubled in size with this new data. Probability distributions display temporal discontinuities that support the notion of intermittent occupations of the area during certain time periods. During other periods, overall gradual increases in occupational intensity through time are suggested. It must be kept in mind that the sample size (56) is small. The question of whether these patterns are "real" or the product of insufficient sample size or age bias awaits future research.

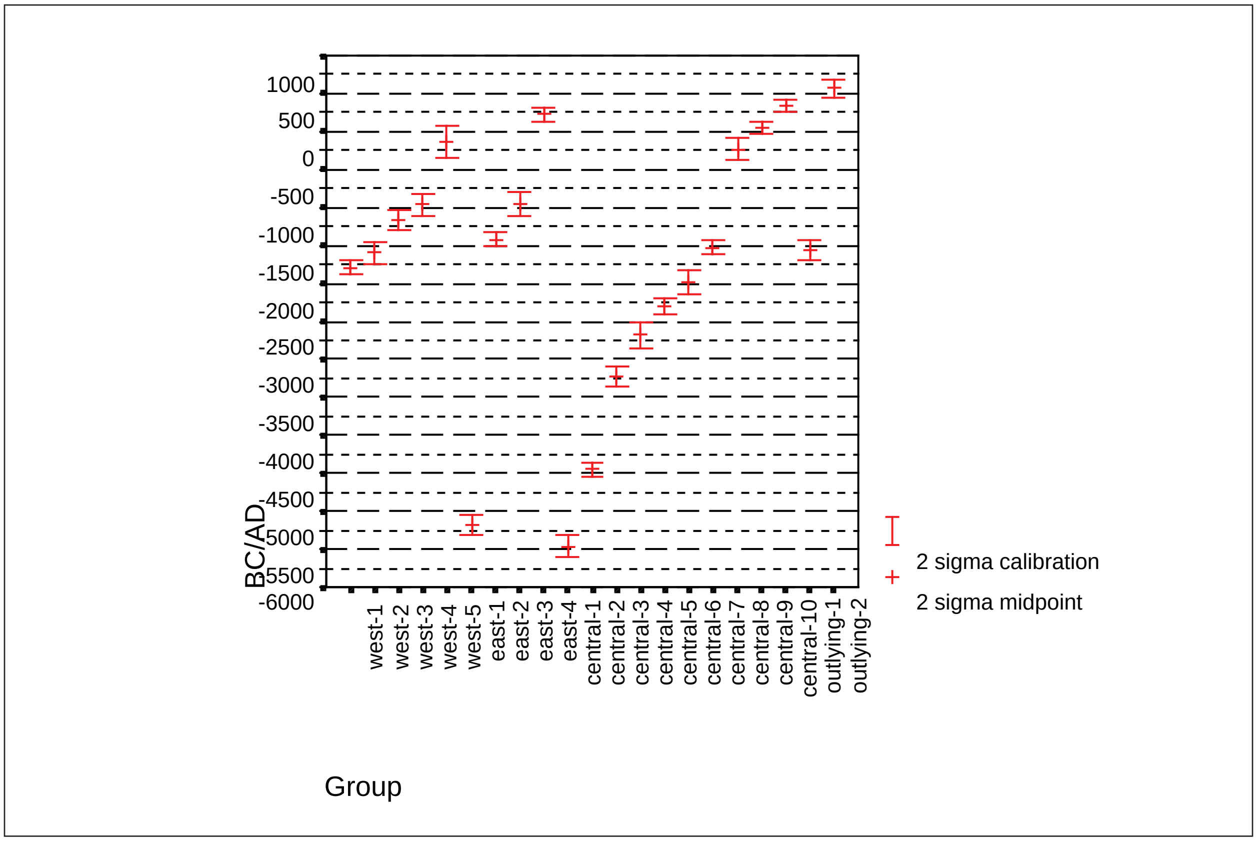


Figure 280. High-low chart of Santa Fe area Archaic by spatial groups (2-sigma calibration age range and midpoint).

Procurement and Use of Chipped Stone

Stephen S. Post

This broad topic incorporates technological, functional, and structural studies of lithic artifact assemblages, attributes, and distributions. Chipped stone artifacts were recovered from excavation of Archaic residential sites, habitation sites, limited-activity sites, Ancestral Pueblo core-reduction concentrations or clusters and feature/activity areas, and near-surface artifact clusters and features of unknown age. These excavations were carried out to address Problem Domain 1 of the research design.

A basic assumption of material procurement and use is that sites or components that are part of different subsistence strategies will reflect organizational differences in terms of decisions made when selecting, preparing, using, and discarding lithic raw materials. While daily activities and discard will be invisible, accumulations may reflect a composite index of the range of activities. A residential occupation with a full range of domestic activities should be quantitatively and qualitatively different from a simpler foraging or processing component. These assumed differences may be apparent in gross patterns of attribute distribution within and between material types and artifact classes. It is also expected that within these single events or accumulated assemblages there will be patterns that reflect different levels or strategies of technological organization. These variable aspects of technological organization should coincide with or complement other aspects of economic organization as groups from different periods addressed temporal and spatial incongruities in biotic resource availability relative to critical resource distributions. Critical resources are water, primary food sources, and available shelter consistent with season of occupation. These investigations will be examined from the perspective of raw-material procurement and technological organization and subsistence in terms of expedient and curated strategies Binford (1979).

Raw-Material Procurement

Different models have been suggested for Archaic hunter-gatherer organization lithic raw-material procurement and use. Local availability of suitable material, seasonal movement relative to known raw-material sources of high quality, and the range of activities conducted at a site or camp can be primary conditioners of variability in lithic assemblages.

Another avenue for examining potential variability and its relationship to raw-material procurement, reduction, and use is the distribution of dorsal cortex on reduction debris. A major assumption is that as distance to the raw-material source increases, so does the need to reduce the volume of unsuitable or waste material that is transported from the source to the camp or extractive or processing task location (OAS 1994). The unsuitable material, which includes dorsal cortex, is removed or reduced at the material source, and the cleaned raw material is transported. This results in low proportions of cortical debris relative to noncortical debris. The other half of the model is that if suitable raw material is available near the camp or extractive or processing task location, then reduction of unwanted raw material is less important because transport distance is short, and exhausted material is easily replaced by a trip to the local source. Obviously, for the Northwest Santa Fe Relief Route sites and other sites on the piedmont, the latter strategy was practiced at most sites. The Northwest Santa Fe Relief Route testing project (Wolfman et al. 1989) and the Las Campanas project (Post 1996a; Lang 1997) produced a large body of nondiagnostic surface lithic scatters with equal to greater proportions of cortical to noncortical debris of local chert and quartzite. However, assemblages from excavated Late Archaic period sites did show higher proportions of noncortical debris. This high proportion of noncortical debris reflected longer and more intensive occupation of the sites.

Early Archaic Period

Early Archaic occupation of the Northwest Relief Route was evident in buried deposits from LA 61286 (Area 3) and LA 61289. LA 61286, Area 3, yielded only two chipped stone artifacts. LA 61289 yielded no artifacts. The low frequency of artifacts may reflect natural processes such as erosion that have removed the artifacts from association with the thermal features. It may also reflect infrequent use of stone tools and therefore a reduced need for raw material and core reduction. Given the limited excavated space (less than 8 sq m for both components), it is also possible that insufficient area was examined relative to small-scale camp activities to yield greater quantities of artifacts. Given the low frequency of artifacts, interpretation is mostly conjectural.

The two artifacts from LA 61286, Area 3, were core-reduction debris generated from locally available chert. Their occurrence indicates that chert was available from the local gravel deposits as early as 4500 BC. Use of local material indicates knowledge of geologic resources north of the Santa Fe River. However, since these early people may have had few predecessors, sources of raw material may not have been easily found. It is likely that the longer the piedmont was occupied, the more geologic resources were marked by accumulations of discarded material from testing and procurement. In other words, the best sources would have been made more apparent by debris that accumulated on stable surfaces and more easily recognized by subsequent procurers.

In the piedmont area, two other Early Archaic components have been excavated. The College Hills excavation of a portion of LA 115598 (Anschuetz 1998) yielded a small hearth buried only 20 cm deep with a radiocarbon two-sigma date range between cal. 5561 and 5282 BC but no associated artifacts. The absence of artifacts may reflect the small area that was investigated as much as a limited use of local raw material or any chipped stone material. LA 61315, excavated during Phase 3 of the Northwest Santa Fe Relief Route project (Post 2000b), had a deeply buried Early Archaic component. It was radiocarbon-dated to a two-sigma range of cal. 5260–5040 BC (Beta-84814), slightly younger than the LA 115598 component. Of the 57 chipped stone artifacts recovered, 19.3 percent were nonlocal obsidian or basalt, including a Gypsum Cave–style projectile point lying next to the collapsed hearth remnant. Local materials were preferred, but nonlocal materials were also brought to the site. Again, the low frequencies of artifacts may reflect the total area excavated (14 sq m) as much as infrequent use of chipped stone raw material.

The low frequency of chipped stone from Area 3 of LA 61286 and LA 61289 precludes inferences about reduction and use. LA 61315, Area 2, showed some preference for nonlocal materials for formal tool production but also a wide selective range relative to material texture for local material (Post 2000b). Seventy-six percent of the chipped stone debris was noncortical, indicating that the majority of raw material was brought to the site in a reduced state. This suggests that Early Archaic residents planned for raw material to be available for some tasks but also anticipated that raw material suitable for all tool-production requirements would not be available. Less time spent on procuring lithic raw material may have afforded more time on other subsistence-related activities.

Whether a result of excavation bias or mobility and planning, the Early Archaic chipped stone assemblages are as difficult to interpret as they are to find in the piedmont. Obviously, the known piedmont Early Archaic components are a far cry from the tool and debris rich assemblages of the Bajada site (LA 9051) and its annex (LA 9052), which are near an abundant source of basalt. The site surface is littered with debris and tool fragments as well as an amazing array of Bajada-style points in various states of completion and modification. This suggests that abundant suitable raw material near intensively used, long-term resource areas results in larger assemblages, while the Santa Fe River piedmont assemblages reflect less intensive, smaller-scale exploitation of less concentrated resources.

Middle Archaic Period

Middle Archaic period raw-material procurement, reduction, and use are better represented than the Early Archaic period at these sites. Middle Archaic components were excavated at Area 2 of LA 61286, LA 61289, LA 61290, and LA 67959. These four components span from 3642 to 1776 BC as determined by the earliest and latest dates of the two-sigma calibrated date ranges—the full Middle Archaic range, plus a little more at the beginning and end. These components are remarkably different in raw-material procurement, reduction, and use, but closer inspection shows how single reduction events and resultant cluster effects can heavily influence raw-material distributions.

In Table 180, LA 61286, Area 2, appears considerably different from the other three components. It has 70.2 percent nonlocal material, while the other three have 98.7 to 100 percent local material. LA 61286, Area 2, has the highest total assemblage count, but LA 61289 is close enough that sample size is not the only explanation for the differences in the raw-material distribution. All components except LA 67959 had 40 sq m or more excavated, so sufficient area was investigated to suspect that the artifact distributions are related more to human occupation than to natural processes. LA 61286, Area 2, had a discrete reduction area that yielded biface fragments and a full range of reduction debris. This discrete cluster accounted for 244 pieces of debitage, of which 233 were obsidian, mainly from Cerro Toledo rhyolite. Normalizing the remainder of the LA 61286, Area 2, assemblage by removing the single-episode reduction event changes the nonlocal contribution to 41.1 percent and raises the local to 58.9 percent. This is more consistent with the other Middle Archaic components, but nonlocal materials are well represented. The heavy emphasis on local materials at LA 61289, LA 61290, and LA 67959 may reflect a less mobile component of the subsistence strategy. In other words, resources that were gathered, processed, and consumed were within daily foraging range from a residential camp. The nonlocal obsidian from LA 61286, Area 2, may reflect some occupations that combined daily foraging and logistical hunting, both staged from a residential camp. Residents of LA 61286, Area 2, may have occasionally organized activities like the residents of other Middle Archaic occupations, but those episodes have been masked by an occupation(s) that generated more debris.

In terms of material selection relative to material quality and how differences in material quality may reflect subsistence organization, the Middle Archaic sites display remarkable similarity. All components (if you factor out obsidian from Area 3 of LA 61286) have between

Table 180. Material source by time period (count and row percentage)

Site	Nonlocal Material	Local Material	Total
	Early Archaic		
LA 61286	-	2	2
	-	100.0%	100.0%
	Middle Archaic		
LA 61286	330	140	470
	70.2	29.8%	100.0%
LA 61289	5	373	378
	1.3	98.7%	100.0%
LA 61290	-	46	46
	-	100.0%	100.0%
LA 67959	-	26	26
	-	100.0%	100.0%
	Late Archaic/ BM III		
LA 61286	35	452	487
	7.2	92.8%	100.0%
LA 61286	1	25	26
	3.8	96.2%	100.0%
LA 61290	10	62	72
	13.9	86.1%	100.0%
LA 61293	2	201	203
	1	99.0%	100.0%
	Pueblo		
LA 61287	1	41	42
	2.4	97.6%	100.0%
LA 61289	-	7	7
	-	100.0%	100.0%
LA 61290	2	54	56
	3.6	96.4%	100.0%
LA 61299	1	10	11
	9.1	90.9%	100.0%
LA 61302	-	31	31
	-	100.0%	100.0%
LA 113954	-	80	80
	-	100.0%	100.0%
	Unknown		
LA 61290	13	37	50
	26	74.0%	100.0%
LA 61293	-	37	37
	-	100.0%	100.0%
LA 67959	2	15	17
	11.8	88.2%	100.0%
LA 67960	-	11	11
	-	100.0%	100.0%
LA 113946	1	285	286
	0.3	99.7%	100.0%
LA 114071	-	94	94
	-	100.0%	100.0%
	Mixed		
LA 108902	312	163	475
	65.7	34.3%	100.0%
LA 111364	-	27	27
	-	100.0%	100.0%
	Component Summary		
Early Archaic	-	2	2
	-	100.0%	100.0%
Middle Archaic	335	585	920
	36.4	63.6%	100.0%
Late Archaic/ BM III	48	740	788
	6.1	93.9%	100.0%
Pueblo	4	223	227
	1.8	98.2%	100.0%
Unknown	16	479	495
	3.2	96.8%	100.0%
Mixed	312	190	502
	62.2	37.8%	100.0%

77 and 80 percent fine-grained reduction debris. This may reflect distribution of fine- or medium-grained materials within the gravel deposits, but it also may reflect knowledge of suitable material availability. This knowledge might be gained by familiarity with a landscape gained through long-term and persistent use (Binford 1979; Kelly 1988; Andrefsky 1994; Sassaman 1998).

The Northwest Santa Fe Relief Route Middle Archaic lithic assemblages exhibit enough variability in dorsal cortex distributions that neither possible interpretation of raw-material procurement and reduction is well supported (Table 181). LA 61286, Area 2, which had the obsidian reduction area, has only 47.6 percent noncortical core flakes. If the obsidian is factored out, the percentage of the percentage drops to 36.7 percent, indicating that obsidian was more reduced and fewer of its cortical core flakes were left at the site. However, if obsidian were to strongly reflect the distance-to-transport model, high proportions of noncortical debris would be expected. Instead, obsidian reduction debris has only a 66.5-percent noncortical percentage. This indicates that even obsidian was transported to the site in only partly reduced form, which could reflect the use of portable nodules or cobbles from secondary sources on the fringe of the Pajarito Plateau.

In contrast to Area 2 of LA 61286, LA 61289, with an assemblage of 99 percent local material, had a noncortical core flake percentage of 55.6 percent. Local raw material is reduced more completely on site. This may reflect an accumulation of debris from sequential occupations or the further reduction of existing debris by subsequent occupants. Both LA 61289 and LA 61286, Area 2, were repeatedly occupied camps with mixed lithic assemblages. The features are different, suggesting a different set of activities and raw material or tool requirements. LA 61289 shows limited evidence of formal tool production and use, suggesting a expedient or situational technological organization that relied on local raw material (Table 182).

LA 61290 and LA 67959 are similar to LA 61286, Area 2—small assemblages exhibiting low noncortical and higher cortical core flake percentages. LA 61290 shows a pattern of repeated use with a range of features more similar to LA 61286, Area 2, than LA 61289. LA 61290 had a higher percentage of nonlocal material, indicating long-distance procurement or logistically organized activities staged from a base camp. Similarities between LA 61290; LA 67959; and LA 61286, Area 2, suggest consistent long-term use of the piedmont during the middle and late years of the Middle Archaic period.

Overall, the four Middle Archaic components exhibit differences in raw-material procurement and use that may relate to different mobility patterns and the range of activities and technological organization from the early to middle and late years of the Middle Archaic period. LA 61289, which had the earliest component, displays a total reliance on local raw material and a strong focus on core reduction with very limited evidence of formal tool production and use of exotic materials. This provisionally suggests that LA 61289 occupations focused on the piedmont, where foraging, collecting, and processing were staged independently of hunting or other logistically organized activities. The other three components are more similar to one another in that they reflect more balance between gathering and hunting, and aspects of logistically organized activities were linked to the main occupation. LA 67959 is the least well known because only three features and 26 artifacts were recovered. It seems to reflect less concentrated occupation with a focus on locally available raw material. In this sense it is similar to LA 61289.

Late to Latest Archaic Periods

The four Late to Latest Archaic components include two components with pit-structure foundations that were residential camps and two limited-activity or extractive/processing sites. These five components have radiocarbon dates from 412 BC to AD 532. Even with the potential for considerable variability in raw-material procurement and use, given the different range and intensity of activities represented by the four components, there is surprising homogeneity.

Relatively homogeneous distributions regardless of site type are seen first in the raw-material types and sources. All component assemblages are dominated by locally available chert, which comprised 79.3 to 89.2 percent of each. Differences in the frequency of nonlocal material between sites were small. Area 1 of LA

Table 181. Core flake cortex retention by time period (count and row percentage)

Site	Noncortical	10-50% Cortical	60-100% Cortical	Total
		Early Archaic		
LA 61286	1	1	-	2
	50.0%	50.0%	-	100.0%
		Middle Archaic		
LA 61286	131	60	84	275
	47.6%	21.8%	30.5%	100.0%
LA 61289	133	61	45	239
	55.6%	25.5%	18.8%	100.0%
LA 61290	10	8	9	27
	37.0%	29.6%	33.3%	100.0%
LA 67959	10	8	5	23
	43.5%	34.8%	21.7%	100.0%
		Late Archaic/ BM III		
LA 61286	144	79	91	314
	45.9%	25.2%	29.0%	100.0%
LA 61289	8	7	5	20
	40.0%	35.0%	25.0%	100.0%
LA 61290	20	1	6	27
	74.1%	3.7%	22.2%	100.0%
LA 61293	50	33	37	120
	41.7%	27.5%	30.8%	100.0%
		Pueblo		
LA 61287	7	7	12	26
	26.9%	26.9%	46.2%	100.0%
LA 61289	3	1	1	5
	60.0%	20.0%	20.0%	100.0%
LA 61290	18	6	7	31
	58.1%	19.4%	22.6%	100.0%
LA 61299	4	2	2	8
	50.0%	25.0%	25.0%	100.0%
LA 61302	6	6	9	21
	28.6%	28.6%	42.9%	100.0%
LA 113954	22	15	12	49
	44.9%	30.6%	24.5%	100.0%
		Unknown		
LA 61290	8	3	3	14
	57.1%	21.4%	21.4%	100.0%
LA 61293	13	6	7	26
	50.0%	23.1%	26.9%	100.0%
LA 67959	2	5	4	11
	18.2%	45.5%	36.4%	100.0%
LA 67960	3	1	2	6
	50.0%	16.7%	33.3%	100.0%
LA 113946	110	24	19	153
	71.9%	15.7%	12.4%	100.0%
LA 114071	43	13	8	64
	67.2%	20.3%	12.5%	100.0%
		Mixed		
LA 108902	220	31	32	283
	77.7%	11.0%	11.3%	100.0%
LA 111364	4	8	7	19
	21.1%	42.1%	36.8%	100.0%
		Component Summary		
Early Archaic	1	1	-	2
	50.0%	50.0%	-	100.0%
Middle Archaic	284	137	143	564
	50.4%	24.3%	25.4%	100.0%
Late Archaic/ BM III	222	120	139	481
	46.2%	24.9%	28.9%	100.0%
Pueblo	60	37	43	140
	42.9%	26.4%	30.7%	100.0%
Unknown	179	52	43	274
	65.3%	19.0%	15.7%	100.0%
Mixed	224	39	39	302
	74.2%	12.9%	12.9%	100.0%

Table 182. Morphology class by time period (count and row percentage)

Site	Core Reduction Debris	Tool / Manufacture	Cores	Total
		Early Archaic		
LA 61286	2	-	-	2
	100.0%	-	-	100.0%
		Middle Archaic		
LA 61286	383	83	4	470
	81.5%	17.7%	0.9%	100.0%
LA 61289	363	5	10	378
	96.0%	1.3%	2.6%	100.0%
LA 61290	41	3	2	46
	89.1%	6.5%	4.3%	100.0%
LA 67959	26	-	-	26
	100.0%	-	-	100.0%
		Late Archaic/ BM III		
LA 61286	430	51	6	487
	88.3%	10.5%	1.2%	100.0%
LA 61289	25	-	1	26
	96.2%	-	3.8%	100.0%
LA 61290	65	7	-	72
	90.3%	9.7%	-	100.0%
LA 61293	180	11	12	203
	88.7%	5.4%	5.9%	100.0%
		Pueblo		
LA 61287	36	2	4	42
	85.7%	4.8%	9.5%	100.0%
LA 61289	7	-	-	7
	100.0%	-	-	100.0%
LA 61290	53	1	2	56
	94.6%	1.8%	3.6%	100.0%
LA 61299	10	-	1	11
	90.9%	-	9.1%	100.0%
LA 61302	31	-	-	31
	100.0%	-	-	100.0%
LA 113954	78	-	2	80
	97.5%	-	2.5%	100.0%
		Unknown		
LA 61290	38	10	2	50
	76.0%	20.0%	4.0%	100.0%
LA 61293	34	2	1	37
	91.9%	5.4%	2.7%	100.0%
LA 67959	11	1	5	17
	64.7%	5.9%	29.4%	100.0%
LA 67960	8	-	3	11
	72.7%	-	27.3%	100.0%
LA 113946	286	-	-	286
		-	-	100.0%
LA 114071	93	-	1	94
	98.9%	-	1.1%	100.0%
		Mixed		
LA 108902	419	54	2	475
	88.2%	11.4%	0.4%	100.0%
LA 111364	26	-	1	27
	96.3%	-	3.7%	100.0%
		Component Summary		
Early Archaic	2	-	-	2
	100.0%	-	-	100.0%
Middle Archaic	813	91	16	920
	88.4%	9.9%	1.7%	100.0%
Late Archaic/ BM III	700	69	19	788
	88.8%	8.8%	2.4%	100.0%
Pueblo	215	3	9	227
	94.7%	1.3%	4.0%	100.0%
Unknown	470	13	12	495
	94.9%	2.6%	2.4%	100.0%
Mixed	445	54	3	502
	88.6%	10.8%	0.6%	100.0%

61286 and LA 61290 exhibit the highest occurrence of obsidian or other nonlocal material. Both components have enough obsidian to indicate that trips to the Pajarito Plateau or at least the Rio Grande canyon were a regular part of their seasonal activities. Certainly, LA 61286, Area 1, with its formal site structure, would have been a primary staging location for logistically organized activities. On the other hand, LA 61293, which had a well-used structure with numerous intramural features, shows almost no evidence of contact or movement into obsidian-bearing source areas. The only obsidian artifact was a projectile point, indicating that exotic material was reserved for the production of formal tools.

Raw-material selectivity is in evidence, as it was for the Middle Archaic period assemblages. Between 69 and 83 percent of the assemblages incorporated fine- rather than medium-grained raw materials. This pattern indicates that rather than putting energy into obtaining quantities of high-quality, exotic material, local sources were culled for the best raw material. This culling process resulted in suitable raw material for all purposes. As a class, the Late to Latest Archaic period assemblages show that fine-grained and glassy materials were more commonly selected for tool manufacture, although core reduction accounted for 90.0 and 96.8 percent of the fine-grained and medium-grained materials. The one hand tool was medium grained, while the formal tools were all glassy or fine grained. This reliance on local fine- and medium-grained materials reinforces the argument that much of the raw-material procurement and subsequent core reduction was more consistent with a foraging economy.

Dorsal cortex percentages on core flakes have two distributions. Core flakes from LA 61286 and LA 61293 have more than 50 percent cortical debris, indicating that raw materials were not heavily reduced before transport to the residential or processing site. LA 61290, on the other hand, is 74.1 percent noncortical debris, suggesting the assemblage was more consistent with logistical organization. In other words, the raw material was heavily reduced before the location was occupied. The low frequency assemblage from LA 61290 indicates short occupation, which would be consistent with a logistical foray. The LA 61286 (Area 1) and LA 61293 components were residential, in direct contrast to LA 61290. LA 61286, Area 2, was a processing site, more like a foraging component than a hunting component, suggesting that raw-material acquisition and reduction were embedded in foraging activities at the residence and at task-specific locations that may have been within the daily foraging range.

Contrasts in raw-material acquisition and reduction are apparent during the Latest and Late Archaic occupations. Unlike the Middle Archaic, residential and task-specific components were investigated, suggesting that residential sites were primarily geared to acquisition and use of locally available materials for core reduction and expedient tool production. When formal tools were produced, fine-grained chert and imported glassy obsidian were used. The two task-specific sites show that an emphasis on processing, indicated by thermal features, coincided with local material use and core reduction. Locations used in logistical forays exhibited economy in raw material transport, as shown by low cortical core flake percentages, a greater reliance on nonlocal, potentially more reliable obsidian, and less use of medium-grained material.

Pueblo Period

Pueblo period raw-material acquisition and reduction is represented in six small assemblages, all with fewer than 100 artifacts. Low artifact frequency is typical of Pueblo sites, as in the Las Campanas and earlier Santa Fe Relief Route investigations. The six assemblages occur in loose spatial association with thermal features that were used for plant and seed processing or pottery firing. If these sites and components reflect daily foraging, processing, and productive activities of Ancestral Pueblo groups living along the Santa Fe River, then local raw-material acquisition and use should dominate, and it does. Local raw material use accounts for 90.9 to 100 percent of the assemblages. The lowest percentage (90.9 percent) is from LA 61299, where only eleven lithic artifacts were recovered. Material-quality selection was variable; fine-grained material ranges from 54.5 to 85.7 percent. Dorsal cortex percentages are expected to be higher than for residential or logistically organized task-specific locations. This is generally true; noncortical core flakes account for 26.9 to 60 percent of the assemblages. LA 61290, with a piñon-processing area and a possible kiln, has the highest percentage of noncortical debris, suggesting repeated or longer occupations or a greater need for well-reduced raw materials and expedient tools. Finally, as expected with a strategy dominated by daily foraging, formal tool manufacture or use was represented by only three artifacts from six sites.

Raw-material procurement and reduction at Ancestral Pueblo sites can be compared with that of the 23 sites that had associated Pueblo pottery from the testing phase of the Northwest Santa Fe Relief Route project (Wolfman et al. 1989). Dorsal cortex frequencies on core flakes were monitored for the Northwest Santa Fe Relief Route testing project sites. The 23 sites had between 6 and 145 core flakes (Fig. 281). This range obviously reflects different aspects of reuse, intensity, and duration, although these sites probably reflect debris left from one or more short visits. Figure 281 also shows the relationship between core flake frequency by noncortical core flakes as a percentage of the total core flake count by site. There are two main expectations for noncortical core flake frequency and percentage of total core flake count. First, if core flake frequency represents an accumulation from a similar range of acquisition or reduction activities, then as the frequency increases the percentage of noncortical core flakes should remain constant. Low frequencies of noncortical flakes relative to cortical flakes would indicate a primary focus on material testing and early-stage reduction. Higher frequencies of noncortical flakes relative to cortical flakes would indicate a primary focus on later stages of core reduction in conjunction with material testing. Both of these scenarios assume that frequency results from increased numbers of visits or length of visits, but for the same range of activities. Figure 281 shows a fairly continuous spread from 15 to 65 percent noncortical flake percentages for sites with core flake assemblages of less than 80 artifacts. As the core flake counts increase, the distribution is limited to the 25 to 48 percent range. This may represent a different activity set within Ancestral Pueblo sites, but it also may result from a small sample size. This simple scatter plot presents an alternative to the two scenarios of consistently low or high noncortical flake percentages. This alternative

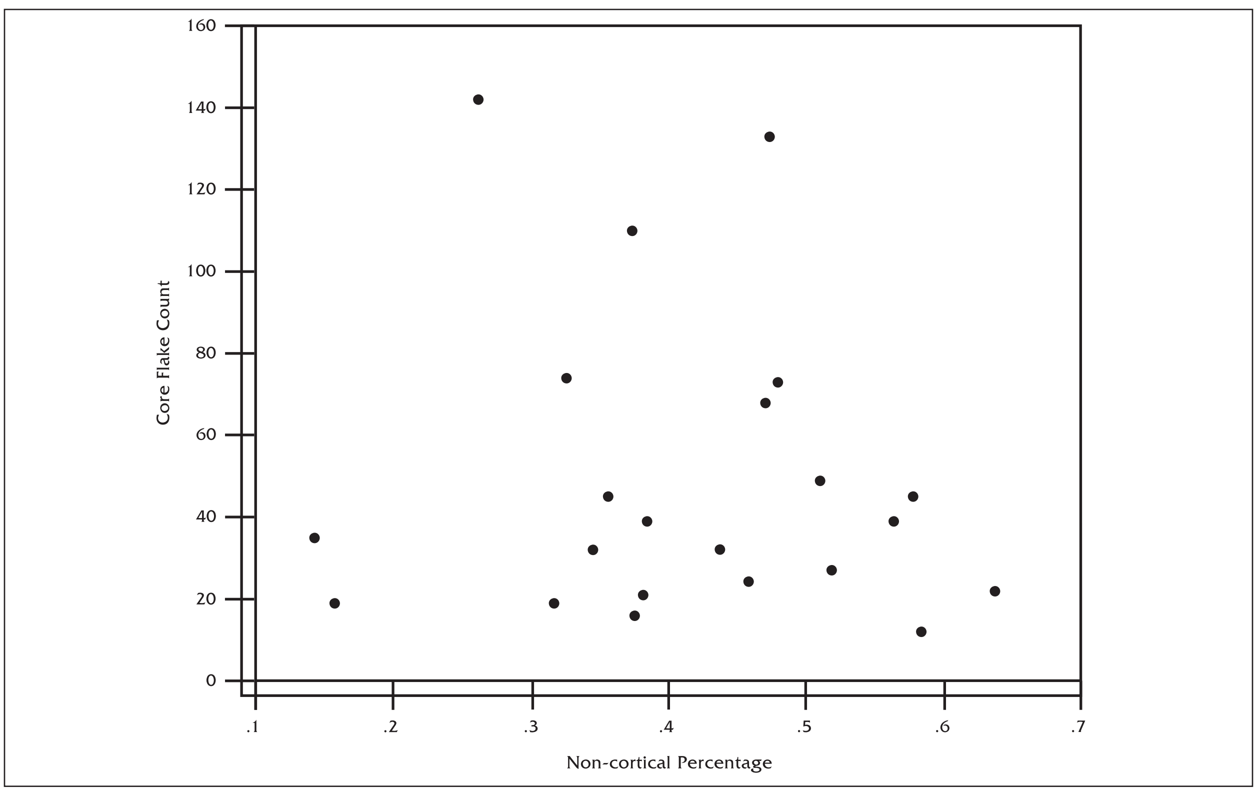


Figure 281. Core flake count by noncortical percentage, Ancestral Pueblo testing sites, Northwest Santa Fe Relief Route.

indicates that raw-material procurement and core reduction at surface Ancestral Pueblo sites coincided with a broad range of activities that overlapped at sites. This observation is consistent with the concept presented in the research design, where the piedmont is characterized as a landscape consisting of a low-density distribution of features and artifacts. Collapsed into this distribution is the record of many foraging and resource-procurement forays over 200 years.

Unknown and Mixed Periods

Unknown and mixed periods are represented at eight sites or site components. These surface distributions were not associated with pottery or radiocarbon dates or had assemblage characteristics that suggested multiple temporal components. The expectation is that the unknown components date to the Ancestral Pueblo period, and if so, they should exhibit similar raw-material acquisition and reduction patterns. Mixed components may be similar to Ancestral Pueblo deposits, or they may be completely different from assemblages associated with any other period.

With the exception of LA 61290, the unknown sites resemble patterning observed in Ancestral Pueblo assemblages in material source exploitation. LA 111364 also exemplifies the Ancestral Pueblo pattern, while LA 108902 is unlike any other site, except for LA 61286, Area 2, which was a Middle Archaic component. The typical Ancestral Pueblo pattern of high percentages of locally available material is reflected in percentages ranging from 88.2 to 100 percent. There was a predominant use of chert, with varying amounts of quartzite. Fine-grained material also predominates. Smaller percentages of medium-grained material range from 8.1 to 28.7 percent. Core-reduction debris and cores are the most common; only three artifacts represent tool manufacture. Material procurement and mixed core reduction are represented by noncortical core flake percentages of 18.2 to 71.9. The two exceptions are LA 113946 and LA 114071, isolated, single core-reduction episodes. These sites yielded 71.9 and 67.2 percent noncortical core flakes, at the high end of the cortical/noncortical continuum. This combination of attributes suggests that these sites are Ancestral Pueblo foraging locations.

The two exceptions, LA 61290 and LA 108902, are not similar to one another. LA 61290 is more similar to the Late to Latest Archaic component from the same site. It is possible that it is another Late to Latest Archaic component that lacked a temporally diagnostic artifact. Basically, the LA 61290 unknown component had unusually high percentage of nonlocal material (26 percent), a high percentage of glassy and fine-grained material (72 percent), a 20-percent tool manufacture component, and 57.1 percent noncortical core flakes. Given the general lack of Ancestral Pueblo components that fit this profile, it cannot be ruled out that this is an exception, rather than another Late to Latest Archaic component. Either way, the assemblage reflects raw material and acquisition that tends toward logistical organization rather than daily foraging.

LA 108902 is the truly anomalous site in the Northwest Santa Fe Relief Route assemblage. The assemblage is predominantly nonlocal (65.7 percent). It is 62.1 percent obsidian, suggesting groups that moved between the Santa Fe River and the Pajarito Plateau. Glassy and fine-grained materials account for 89.5 percent of the assemblage, higher than any component other than the LA 61286, Area 2, Middle Archaic component, which also had a high percentage of obsidian debris. Surprisingly, with all the nonlocal raw-material use, technology is focused on core reduction and core flake production rather than biface or formal tool production, which is more consistent with a logistically organized subsistence strategy. Finally, core flake dorsal cortex was 77.7 percent noncortical, the highest percentage for an assemblage with more than 100 artifacts. Even though biface manufacture is not heavily represented, intensive material reduction was the norm for LA 108902. Pottery and points recovered from LA 108902 suggest it was a Coalition or Classic period camp.

Similarities to LA 98688, in the Las Campanas project area, cannot be ignored. LA 98688 was a multicomponent Coalition and Classic period site with tremendous accumulation of chipped stone debris, but also a number of trampled jars and bowls (Post 1996a:331–367). This site was a reused hunting and foraging camp on a broad ridge overlooking the Arroyo Calabasas and La Cienega to the west. LA 108902 is also on a broad ridge site overlooking a major drainage system. It is possible that some of the LA 108902 occupation relates to logistical use of the Santa Fe River valley by fifteenth-century populations following the abandonment of the Pindi–Agua Fria Schoolhouse community. This will be explored more in subsequent sections of this chapter. LA 108902 is unique in the Northwest Santa Fe Relief Route assemblage, just as LA 98688 was unique at Las Campanas.

Summary

Raw-material acquisition and reduction show a remarkable consistency through time from the Middle Archaic period to the Ancestral Pueblo period. Over 5500 years, there is remarkably limited use of nonlocal material, with a few isolated exceptions, and a remarkable focus on local raw-material acquisition and core reduction. This favorably supports the idea that occupation and exploitation of the piedmont was a long-term foraging adaptation focused on the resources near the Archaic residential camps and the Ancestral Pueblo Santa Fe River villages. It was expected that the Archaic residential camps and task-specific locations would show more evidence of a planned technology employed in support of either logistical forays into the project area or staged from the project area. Only Area 2 of LA 61286 (Middle Archaic) and LA 108902 strongly reflect a logistically organized strategy. LA 61290 contributed two low-frequency surface scatters that look like remains from logistical forays. The long-term focus on local material use and foraging seems to fit well with the expectation of the research design—that the project area and the Santa Fe River piedmont were part of a larger landscape that comfortably supported residential occupation by small groups during seasons when plant resources were abundant, while allowing for logistical forays into protein-rich environments in the surrounding mountains. During the Ancestral Pueblo period, the piedmont provided the lithic raw material that supported foraging from riverine, agricultural villages. Field and logistical hunting were staged from the village, while the full range of biotic and geologic resources were exploited, including the opportunistic use of available lithic raw material. The scattered chert and quartzite deposits provided raw material for nearby foraging between Arroyo Frijoles and the Santa Fe River. This 2 to 4 km wide zone could have been used by all members of the village and may have been the main territory exploited by women as they acquired resources necessary to maintaining village life and sustaining a sedentary lifestyle.

Technological Organization and Subsistence

The Northwest Santa Fe Relief Route data recovery plan did not specifically anticipate that lithic artifact assemblage variability would be sufficient for us to examine the technological organization and its relationship to different hunting and foraging behaviors of populations living along the Santa Fe River and its tributaries. This low expectation for the analytical potential of the Northwest Santa Fe Relief Route project resulted from the redundant technological patterns observed in the Ancestral Pueblo and temporally nondiagnostic lithic artifact assemblages recovered during the testing phase. Excavation was expected to yield lithic artifact data similar to that from the testing phase. If the modern ground surface at these sites had been the only context from which lithic artifacts were recovered, this expectation would have been confirmed. Instead, the identification and examination of subsurface cultural deposits with considerable time depth have introduced the possibility of more variability in lithic technological organization.

The Northwest Santa Fe Relief Route excavations recovered or field recorded 2,934 chipped stone artifacts from 14 sites representing at least 23 components. The sites and components are classed according to broad periods: Early, Middle, Late, and Latest Archaic, Ancestral Pueblo, unknown, and mixed. Broad temporal divisions were based on diagnostic artifacts and radiocarbon dates. Unknown components lacked temporally diagnostic artifacts. The mixed period consists of LA 108902 and LA 111364, temporally mixed deposits that may span from AD 1200 to 1600. When possible, assemblages were segregated according to the recognized chronometric data for each site. In some cases, components were combined because the lithic assemblages could not be segregated spatially by the different radiocarbon dates. This was especially true for LA 61293, where Late and Latest Archaic components were combined.

Functional and technological variability are represented by differential distribution of feature and artifact frequencies and classes for the different time periods. Functional and technological variability can be understood in terms of subsistence and settlement strategies. These strategies are assumed to have changed as prehistoric groups went from a highly mobile lifestyle to a more sedentary agricultural existence.

The Archaic period components, which span 5,500 years, should reflect different aspects of a mobile settlement and subsistence pattern that was conditioned by seasonal and annual periodicity in the abundance and distribution of biotic resources (Binford 1979, 1980, 1982; Hudspeth 1997; Kelly 1992; Matson 1991; Vierra 1985; and many others). Variations on a site type continuum consisting of base camps, limited-activity sites, and extraction sites are often used to interpret artifact and feature frequency, structure, and distributional variability relative to mobility (Binford 1980; Vierra 1985; Ebert and Kohler 1988; Hudspeth 1997). These different site types have been identified in the Las Campanas area (Lang 1997; Post 1996a), on the piedmont (Kennedy 1998; Lakatos et al. 2001), and along tributaries of the Santa Fe River (Lang 1992; Post 1998; Schmader 1994a). This Archaic period variability reflects changing land-use patterns in response to variable climate and available biomass.

The Coalition and Classic period features and artifacts were built, used, and left by sedentary village dwellers of the Santa Fe River. These more sedentary Ancestral Pueblo agriculturalists used the piedmont landscape to obtain biotic and geologic resources. Biotic resources such as plants, nuts, seeds, fruit, and game mammals were supplementary to domesticated products of floodplain agriculture. Both biotic (fuelwood or yucca for mats and cordage, for example) and geologic resources provided the material goods for construction, tool and pottery production, weaving, clothing, and ritual paraphernalia. The small sites that dot the piedmont are viewed as remnants of a strategy that was primarily diurnal. Brief occupations focused on arroyo margins and primary ridges that separated drainage systems (Post 1996a). As distance from the village increased, there was a tendency for foraging locations to be reused and initial processing to occur in the field to allow for longer-distance transport of resources (Post 1996a; Post 1998:200). By defining expectations for a technology that would support a diurnal foraging strategy, the chipped stone can be examined for variability that may suggest divergence from the expected patterns. These divergences may be related but not limited to changing population size and distribution, depletion of local resources, or changing subsistence strategies.

The Analytical Framework

To interpret chipped stone patterns, many lithic specialists rely on two defined chipped stone reduction strategies that are based on expectations of forager and collector subsistence models proposed by Lewis Binford (1979, 1980, 1982). Curated strategies are characterized by the manufacture of bifaces that served as the source of flakes or blanks for informal and formal tools and as formal tools (Bleed 1986; Kelly 1988; Sassaman 1998; Lent 1991 [in the Tewa Basin]; Moore 2001). Expedient procurement and reduction strategies focused on the production of flakes for tools with limited or no modification. It was suggested that curated strategies were associated with residential mobility, while expedient strategies were associated with long-term residential stability. Each strategy may result in debitage and tool morphology and frequency patterns that are relatively distinct (Kelly 1988; Camilli 1989; Bamforth 1991; Ebert 1992; Andrefsky 1994).

Curated strategies emphasize production of the maximum length of usable edge per core. Flintknappers maximized the number of usable flakes per core with the added potential of using the core as a tool (Kelly 1988:719–720). Production of cores with regular shapes from homogeneous material increased the probability that flakes could be removed and used for anticipated tasks (Sassaman 1998). By more efficient tool production, waste was reduced and raw materials were more effectively used, reducing the amount of raw material that needed to be transported to or obtained from a base camp. Expedient strategies were not conditioned by transport costs; therefore, raw material did not have be used as efficiently (Andrefsky 1994; Kelly 1988:719; Sassaman 1998).

Flakes were removed from cores as needed. Therefore, it is expected that long-term foraging or collecting base camps would have chipped stone assemblages dominated by the debris from expedient reduction and a greater frequency of informal tools versus formal tools. Collecting base camps, which were moved more frequently, may exhibit increased evidence of a curated or more efficient reduction strategy with more debris from biface reduction. Logistical camps or limited-activity sites, where raw material was not available or suitable, should exhibit greater evidence of a biface reduction strategy. Daily foraging sites may exhibit no evidence of lithic reduction, or flakes and tools would be produced from local material.

Curated and expedient strategies are presented as mutually exclusive. However, in practice these different reduction strategies reflect a technological continuum. Reliance on a strategy was conditioned by availability of suitable raw material, occupation duration, range of tasks, potential for reuse of existing materials, and distance from the residence in the case of logistical or daily foraging sites. Chipped stone assemblages undoubtedly represent a mix of these reduction strategies, since subtleties are masked by more abundant artifact classes. Obviously, single-component residential, logistical, and extraction sites offer the most potential for identifying the two strategies and assessing their relative contribution to the group's technological organization.

The dichotomy of curated and expedient strategies is useful for examining differences in how Archaic and Pueblo period populations organized their technology to extract resources from the piñon-juniper piedmont north of the Santa Fe River. Archaic populations are typically characterized as mobile, small commensal units that would have settled near critical resources and organized their strategies around extracting the maximum yield from nearby biotic resources (Chapman 1979). Pueblo populations during the Coalition, Early Classic, and Developmental periods were more sedentary, with a heavy reliance on agriculture. Diurnal foraging would have supplemented stored foods. Longer-duration forays would have been supported by village stores and food sharing. These contrasting subsistence and settlement patterns should have resulted in different reduction strategies. These differences should be elucidated by examining reduction sequence and stages, and tool manufacture and use.

Material Procurement and Expedient versus Curated Strategies

Local raw material was used to produce most of the lithic reduction debris for most temporal components at the Northwest Santa Fe Relief Route sites. The two instances where nonlocal material were prevalent, the LA 61286, Area 2, Middle Archaic chipping concentration and the multicomponent LA 108902, are isolated episodes and unusual sites within the predominant pattern of the Northwest Santa Fe Relief Route and regional piñon-juniper piedmont. This low frequency of nonlocal material and heavy dependence on local material is reflected in the predominance of core-reduction debris from all components for all periods. At the gross temporal levels presented in Table 183, core reduction and the use of local raw material are the main features of the lithic technology.

Based on expectations of a curated strategy and its focus on the use of reliable, high-quality materials for production of tools (which, if they fail, will have the greatest consequences), it is surprising that during the Middle Archaic period, nonlocal material is dominated by 76.1 percent core-reduction debris. The broken bifaces recovered with the obsidian reduction debris from LA 61286, Area 2, indicate that obsidian was used to produce tools that were carried off site, since finished obsidian tools were rare at LA 61286, Area 2, or any Middle Archaic site. Basically, on-site lithic reduction focused on core reduction and ostensibly the production of expedient tools. This said, the total number of Middle Archaic expedient flake tools was 15, compared to 68 Middle Archaic pit features. Evidence of expedient tool use is as scarce as production and use or discard of formal or curated tools. Clearly, for most Middle Archaic components the focus on thermal processing of resources or foods far outweighed the use and discard of tools.

A slightly different pattern is evident for the Late to Latest Archaic components, which combined residential and task-specific or limited-activity use of the piñon-juniper piedmont and

Table 183. Material source by manufacture stage (count and row percentage)

Local/Nonlocal Material	Core Reduction Debris	Tool / Manufacture	Cores	Total
		Early Archaic		
Nonlocal	-	-	-	-
Local	2	-	-	2
	100.0%	-	-	100.0%
Total	2	-	-	2
	100.0%	-	-	100.0%
		Middle Archaic		
Nonlocal	255	80	-	335
	76.1%	23.9%	-	100.0%
Local	558	11	16	585
	95.4%	1.9%	2.7%	100.0%
Total	813	91	16	920
	88.4%	9.9%	1.7%	100.0%
		Late Archaic / BM II		
Nonlocal	16	32	-	48
	33.3%	66.7%	-	100.0%
Local	684	37	19	740
	92.4%	5.0%	2.6%	100.0%
Total	700	69	19	788
	88.8%	8.8%	2.4%	100.0%
		Pueblo		
Nonlocal	3	1	-	4
	75.0%	25.0%	-	100.0%
Local	212	2	9	223
	95.1%	0.9%	4.0%	100.0%
Total	215	3	9	227
	94.7%	1.3%	4.0%	100.0%
		Unknown		
Nonlocal	5	11	-	16
	31.3%	68.8%	-	100.0%
Local	465	2	12	479
	97.1%	0.4%	2.5%	100.0%
Total	470	13	12	495
	94.9%	2.6%	2.4%	100.0%
		Mixed		
Nonlocal	265	47	-	312
	84.9%	15.1%	-	100.0%
Local	180	7	3	190
	94.7%	3.7%	1.6%	100.0%
Total	445	54	3	502
	88.6%	10.8%	0.6%	100.0%

showed a predominance of local material used in core reduction. The nonlocal material was used more commonly to produce tools or was discarded as tools. Twenty-five informal tools and 13 formal or potentially curated tools were recovered from Late to Latest Archaic contexts. The low frequency of tools in the Middle Archaic continues in the Late to Latest Archaic, but there seems to be more balance between tools and the range of potential tasks. There is some evidence that logistical forays were supported by tool manufacture as residential or base camps. There is also evidence to suggest that Late to Latest Archaic tool makers were selecting materials that would produce the most reliable tools, since replacements would be hard to find as tools failed or were lost. For the most part, Late to Latest Archaic lithic technology focused on expedient strategies employing locally available materials.

As might be expected, Ancestral Pueblo lithic technology reflects an almost total reliance on locally available raw material. There is very limited evidence of expedient or curated tool production or use for any of the components. This was the overwhelming pattern observed during the testing project (Wolfman et al. 1989) and remained the pattern for data recovery. By and large, this observation holds true for the unknown components, although there is slim evidence to suggest that nonlocal material was used differently from local material and that a low use of curated artifacts or raw materials was employed. For the most part, core-reduction debris made up the vast majority of lithic debris left on the landscape at these sites.

Mixed components reflect both patterns. LA 111364, a mixed Late Developmental to Classic site, showed a heavy reliance on local material, the production of core-reduction debris, and no discard of formal or informal tools. LA 108902 had a predominance of nonlocal material. Interestingly, the nonlocal material was reduced in much the same way as the nonlocal material: only 15.1 percent remained from tool manufacture or the discard of tools. It was expected that the heavy emphasis on nonlocal material would have coincided with a curated strategy. This seems to be partly true, but expedient reduction of local raw material remained an important part of the technological organization. Five of eleven formal tools and two of eight informal or expedient tools were made from nonlocal material, further emphasizing the importance of local material and expedient technological organization, even for a site that resembles other Ancestral Pueblo logistically organized sites (Post 1996b).

Reduction Stages and Expedient versus Curated Strategies

At the attribute level, platform shape and modification, flake breakage, dorsal cortex percentage, and flake dimensions are related to reduction stage. At the assemblage level, debitage ratios are useful for examining reduction strategies. These attributes can be examined individually, but it is the overall attribute patterning that provides the best indication of reduction strategy.

Dorsal cortex refers to the outer rind of nodules or cobbles that has been chemically altered by exposure to the elements and is rarely suitable for reduction or use (OAS 1994). In addition, outer layers of alluvially transported nodules and cobbles often have microcracks or fissures that form a zone with unreliable flaking characteristics. As unsuitable dorsal cortex is removed and discarded, it provides a measure of reduction. As a cobble or nodule is reduced, the dorsal cortex is reduced. Early-stage reduction results in flakes with high percentages of dorsal cortex, while late-stage reduction may lack cortical flakes.

Reduction can be divided into two basic stages: core reduction and tool manufacture. During core reduction, flakes are removed to prepare a core for tool production, or flakes are removed to be used for tools or modified as tools. Primary core reduction is defined by the initial core platform preparation and removal of the cortical surface (J. Moore 1994:301). *Secondary core reduction* refers to the removal of cores from the core interior. The distinction between primary and secondary core reduction is not clear-cut. Both stages usually occur simultaneously, and secondary reduction often begins before or during cortex removal and platform preparation. However, as general markers of reduction, core flakes can be classified as primary or secondary based on dorsal cortex percentage. Primary core flakes have more than 50 percent dorsal cortex, and secondary core flakes have 50 percent or less. A third class, tertiary core flakes, was defined by combining core flake thickness and absence of dorsal cortex. Generally, thinner flakes (5 mm or less) tended to have less cortex and could represent a late core-reduction stage. However, the pattern was not consistent enough to warrant further use of the tertiary core flake class in this analysis.

Inferences about core-reduction strategies can be drawn from dorsal cortex and primary and secondary core flake distributions. J. Moore (1994:301) and Chapman (1977) suggest that a lack of primary flakes indicates that initial reduction occurred elsewhere, while the presence of few secondary flakes may indicate that cores were transported to another locale for further reduction. A mix of primary, secondary, and biface flakes indicates intensive reduction of raw materials. A mixed technology indicates curated or expedient strategies, while an emphasis on biface production indicates a curated strategy.

Another variable that can be examined with dorsal cortex is flake thickness. Flake thickness is an obvious partial indicator of reduction. From early- to late-stage core reduction and biface reduction, flake thickness decreases. This applies especially if reduction is geared to production of portable or reliable cores or blanks. Early-stage reduction or expedient core tool production may leave thicker flakes, since bulk and waste reduction is not as critical.

Dorsal cortex percentages and core flake thickness are combined in Table 184 and cross-tabulated by time. There are three classes for each variable. Dorsal cortex is divided into noncortical, 10–50 percent cortical, and greater than 50 percent cortical. Noncortical core flakes most commonly remain from late-stage core reduction. Core flakes with cortex remain from early or transitional reduction from raw-material procurement to tool production or core thinning. These classes are not mutually exclusive, but they do represent the basic reductive trend. Core flake thickness was divided into thin (1–5 mm), medium (6–10 mm), and thick (11 mm or thicker).

The expectation for how these two variables covary follows the observation that as the core or blank is reduced, the cortex percentage is reduced or eliminated, and the flake thickness declines. It is further expected that lithic technology focused on supporting logistical hunting and gathering will display higher percentages of thin, noncortical core flakes. Chipped stone assemblages remaining from mixed subsistence activities that incorporated both expedient and curated strategies will have a wide range of flake thicknesses and dorsal cortex distribution. Limited-activity or material-procurement sites are expected to have either a high percentage of thin noncortical flakes, reflecting production of bifacial tools in connection with hunting and meat processing, or a high percentage of thick flakes with mixed percentages of noncortical and cortical occurrence. Basically, tools or flakes are produced from locally available raw material

Table 184. Dorsal cortex by core flake thickness (count and row percentages)

Site / Component	Thickness	Noncortical	10-50% Cortical	60-100% Cortical	Total
		Early Archaic			
LA 61286, Area 2	medium	1	-	-	1
		100.0%	-	-	100.0%
	thick	-	1	-	1
		-	100.0%	-	100.0%
Total		1	1	-	2
		50.0%	50.0%	-	50.0%
		Middle Archaic			
LA 61286, Area 2	thin	176	32	59	267
		65.9%	12.0%	22.1%	100.0%
	medium	20	15	13	48
		41.7%	31.3%	27.1%	100.0%
	thick	6	17	12	35
		17.1%	48.6%	34.3%	100.0%
Total		202	64	84	350
		57.7%	18.3%	24.0%	100.0%
LA 61289	thin	51	9	9	69
		73.9%	13.0%	13.0%	100.0%
	medium	52	21	15	88
		59.1%	23.9%	17.0%	100.0%
	thick	33	31	21	85
		38.8%	36.5%	24.7%	100.0%
Total		136	61	45	242
		56.2%	25.2%	18.6%	100.0%
LA 61290	thin	7	1	1	9
		77.8%	11.1%	11.1%	100.0%
	medium	5	2	1	8
		62.5%	25.0%	12.5%	100.0%
	thick	-	5	7	12
		-	41.7%	58.3%	100.0%
Total		12	8	9	29
		41.4%	27.6%	31.0%	100.0%
LA 67959	thin	5	2	1	8
		62.5%	25.0%	12.5%	100.0%
	medium	4	4	3	11
		36.4%	36.4%	27.3%	100.0%
	thick	1	2	1	4
		25.0%	50.0%	25.0%	100.0%
Total		10	8	5	23
		43.5%	34.8%	21.7%	100.0%
		Late Archaic / BM II			
LA 61286, Area 1	thin	118	16	30	164
		72.0%	9.8%	18.3%	100.0%
	medium	40	30	26	96
		41.7%	31.3%	27.1%	100.0%
	thick	28	33	35	96
		29.2%	34.4%	36.5%	100.0%
Total		186	79	91	356
		52.2%	22.2%	25.6%	100.0%
LA 61286, Area 2	thin	2	-	2	4
		50.0%	-	50.0%	100.0%
	medium	5	3	-	8
		62.5%	37.5%	-	100.0%
	thick	1	4	3	8
		12.5%	50.0%	37.5%	100.0%
		8	7	5	20
		40.0%	35.0%	25.0%	100.0%
LA 61290	thin	16	-	1	17
		94.1%	-	5.9%	100.0%
	medium	4	-	2	6
		66.7%	-	33.3%	100.0%
	thick	7	1	3	11
		63.6%	9.1%	27.3%	100.0%
Total		27	1	6	34
		79.4%	2.9%	17.6%	100.0%

Table 184 (continued).

Site / Component	Thickness	Noncortical	10-50% Cortical	60-100% Cortical	Total
LA 61293	thin	19	4	4	27
		70.4%	14.8%	14.8%	100.0%
	medium	22	15	15	52
		42.3%	28.8%	28.8%	100.0%
	thick	13	14	18	45
		28.9%	31.1%	40.0%	100.0%
Total		54	33	37	124
		43.5%	26.6%	29.8%	100.0%
		Pueblo			
LA 61287	thin	4	-	3	7
		57.1%	-	42.9%	100.0%
	medium	2	5	4	11
		18.2%	45.5%	36.4%	100.0%
	thick	1	2	5	8
		12.5%	25.0%	62.5%	100.0%
Total		7	7	12	26
		26.9%	26.9%	46.2%	100.0%
LA 61289	thin	1	-	-	1
		100.0%	-	-	100.0%
	medium	1	-	1	2
		50.0%	-	50.0%	100.0%
	thick	1	1	-	2
		50.0%	50.0%	-	100.0%
Total		3	1	1	5
		60.0%	20.0%	20.0%	100.0%
LA 61290	thin	7	1	-	8
		87.5%	12.5%	-	100.0%
	medium	5	1	4	10
		50.0%	10.0%	40.0%	100.0%
	thick	6	4	3	13
		46.2%	30.8%	23.1%	100.0%
Total		18	6	7	31
		58.1%	19.4%	22.6%	100.0%
LA 61299	medium	2	1	-	3
		66.7%	33.3%	-	100.0%
	thick	2	1	2	5
		40.0%	20.0%	40.0%	100.0%
Total		4	2	2	8
		50.0%	25.0%	25.0%	100.0%
LA 61302	thin	1	1	-	2
		50.0%	50.0%	-	100.0%
	medium	2	2	7	11
		18.2%	18.2%	63.6%	100.0%
	thick	3	3	2	8
		37.5%	37.5%	25.0%	100.0%
Total		6	6	9	21
		28.6%	28.6%	42.9%	100.0%
LA 113954	thin	10	3	-	13
		76.9%	23.1%	-	100.0%
	medium	9	4	7	20
		45.0%	20.0%	35.0%	100.0%
	thick	3	8	5	16
		18.8%	50.0%	31.3%	100.0%
Total		22	15	12	49
		44.9%	30.6%	24.5%	100.0%
		Unknown			
LA 61290	thin	13	-	-	13
		100.0%	-	-	100.0%
	medium	1	1	-	2
		50.0%	50.0%	-	100.0%
	thick	4	2	3	9
		44.4%	22.2%	33.3%	100.0%
Total		18	3	3	24
		75.0%	12.5%	12.5%	100.0%
LA 61293	thin	7	1	2	10
		70.0%	10.0%	20.0%	100.0%
	medium	5	4	3	12
		41.7%	33.3%	25.0%	100.0%
	thick	2	1	2	5
		40.0%	20.0%	40.0%	100.0%
Total		14	6	7	27
		51.9%	22.2%	25.9%	100.0%

Table 184 (continued).

Site / Component	Thickness	Noncortical	10-50% Cortical	60-100% Cortical	Total
LA 67959	thin	-	1	1	2
		-	50.0%	50.0%	100.0%
	medium	-	3	1	4
		-	75.0%	25.0%	100.0%
	thick	2	1	2	5
		40.0%	20.0%	40.0%	100.0%
Total		2	5	4	11
		18.2%	45.5%	36.4%	100.0%
LA 67960	thin	1	-	-	1
		100.0%	-	-	100.0%
	medium	-	1	-	1
		-	100.0%	-	100.0%
	thick	2	-	2	4
		50.0%	-	50.0%	100.0%
Total		3	1	2	6
		50.0%	16.7%	33.3%	100.0%
LA 113946	thin	26	7	3	36
		72.2%	19.4%	8.3%	100.0%
	medium	57	9	4	70
		81.4%	12.9%	5.7%	100.0%
	thick	27	8	12	47
		57.4%	17.0%	25.5%	100.0%
Total		110	24	19	153
		71.9%	15.7%	12.4%	100.0%
LA 114071	thin	2	-	-	2
		100.0%	-	-	100.0%
	medium	22	2	3	27
		81.5%	7.4%	11.1%	100.0%
	thick	19	11	5	35
		54.3%	31.4%	14.3%	100.0%
Total		43	13	8	64
		67.2%	20.3%	12.5%	100.0%
Mixed					
LA 108902	thin	209	18	15	242
		86.4%	7.4%	6.2%	100.0%
	medium	43	6	6	55
		78.2%	10.9%	10.9%	100.0%
	thick	12	9	11	32
		37.5%	28.1%	34.4%	100.0%
Total		264	33	32	329
		80.2%	10.0%	9.7%	100.0%
LA 111364	thin	-	2	2	4
		-	50.0%	50.0%	100.0%
	medium	3	3	2	8
		37.5%	37.5%	25.0%	100.0%
	thick	1	3	3	7
		14.3%	42.9%	42.9%	100.0%
Total		4	8	7	19
		21.1%	42.1%	36.8%	100.0%

found at the site or nearby, or raw material is minimally reduced for transport to the village or base camp.

For the Middle Archaic components, which are base camps that had occupations of varying intensity and duration, a mixed assemblage would be expected. Only LA 61286, Area 2, had greater than 50 percent thin core flakes. This is heavily influenced by the isolated obsidian reduction area that was present and the more common occurrence of nonlocal materials throughout the component. Thin, noncortical flakes are more than 50 percent of the total flake assemblage, again reflecting a lithic technology that supported logistical and residential tasks. By comparison, LA 61289, which has a comparable assemblage size, thin, noncortical flakes comprise 21 percent of the assemblage. Thicker flakes comprise 71 percent of the component assemblage, and roughly half are noncortical. This pattern is consistent with a residentially based technology in which all stages of core reduction occur on site, but very limited production of tools for logistical forays. LA 61290 and LA 67959, with much smaller assemblages, are more comparable with LA 61289, suggesting that the Middle Archaic pattern on the piedmont tended more toward a technology that supported residential and daily foraging activities and more limited support of logistical forays.

Late to Latest Archaic components are a mix of residential and limited activities. Therefore, a mixed reduction pattern would be expected. LA 61286, Area 1; and LA 61293, Area 1, are predominantly residential components with pit-structure foundations and extramural thermal features. Both have an overlay or mix of limited activity that succeeds the residential occupation. Typically, these later and less intensive activities will be masked by the larger assemblages left from the residential occupation. Therefore, the detail of the limited-activity component is masked, and the residential component assemblage is slightly skewed. LA 61286, Area 1, exhibits a slight preference for thin, noncortical flakes, although they are not in the majority, as at LA 61286, Area 2. More thin flakes are noncortical than cortical, and the thicker flakes are the opposite. This suggests that both expedient and curated strategies were supported by the lithic technology. LA 61293, Area 1, which had a small assemblage, exhibits a much higher percentage of medium and thick flakes than thin flakes. The majority of thin flakes are noncortical, and cortical flakes account for more than 50 percent of the medium and thick flakes. The LA 61293, Area 1, assemblage does reflect a mixed lithic technology, but the focus is on early-stage biface reduction or expedient use of locally available material.

The two spatially discrete Late to Latest Archaic limited-activity components reflect the two main subsistence strategies. LA 61286, Area 2, had a low-frequency assemblage dominated by medium and thick flakes that were 50 percent cortical. Early-stage or expedient core-reduction technology may be more associated with foraging and processing than hunting. These artifacts were associated with four thermal features that were used primarily for plant processing. LA 61290, Area 6, lacked thermal features, but the lithic assemblage is predominated by thin flakes and noncortical flakes. Thin flakes make up almost 50 percent of the assemblage, and noncortical flakes account for 64 percent of the assemblage. Small size and low frequency of cortex suggests a curated technology, commonly with reduction of preforms or heavily reduced cores. A dart point was recovered from this cluster, further suggesting that this component was related to hunting that was logistically organized rather than carried out from a nearby residential camp.

The Late to Latest Archaic components reflect a mixed technology in support of subsistence strategies that included residential and limited-activity sites. Differences in the residential camp assemblages may reflect length of occupation and perhaps intensity. The LA 61293, Area 1, pit structure shows at least two remodeling episodes, suggesting it was used over at least two seasons. LA 61286, Area 1, is more consistent with one, longer occupation. The season and focus of the subsistence strategies at these residential camps may have conditioned the assemblage composition. The two limited-activity sites represent the two main strategies employed from residential camps: logistical and foraging. LA 61290, Area 6, may remain from a hunting foray into the piedmont from a more distant residential site. This would fit a model of shifting uses of a seasonal territory as biotic resource availability and distribution changed. LA 61286, Area 2, appears to remain from processing activities more commonly associated with foraging. Daily foraging is not often characterized by a field processing component. However, the shallow thermal features suggest similar processing requirements over the course of a few hundred years. This suggests more depth to processing and foraging than has usually been proposed in the literature for archaeological hunter-gatherer populations in other areas.

The Ancestral Pueblo period assemblages are expected to reflect expedient technology, primarily in support of daily or overnight hunting and gathering activities. Lithic reduction should have been less intensive than has been described for the Archaic period components. For all assemblages, thin flakes are in the minority and cortical flakes are in the majority, with two exceptions. Medium and thick flakes with more than 10 percent cortex are the majority core flake type and are typical of Ancestral Pueblo tool makers or foragers. More noncortical, thin flakes were recovered from LA 61290 components, which may reflect more intensive foraging or processing use of the area. Thermal features were always associated, and they clustered mainly in Area 1, suggesting focused use. More intensive use may result in reduction on partly reduced material left by previous occupants or the transport of more reduced material to a location, where processing, not raw-material procurement and reduction, was the main activity. Differences in Ancestral Pueblo flake assemblage characteristics caution against considering the piedmont sites and components as monolithic.

It is useful to compare unknown assemblages to dated assemblages (Table 184). Interestingly, the unknown assemblages reflect the range of variability for Ancestral Pueblo and Archaic components of limited-activity sites. Three assemblages—LA 61290, unknown components; LA 113946; and LA 114071—have unusually high percentages of noncortical flakes, suggesting middle- or late-stage reduction. Flake thickness, however tends toward medium and thick. Only two thin flakes were recorded from LA 114071, and at LA 113946 only 24 percent were thin. The LA 61290 unknown components were the opposite, with predominantly thin flakes. LA 114071 and LA 113946 were core-reduction areas, where large pieces of raw material were reduced and presumably the least desirable or suitable was left behind. LA 61290 reflects reduction or heavily reduced cores or blanks, perhaps in support of hunting. Since these three components could fit Late to Latest Archaic and Ancestral Pueblo patterns, they are best categorized as unknown. The other assemblages are small and reflect a general range of thickness and dorsal cortex that is consistent with mixed reduction, which would support foraging activities.

Mixed components present two different technological profiles. LA 108902 is outstanding for its predominance of thin, noncortical flakes, which comprise 64 percent of the assemblage. Thin flakes make up 81.5 percent of the assemblage, adding to the impression that LA 108902 debris reflects a curated technology with very limited use of minimally reduced raw material. Tool production and maintenance may have been the technological focus, which would suggest a logistically organized component. This more intensive lithic reduction is consistent with LA 61290, Area 6, which has characteristics of a curated assemblage. LA 111364 is more like the Ancestral Pueblo components, but with Late Developmental through Early Classic period time depth. The small assemblage reflects material procurement and early-stage reduction with a high percentage of cortical, medium and thick core flakes.

Technological Variables as Ratio Data: Implications for Lithic Technological Organization

It is explicit in the analysis of lithic technology that the assemblages are from sites or components representing an aspect or aspects of a settlement and subsistence strategy. These sites or components were the site of one or many activities that resulted in the discard of assemblages. Patterning in assemblages and attributes within these assemblages and the relationship between similar and different site types across and between time reflect different strategies and technologies. These technological variables are examined for clustering and correlation that may lead to a better understanding of technological organization.

In this analysis, six ratio scale variables were constructed that reflect different, nonautocorrelated aspects of lithic technological organization: noncortical to cortical core flake ratio, whole to fragmentary core flake ratio, local to nonlocal material source ratio, early- to late-stage platform type ratio, core-reduction debris to core ratio, biface manufacture debris to formal tool ratio, and core-reduction debris to informal tool ratio. Each of these ratios incorporates an aspect of core reduction, tool manufacture, or tool use. These measures alone reflect reliance on core-reduction or biface manufacture, expedient or curated material use, and formal or informal tool use or maintenance.

The preceding analysis of dorsal cortex and flake thickness indicates that there may be considerable variability across components within each period. This variability reflects different activities and associated technological organization. A hierarchical cluster analysis was constructed to examine this variability through three or more of the ratio scale variables. It is expected that similar site types and technological organization will occur across time. It is also expected that the clusters will not form along a temporal dimension. Analyses were completed for the Archaic period sites and the Ancestral Pueblo sites. Both analyses used average linkage within group and Euclidean distance (Figs. 282 and 283).

For the Archaic period sites, eight components were included in a hierarchical cluster analysis employing the noncortical to cortical core flake

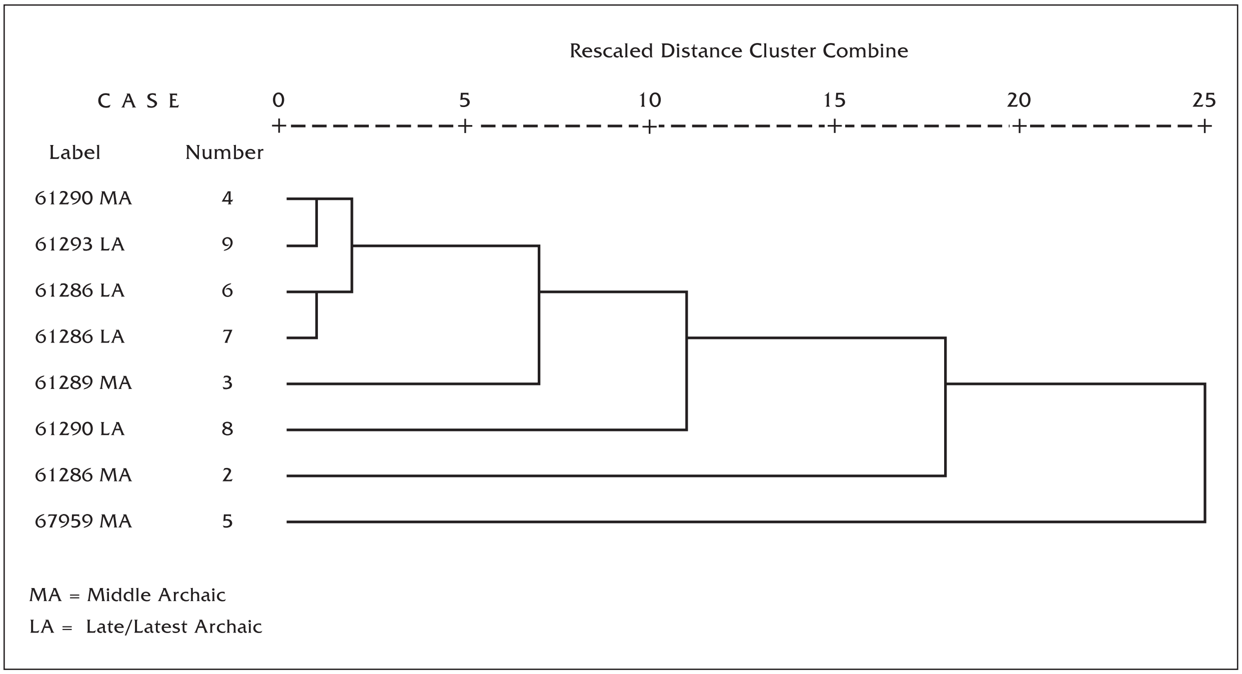


Figure 282. Archaic lithic assemblage hierarchical cluster analysis using average linkage, within group distance.

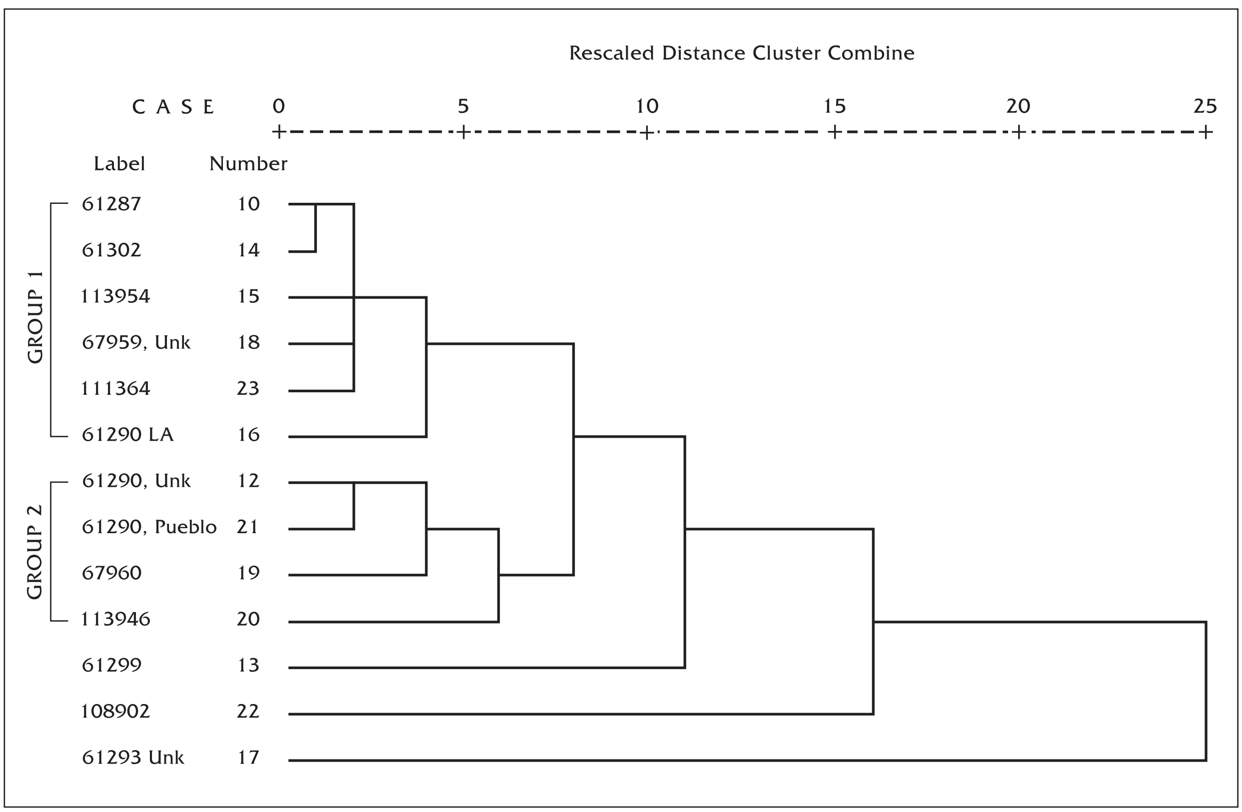


Figure 283. Ancestral Pueblo, mixed, and unknown lithic assemblage hierarchical cluster analysis using average linkage, within group distance.

ratio, whole to fragmentary core flake ratio, local to nonlocal material source ratio, and early- to late-stage platform type ratio. Four components clustered into one group at the two-cluster level, and the remaining four components were added at seven- to ten-cluster level intervals, indicating that they were each a cluster.

The four components that clustered were LA 61290 (Middle Archaic); LA 61293 (Late to Latest Archaic); LA 61286, Area 2 (Late Archaic); and LA 61286, Area 1. Three of the components are Late to Latest Archaic, and two (LA 61286, Area 1; and LA 61293) are residential basecamps. LA 61290 may have been a basecamp, but no indisputable structure remains were identified. LA 61286, Area 2, is a limited-activity or processing site. Obviously, site type and technological organization may not correspond. Nor is there a temporal dimension to this cluster, since Middle and Late to Latest Archaic components are present. Looking for correlations within the group yielded mixed results. A correlation matrix using noncortical to cortical core flake ratio, whole to fragmentary core flake ratio, local to nonlocal material source ratio, early- to late-stage platform type ratio, and core-reduction debris to core ratio variables was run using Pearson's two-tailed test (Table 185). The matrix showed significance at the 0.01 level between early- to late-stage platform and whole to fragmentary core flake ratios, and at the -0.05 level for core-reduction debris to core and whole to fragmentary core flake ratios. These two strong correlations are contradictory, since it is expected that early-stage reduction and a greater proportion of whole flakes will co-occur and that an increase in the ratio of core flakes to cores reflects late-stage reduction and therefore an increased probability of fragmentary flakes. Instead, whole flake proportion increases as the number of flakes relative to cores also increases. The only other correlation that is strong, though not statistically significant, is the positive relationship between the core-reduction debris to cores and nonlocal to local material source ratios. A positive correlation between these variables would be expected because nonlocal materials such as obsidian should have low core frequencies. So as obsidian is more abundant, the number of cores relative to core flakes should decrease. This relationship indicates that the components may have had a low-level logistical component to their subsistence organization. Basically, this analysis suggests that there is no consistent set of variable correlations that would explain the clustering of these four components. In this case, the hierarchical cluster analysis yields groups that are difficult to interpret relative to technological organization.

Table 185. Correlation matrix of Archaic period lithic reduction ratios

Pearson Correlation Significance (2-tailed) Number	Noncortical to Cortical Core Flakes	Whole to Fragmentary Core Flakes	Nonlocal to Local Material Sources	Early- to Late-Stage Flake Platforms	Core-Reduction Debris to Cores
Noncortical to cortical core flakes	1	-.126	-.033	-.096	.354
	-	.767	.938	.82	.491
	8	8	8	8	6
Whole to fragmentary core flakes	-.126	1	-.529	.875**	-.887**
	.767	-	.177	.004	.019
	8	8	8	8	6
Nonlocal to local material sources	-.033	-.529	1	-.565	.797
	.938	.177	-	.144	.057
	8	8	8	8	6
Early- to late-stage flake platforms	-.096	.875**	-.565	1	-.670
	.82	.004	.144	-	.145
	8	8	8	8	6
Core-reduction debris to cores	.354	-0.887*	.797	-.670	1
	.491	.019	.057	.145	-
	6	6	6	6	6

** Correlation is significant at the 0.01 level.

* Correlation is significant at the 0.05 level.

The other four components that are not clustered include LA 61286, Area 2 (Middle Archaic); LA 61289 (Middle Archaic); LA 61290 (Late Archaic); and LA 67959, Middle Archaic. They include two base camps and two limited-activity sites or temporary camps. Strong correlations between assemblages from these sites would not be expected. All Middle Archaic components were tested for correlations for the same five variables, and no significant correlations were produced. This seems to strengthen the classifications drawn from the hierarchical cluster analysis. The Late to Latest Archaic components were tested in the same manner, and there was a statistically significant positive correlation between core-reduction debris to cores and whole to fragmentary core flakes. This correlation is difficult to explain, because as the proportion of core flakes increases, it is expected that the number of fragmentary flakes would increase if late-stage core reduction or early-stage biface production were carried out. Instead, it appears that early- or middle-stage reduction resulted in higher frequencies of core flakes while maintaining high frequencies of whole specimens. This trend would result in a greater availability of long edge flakes, which may have been preferred for expedient tools.

In summary, the eight Archaic component assemblages embody sufficient variability that each component is virtually unique, different variables are not highly correlated, and those that are can be contradictory. This variability reflects the fluid and flexible nature of the technological organization within and across time and site or component types. This same flexibility is reflected in the range of features in association with the assemblages. Because a small sample of temporal components is available to examine roughly 4,500 years of occupation, it is not surprising, if not a little disappointing, that potentially meaningful correlations were lacking.

Cluster analysis of the Ancestral Pueblo components, unknown temporal components, and mixed components yielded two groups at the eighth cluster level (Fig. 283). Only three assemblages—LA 61299; LA 108902; and LA 61293, unknown—failed to fall into a group.

Group 1 had six components. All but LA 111364 and LA 67959, unknown, had thermal features, but the artifacts were not directly associated with the features. All assemblages except LA 113954 consisted of fewer than 50 artifacts, primarily from scattered surface contexts. These assemblages represent accumulations from multiple small-scale visits by foragers. A Pearson's R correlation matrix shows no significant attribute correlations for these components. This is not surprising, since they are accumulations from a potentially varied set of activities.

Group 2 had four components. Two components, LA 113946 and LA 114071, had discrete core-reduction areas where large pieces of raw material had been left behind. LA 67960 is a diffuse artifact scatter that may represent an opportunistic quarry. LA 61290 does not obviously fit into this mix because the artifacts are associated with a cluster of thermal features and pottery that remain from repeated foraging and nut processing by Ancestral Pueblo groups. As with Group 1, there are no significant correlations between variables. The strongest positive correlation is between noncortical to cortical core flakes and core flakes to cores. As the noncortical core flakes increase, the proportion of cores decreases, which seems to reflect the two discrete lithic-reduction areas at LA 113946 and LA 114071.

As with the Archaic assemblage, the inherent variability within each component assemblage belies the apparent statistical variability. Even though these assemblages appear to reflect a focus on expedient reduction of cores and a limited use of nonlocal material in the production of curated bifaces and other tools, the assemblages show weak to poor correlations. Rather than emphasizing the lack of variability in these assemblages, the results reinforce the subjective impression that these assemblages reflect a broad and diverse range of activities within generalized subsistence strategies.

Curated versus Expedient Tool Use and Discard

Tool type frequency and variability was expected to be limited based on the test excavation lithic assemblage data. Tools were expected to reflect short-term expedient or single-episode, task-specific use of the piñon-juniper landscape. Tools that required more production input and could be considered reliable were expected to be produced from the highest quality materials, of which nonlocal obsidian would have been the most preferred. Expedient or hand tools were expected to be produced from the locally available raw materials, which might exhibit more variation in quality but have the advantage of availability. These assumptions were based on ethnographically observed and archaeologically tested models of daily foraging and logistically organized resource procurement. It was expected that Ancestral Pueblo foraging would be primarily a daily activity for which planning directed at tool needs would be minimal and fulfilled by the raw material available in the piedmont. Hunting activities would likewise be staged from the village, and, therefore, a minimal number of task-specific tools were taken into the field and there were limited expectations for situational tool manufacture.

Excavation revealed a range of Ancestral Pueblo foraging and processing sites and Archaic residential and processing locations. These three basic functional site types and the inferred range of activities and behaviors that the features and artifacts represent enable us to examine assumptions about the organization of tool technology relative to site function and subsistence needs.

Throughout the lithic technology literature and cultural resource management studies of the last 30 years, there has been a focus on identifying tool assemblages associated with activities and site types relative to subsistence strategies and settlement models (Hudspeth 1997). Abundance and diversity of tool types are used to infer the range of activities, such as expedient tools, scrapers, and ground stone for processing and foraging camps, and bifaces, projectile points, and blades or knives for hunting and meat-processing sites. Combined foraging and hunting assemblages are inferred for residential camps. Abundance reflects intensity and duration and is dependent on consistent identification of formal and informal tools. Diversity is dependent on models that equate tool form and wear. Inferences about tool use are based on ethnographic and ethnoarchaeological observations. High tool-type diversity may arise from a broad range of activities carried out during one occupation or from repeated occupations with different subsistence goals, or tools may accumulated through time from activities carried out by temporally and culturally unrelated groups. The number of tool classes reflects the analyst's ability to discriminate tool functions. Conservative approaches that lump tools into broad classes such as scrapers, bifaces, projectile points, hand tools, etc. restrict the ability to tease out diversity, but they reduce error that may come with incorrect characterizations of function.

A total of 158 tools were recovered from all sites (Table 186): bifaces, scrapers, projectile points, hand tools, manos, metates, and indeterminate ground stone. The low number of tool classes presented in this report reflects a conservative approach to assigning the function of tools.

Informal tools. A total of 59 artifacts were classified as informal tools. Informal or expedient tools are defined as pieces of debitage that were unmodified or modified through use or manufacture along one or more edges. These artifacts show an attempt to modify the piece of debitage to fit a mental or functional template. Informal tools may have modified edges that result from the need to resharpen an edge or change the edge angle to better suit a cutting or scraping task. Two attributes, edge damage and edge angle, provide the best indications of tool use and, by inference, site activities.

Informal tools were identified by edge modification or the presence of visible edge damage. Debitage edges were examined with a binocular microscope for consistent damage. Two basic wear patterns were most commonly identified alone or in combination: unidirectional and bidirectional. Unidirectional wear is attributed to repeated scraping of rough or hard materials (Vaughan 1985:52) or extended use (Schutt 1981). Bidirectional wear is attributed to sawing or cutting of hard materials such as wood or bone. The presence of step-fracturing, crescentic scars, and rounding were monitored. Step fractures most commonly result from unidirectional and bidirectional motion on a hard material. Crescentic scars most commonly occur with unidirectional cutting or scraping. Rounding results from extended use of tools, so that scars become obliterated, and the use-edge is dulled.

Edge angles are used as an indicator of intended tool use. Used edge angles represent the finished edge rather than the original edge, so they are a rough indicator. Experimentation has shown that 40-degree or less edge angles are

Table 186. Tool type by period and site

Site	Bifaces	Scrapers	Projectile Points	Informal Tools	Hand Tools	Manos	Metates	Indeterminate Ground Stone	Number of Tools	Number of Classes
Middle Archaic										
LA 61286	6	-	2	1	1	2	2	1	15	7
LA 61289	2	-	-	11	2	8	2	1	26	6
LA 61290	-	-	-	2	1	-	4	-	7	3
LA 67959	-	-	-	1	-	-	-	-	1	1
Late/Latest Archaic										
LA 61286	5	3	2	16	6	4	1	-	37	7
LA 61286	2	-	-	1	-	-	-	-	3	2
LA 61290	1	-	-	-	-	-	-	-	1	1
LA 61293	2	-	2	8	4	2	-	-	18	5
Ancestral Pueblo										
LA 61287	1	-	-	-	3	-	-	-	4	2
LA 61289	-	-	-	-	-	-	-	-	-	-
LA 61290	1	-	-	-	-	-	-	-	1	1
LA 61299	-	-	-	1	-	-	-	-	1	1
LA 61302	-	-	-	2	-	1	-	-	3	2
LA 113954	-	1	1	1	-	-	-	-	3	3
Unknown										
LA 61290	-	-	-	-	-	-	-	-	-	-
LA 61293	-	1	-	-	-	1	-	-	2	2
LA 67959	-	-	1	1	2	-	-	1	5	4
LA 67960	-	-	-	1	1	-	1	-	3	3
LA 113946	-	2	-	-	-	-	-	-	2	1
LA 114071	-	1	-	-	1	-	-	-	2	2
Mixed										
LA 108902	4	1	4	10	1	-	-	-	20	4
LA 111364	1	-	-	3	-	-	-	-	4	2
Total	25	9	12	59	22	18	10	3	158	

optimal for cutting, while those of greater than 40 degrees are better suited to scraping (Schutt 1981). This rigid dichotomy does not allow for a continuum of scraping activities. In this analysis, edges of 40–60 degrees are considered scraping or cutting edges, and those of greater than 60 degrees are considered heavy-duty scraping edges.

Middle Archaic period components yielded only 15 informal tools from four components. LA 61286 and LA 67959 had one informal tool each, and LA 61290 had two informal tools. The low frequency is amazing, since 470 chipped stone artifacts were recovered from LA 61286, and only 26 were recovered from LA 67959. Informal tool frequencies are not determined by overall assemblage size. Instead, their abundance may reflect on-site activities. In the case of LA 61286, there was sufficient core-reduction debris to suggest that tools could have been made. Clearly, if they were made and used on site, they were not recognized in the analysis. At LA 67959 and LA 61290, the low-frequency assemblage indicates that few tools were required to support limited foraging and processing. LA 61289 had eleven informal tools—not a large number, but more than any other Middle Archaic component. Wear and modification are indicative of scraping and cutting; both unidirectional and bidirectional wear were observed. The majority of the tools have edge angles between 40 and 59 degrees, suggesting the most generalized use. Eight of eleven edges exhibit unidirectional wear from scraping, such as would accompany plant processing. All were made from local chert. For all components, local chert was preferred, except for the obsidian flake from LA 61286. Figure 284 is a scatterplot of utilized edge length by utilized edge angle. The plot shows a linear trend of increasing edge length with increasing edge angle, except that the steepest angles were measured on the shortest angles. Two Madera chert tools from LA 61289 appear to be heavy-duty scrapers, such as might have been used to process wood. The range in edge lengths and angles again suggests

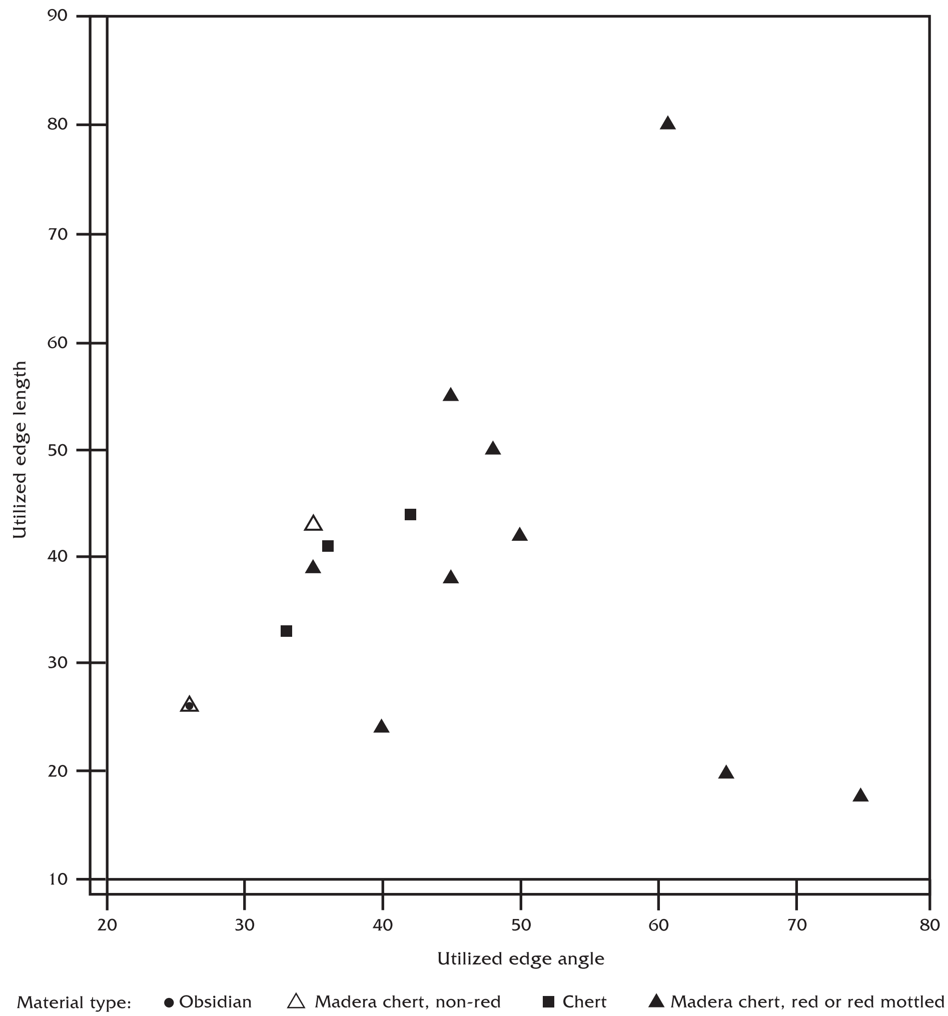


Figure 284. Middle Archaic informal tool scatterplot of utilized edge length by utilized edge angle.

tool flexibility rather than specificity.

Middle Archaic informal tools occur in low numbers and are difficult to interpret. Artifact assemblage and feature counts do not appear to influence the informal tool counts. This suggests that the informal tool counts from the Middle Archaic components reflect site activities rather than sampling. LA 61289 has the highest frequency, with an emphasis on plant or hard-material processing. The other sites have fewer informal tools, suggesting that different resources were processed.

Late to Latest Archaic informal tools are more abundant than tools from Middle Archaic components. A total of 25 informal tools were recovered from the four Late to Latest Archaic components. LA 61290 yielded no informal tools; and LA 61286, Area 2 (Late Archaic), yielded one informal tool. Most of the tools were recovered from LA 61286, Area 1; and LA 61293, Area 1. All informal tools from LA 61286 and LA 61293 were produced from local chert and chalcedony. This is consistent with a model that predicts local materials, if present, will be used for the bulk of the everyday tools (Binford 1979; Andrefsky 1994; Kelly 1988). The edge angles of the tools from LA 61286 are predominantly 40 to 59 degrees, and those from LA 61293 are relatively evenly distributed across all edge-angle ranges. Both components are residential and would be expected to have the widest range of domestic resource-procurement and processing activities represented. Unidirectional edge wear and modification occurred on 16 tools from both sites.

Edge wear in general was evenly distributed across components, further emphasizing the full range of activities that were supported with informal tools. Figure 285 is a scatterplot of utilized edge length by utilized edge angle. It shows an unpatterned distribution for LA 61286 and LA 61293. Steep edge angles occur on short and long edges, as do acute edge angles.

Informal tools from Late to Latest Archaic components follow expectations. Generalized tools with unpatterned morphology and wear, they were made from locally available raw materials. This lack of patterning, which is its own pattern, is the benchmark of residential sites within a mobile adaptation.

Ancestral Pueblo, unknown, and mixed component assemblages yielded few informal tools. This low frequency is consistent with a daily foraging pattern in which tools are brought from the village or are produced at the processing location but are not worn or modified enough to be detected by analysis. Thirteen informal tools were identified, nine from LA 108902, which has the least typical assemblage. For all components, local raw material was used in all but one tool from LA 108902 and one tool from LA 113946. LA 108902 was similar to the LA 61286, Middle Archaic, component in the abundant use of obsidian. Again the pattern is that local raw materials were favored for expedient tools. Only two tools exhibited bidirectional wear, indicating a heavy emphasis on scraping and processing of plants or hard materials. These were not the only activities at these sites, but the informal tools were not regularly used for cutting or slicing. Like the Middle Archaic sites, there was a slight trend of increased edge length and increased edge angle up to 65 degrees. This seems to coincide with an emphasis on tools with unidirectional wear or modification.

Informal tools from Pueblo, unknown, and mixed periods seem to follow the Middle Archaic

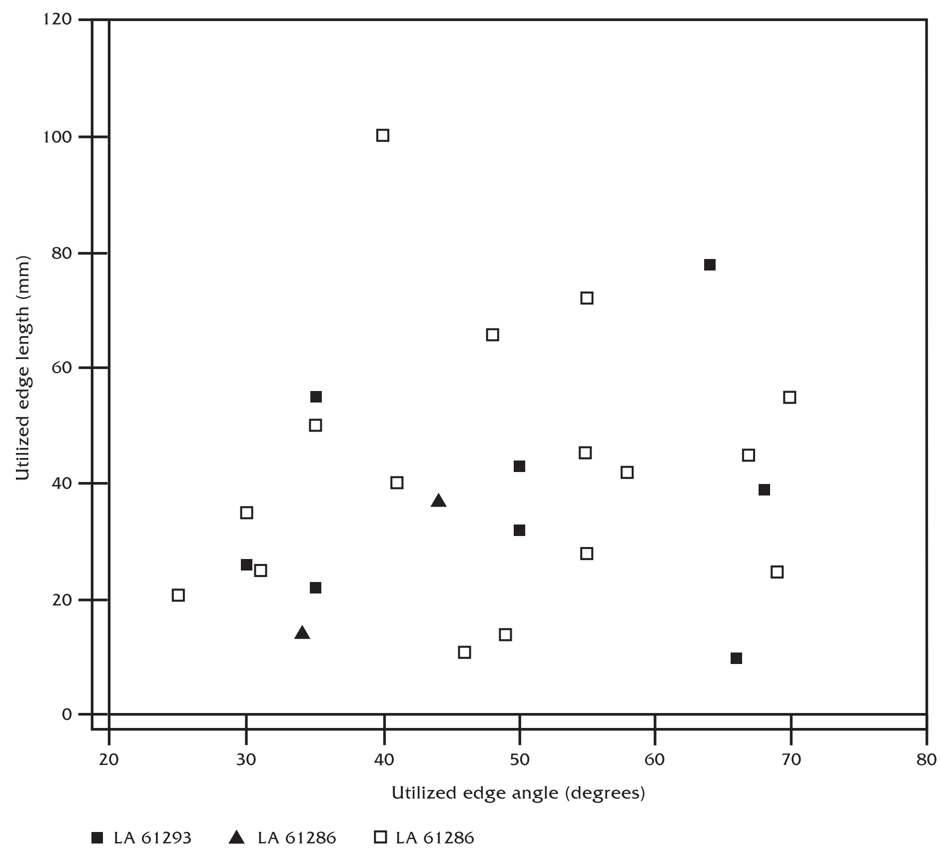


Figure 285. Late/Latest Archaic informal tool scatterplot of utilized edge length by utilized edge angle.

pattern. There was an emphasis on scraping when tools were present. Local raw material was used in all but two cases. LA 108902, which had the most informal tools, shows patterning consistent with repeated processing or residential base camp activities.

Formal tools. Formal tools are debitage or blanks whose form was extensively modified to create a specialized shape, edge outline, or edge angle. Flaking patterns are defined by location as unifacial or bifacial, and forms are classified as early-, middle-, and late-stage tools. Early-stage tools have an irregular outline, chunky profile, and widely spaced flake scars. Middle-stage tools have a more regular outline and more closely spaced and regular flake scars, which may extend across the tool face. Late-stage tools have regular outlines and closely spaced flake scars that span the tool face. Formal tools are an indication of specialize activities and some use of a curated strategy. Formal tools are associated with planned or specific activities. Formal tools used in logistical subsistence activities are returned to a base camp for refurbishing or discard. Occurrence of biface manufacture flakes often accompanies formal tools, or they may occur in the absence of formal tools, depending on the availability of suitable raw material near hunting territories or resource-extraction areas. Abundant raw materials are available in the two upper-elevation hunting areas in the Jemez and Sangre de Cristo Mountains. Therefore, it is less likely that biface production at residential sites would support hunting in these areas. The juniper grasslands of the Galisteo and lower Santa Fe River basins lack abundant raw material, perhaps requiring the production of bifaces prior to forays into those areas.

Formal tools recovered from all contexts totaled 49, of which there were 25 bifaces, 11 unifacial tools or scrapers, and 13 projectile points. For the 21 dated components, 49 formal tools is a low number, representing less than 2.5 per component. This means that over the estimated 6,100 years of occupation, one formal tool was deposited every 125 years. These numbers serve to illustrate the limited contribution made to the technological repertoire by formal tools regardless of period or site type.

Formal tool frequencies are highest for LA 61286, Area 1 (Latest Archaic), with 10; and LA 108902 and LA 61282, Area 2 (Middle Archaic), with 9 each. These three components account for 57 percent of the formal tool assemblage. At LA 61286, Area 2 (Middle Archaic); and LA 108902, retooling or gearing up were definitely part of the technological organization. Both assemblages had more nonlocal raw material than was typically found at Northwest Santa Fe Relief Route sites. Five of seven bifaces and projectile points from LA 61286, Area 2 (Middle Archaic); and four of eight from LA 108902 were made from obsidian. The biface reduction area at LA 61286, Area 2 (Middle Archaic) and the overall assemblage from LA 108902 were geared to hunting. In contrast, at LA 61286, Area 1 (Latest Archaic), five of eight bifaces or projectile points made from obsidian, but obsidian and biface flakes comprised a smaller proportion of the assemblage, and informal tools were more abundant, indicating a more balanced or mixed on-site technological organization.

Examining the assemblage through time is difficult because of the small sample size. Obviously, technology geared to curated tools was important at the Archaic period sites, where even though there are low frequencies of discarded formal tools, biface reduction flakes occur consistently if not always in high numbers. It is more meaningful to examine formal tools and technological organization for all sites because there are interesting patterns that do relate to curated and on-site use.

One aspect of the assemblage that gives perspective on curation and gearing up is the proportion and types of breakage. Eight unnotched bifaces, which account for 51 percent of the assemblage, are whole (32 percent of the artifacts). Compared to projectile points, which had no whole specimens out of the 13 recovered, 32 percent is a high percentage of whole specimens. This suggests that unnotched bifaces were commonly used and discarded unbroken at sites, while projectile points were left at sites only after they had been broken and could not be or were not reused. From this perspective, biface production may have focused on producing dart or arrow points, with less effort on unnotched bifaces. This is not to say that unnotched bifaces were not replaced, since the majority recovered were broken, and nine of those could not be assigned a portion. This suggests that bifaces were intensively used before discard. Regardless of period and site type, technological focus seems to be on core reduction and informal tool use, but the intensive use of bifaces and the regular replacement of projectile points were also important. Unnotched bifaces may be the most flexible component of a tool kit. They can be used as a tool, or notched and used as a projectile point. Flakes can be removed from them as tools, and they can be reworked into many forms and reduced to a very small size. They would be useful at a residential site and for logistically organized foraging and hunting (Kelly 1988).

Whole-biface dimensions may relate to intended biface use. Medium-length bifaces may have been used as tools and may have had flakes removed that were used as tools. Five bifaces from Middle and Latest Archaic components could have been multipurpose bifaces that were discarded at residential camps because of diminished utility caused by decreased size or dulled edges. Multipurpose bifaces are an important indicator of curated technological organization. These tools were made for transport in connection with hunting forays. Serving as tools and sources of tools, they were returned to the residential site for discard. This a pattern that may be typical of logistically organized subsistence (Binford 1979; Kelly 1988; Sassaman 1998). The small bifaces may be exhausted multipurpose tools or tools produced for on-site use with multiple edges that could be maintained. Bifaces during the Archaic period indicate curated and on-site use, although interpretation is heavily constrained by sample size.

Examination of projectile point portions indicates on-site manufacture or the discard of broken points following hunting forays. Overall, there are no whole projectile points. There is a relatively even distribution of proximal and distal fragments, suggesting that discard following hunting forays and production of projectile points occurred. For the Middle Archaic components, three of four projectile point fragments are proximal, indicating that they were discarded after use. Late Archaic distributions are more equal, indicating that points were discarded after removal from the dart shaft and points were broken in manufacture. With the two Latest Archaic residential components, a more balanced manufacture, use, and discard of projectile points would be expected. For Ancestral Pueblo, unknown, and mixed components, there were few projectile points. A projectile point recovered from LA 113954 is a medial fragment of an Archaic style point. LA 108902 projectile point fragments are medial and proximal. These may remain from manufacture errors.

Formal tools are not abundant from any time period, site type, or component. Manufacture of formal tools is indicated by debris and by distal fragments of projectile points and whole bifaces. Projectile points were intensively used and appeared to have been used in logistically organized hunting forays with broken points discarded at the residential sites, especially during the Middle and Late Archaic periods. Bifaces were also intensively used, judging by the high proportion of fragmentary specimens and the small size of the complete specimens. Curated and on-site use are indicated by biface size and condition. The low frequency of projectile points and other formal tools indicates that they were not used in great abundance, but they may have been intensively used. Their discard may indicate that they were no longer functional and that movement to a new base camp included the potential for raw materials that were suitable for tool production and use.

Ground stone and hand tools. Often ground stone tools are separated from the chipped stone tool kit because they are not considered part of the same technological repertoire. Hand tools such as core/choppers are also difficult to integrate into a discussion of technological organization. Combined, they provide an important indicator of the technological organization of plant processing and processing-tool production and maintenance. The low frequency of biface and formal tool production at all sites combined with a high incidence of core-reduction debris and thermal-feature concentrations suggest that plant gathering and processing were important activities during all periods, especially the Archaic. Manos and metates that are manufactured and formed to certain technological specifications, for example, one-hand manos and basin metates, can be considered formal tools. They are less likely to be curated, but they may be cached at the site, and metates are considered reusable tools or site furniture (Binford 1979; Camilli 1989; Nelson and Lippmeier 1993).

LA 61289, Middle Archaic, has the most ground stone—eleven artifacts, including eight manos and two metates. It also had two hand tools and eleven informal tools, but few chipped stone formal tools. The impression is that this component was mainly focused on plant processing. One metate fragment was reused as thermal feature lining, indicating that the site was reused by a succession of Middle Archaic foragers. This component can be contrasted with LA 61286, Area 2 (Middle Archaic), and LA 61290 (Middle Archaic). The latter is interesting because only metates were found in association with the thermal features. Manos appear to have been removed, perhaps reflecting periodic site visits by the same or descendant groups. LA 61286, Area 2 (Middle Archaic) had low numbers of manos and metates. Two manos and one metate were whole, and four tools were fragmentary. The low frequency of ground stone is interesting because there were 31 thermal and pit features, indicating intensive or long-term use for plant processing. The low frequency of ground stone may imply that these features were more commonly used for meat processing or for processing of plant materials that required little or no grinding preparation. This can be contrasted with LA 61289, Middle Archaic, which had more ground stone and was dominated by cobble-lined features, with limited evidence of hunting or meat processing. The higher frequency of ground stone from LA 61289, Middle Archaic, strongly suggests a plant-processing emphasis.

Ground stone from the Latest Archaic components at LA 61286, Area 1; and LA 61293, Area 1, is interesting because manos predominate. One basin metate was recovered from LA 61286, Area 1. Dello-Russo (1997:128–130) suggested that a one-to-one relationship between manos and metates would be expected where curation was not a factor and grinding was an important site activity. He also suggested that more manos than metates could indicate hide processing, which he described as a labor-intensive task, most likely to occur at a residential site. Both latest components have more manos than metates, but moderate evidence of hunting. Hide processing is possible, but the limited evidence of hunting-tool production and use and the limited occurrence of large-mammal bone make it a weakly supported hypothesis. Both components have thermal features that could have been used for plant processing, and both have features that could have been used for storage. Storage was the bridge from winter into the late spring for Archaic populations in the piñon-juniper woodlands adjacent to perennial watercourses. Grinding tools in a situation where inhabitants were processing food for storage take on a different light because they make processing more efficient and help to reduce the amount of non-nutritive volume that is stored. This reduction of non-nutritive biomass also contributes to storage efficiency, reducing the need for large storage features, and makes smaller storage features, which are easier to build and maintain, a more viable option.

Pueblo, unknown, and mixed component ground stone tools are rare. Only one mano fragment was found with a Pueblo thermal feature at LA 61302. This can be contrasted with LA 61290, Area 1, which had a concentration of thermal features, including a piñon nut processing facility. No ground stone was found with this processing area. In-field processing of plant resources did occur, but the grinding of plant nuts, seeds, and fruits may have been rare. Furthermore, it is not surprising that manos and metates would be found randomly scattered on the landscape because Pueblo foragers may have regularly salvaged manos and metate fragments from one site for use at another. The relatively high site density found during the Northwest Santa Fe Relief Route and Las Campanas projects documents an actively used landscape in which all materials were potentially used.

Hand tools are well distributed through time and site and component types. Twenty-two hammerstones, choppers, core/choppers, and core/hammerstones were recovered. Hammerstones and core/hammerstones would be expected to co-occur with regular use of ground stone, which is somewhat the case, although the Middle Archaic component of LA 61289, which had the most evidence of plant processing, had only one core/hammerstone. It did have a chopper and core/chopper, tools that are expected in conjunction with fibrous-plant and wood processing. The Latest Archaic components had the most hand tools. These were the most formal residential occupations, suggesting that they were a regular part of the home tool kit. Ground stone maintenance and heavy-duty plant processing seem to fit lengthy occupation of the piñon-juniper piedmont.

Core/choppers, choppers, and hammerstones occur on Ancestral Pueblo, unknown, and mixed component sites. These tools could be used in the field, left at a site, picked up later and reused, and left again. Isolated core/choppers and choppers are not abundant, but they consistently occur in the juniper piedmont (Lang 1997; Post 1996a). Hand tools may be similar to ground stone and pottery in that they were a highly reused resource in a daily foraging routine.

Summary

The examination of lithic technological organization of populations that inhabited and used the piñon-juniper landscape focused on the dichotomy of expedient and curated tool production strategies. These two strategies, which were expected to operate on a continuum, rather than in opposition to one another, were applied to material procurement, reduction, and tool production and use. Expectations were that Archaic period sites and components would have more evidence of a curated technology with varying proportions of expedient reduction. Ancestral Pueblo assemblages were expected to primarily reflect expedient technology in most or all instances. Curated technology was expected to occur as isolated components within sites, and evidence of it is sometimes found as isolated occurrences on the larger landscape (Lang 1997; Post 1996a). Mixed components, which did date to the Ancestral Pueblo period but had long time spans, were expected to resemble the Ancestral Pueblo and Archaic patterns as more distantly located Pueblo villagers carried out logistically organized forays into the piedmont after the abandonment of Pindi and Agua Fria Schoolhouse Pueblos in the mid to late fourteenth century AD.

Material procurement, core reduction and tool production, and tool use and discard showed considerable variability through time. Expectations for the Archaic period components were partly realized, because there was a curated component to the technological organization, but it played a smaller part than expected, except for the LA 61286, Area 2 (Middle Archaic) component. The focus was typically on the use of local raw material for expedient and formal tools. Given the focus on core reduction and the large number of processing features at the Middle Archaic sites and the residential components for the Latest Archaic, more informal tools were expected, but they were not recovered. The resources that were processed apparently required few tools, or processing resulted in limited numbers of recognizably damaged or worn specimens. The low number of components that were investigated makes it difficult to make comprehensive statements about Archaic technological organization. However, there was considerable variability in assemblage composition and inferred technological organization within and across the different Archaic time periods. Mixed technological organization may reflect a wide range of processing activities, but it also may reflect multiple occupations that focused on different resources, resulting in mixed assemblages. Repeated use of the Archaic sites was noticed in all cases. Segregating assemblages into discrete spatial and temporal components was not possible. This assemblage-lumping contributes to variability and the difficulty of recognizing distinct patterning.

Ancestral Pueblo technological organization also showed technological variability relative to material procurement and core reduction. Differences reflect activities focused on intensive reduction of large pieces of raw material and the accumulation of low-frequency assemblages as locations were used repeatedly for low-intensity resource extraction. In-field processing as evidenced by thermal features was rarely accompanied by concentrations of lithic debris, suggesting that stone tools were not intensively used. Hand tools used for processing of hard or fibrous plant resources reflect a strategy of rendering resources into portable packages, rather than refining, which would increase nutritional or caloric value. For the most part, organization of lithic technology was consistent with a model of diurnal foraging. However, this pattern is not one dimensional, and it incorporates tremendous small-scale variability reflecting seasonal uses of the piedmont by a primarily agricultural population for 300 years.

The mixed-component assemblages show that there will be exceptions to the rule. While the majority of the Ancestral Pueblo assemblages reflect expedient use of local material on gentle hill slopes and ridges, LA 108902 was a lithic artifact concentration accumulated from repeated visits geared to hunting and gathering. Use of nonlocal raw material did not result in a distinct curated technological assemblage. Raw materials were brought to the site in reduced condition, but apparently not as large bifaces or blanks, nor were bifaces the primary tool produced. Portable hand tools and informal tools may have been produced at LA 108902 with a smaller amount of bifacial tools that indicate gearing up for mixed subsistence forays. This site has all the appearance of a logistically organized camp that was positioned to take advantage of a full range of piedmont and riparian resources. This kind of organization might be expected from Ancestral Pueblo groups that had moved downriver into the Cieneguilla area or southeast to Arroyo Hondo Pueblo. The middle and upper Santa Fe River and piedmont became a resource area with enough distance from the village to require logistically organized hunting and foraging. No site in the Northwest Santa Fe Relief Route project is similar. Other sites in the piedmont have similar assemblages, suggesting that specific locations were chosen by Ancestral Pueblo groups as logistical hunting and foraging camps. That these sites have accumulated debris suggests that territoriality played a role in site location.

This overview of lithic technological organization at the Northwest Santa Fe Relief Route sites shows considerable variability within and across time and subsistence adaptations. The small number of components from each time period indicates that variability relates to flexible technological organization responsive to changing abundance and distribution of plant and animal resources. No time period presents a one-dimensional pattern, and all periods show that residential and logistical hunting and gathering occurred.

Pit Features

Jessica Badner and Pamela J. McBride

Extramural features and surrounding activity areas often contributed to a large part of the subsistence and technological information from all Archaic period sites and nonarchitectural Ancestral Pueblo period sites in the Santa Fe area. Preservation of ethnobotanical and faunal remains is often poor at these small sites, as it was at the Northwest Santa Fe Relief Route sites (McBride and Toll, this volume). The faunal assemblage was made up of 156 bones, 114 of which were recovered from historic thermal features (Moga, this volume), and ethnobotanical remains are dominated by a low-frequency scatter of weedy annuals (McBride and Toll, this report). Feature context and morphology, and inferences made about feature function (for example, baseline ethnographic data), can provide valuable information about living space and everyday activities (Binford 1983). Ethnographic and ethnoarchaeological data may provide links to information about changing land-use and subsistence patterns through time in the absence of direct evidence.

A total of 168 features were excavated during the Northwest Santa Fe Relief Route project (Appendix 2). Features that lacked depth or definition were removed from consideration, as were pit structures and discard areas. The remaining 145 features make up a data set that was separated into six temporal groups: Early Archaic (Bajada, n = 2); Middle Archaic (San Jose, n = 68); Late Archaic (Armijo and En Medio, n = 13); Latest Archaic (Basketmaker II, n = 22); Pueblo (17); and unknown (n = 21).

In this analysis, pit features include shallow roasting pits, deep roasting pits, burned pits, unburned pits, and possible storage features. Extramural features often provide most of the information available about living and activity space at early sites.

Ethnographic and Experimental Data

Lewis Binford (1983) demonstrated that feature types such as roasting pits tend to share morphological attributes that can be compared cross-culturally. Using several ethnographic examples, he showed that certain activities (for instance, working next to a hearth) have a spatial "pattern." These patterns at habitation sites condition the construction and maintenance of different "facilities" seen in archeological context as features. The size and location of these features creates a "site framework" that in turn influences the use and construction of new facilities. In turn, activity areas can be identified among these facilities. For instance, Binford (1983) reported that a roasting pit used for meat processing was often large enough to cook a medium-sized animal whole. Because activities associated with roasting such as pit construction and meat removal are performed while standing and are often messy, they created a larger debris scatter. Associated activities such as butchering and skinning were also messy. As a result, meat-roasting pits are usually placed along a habitation's periphery. Binford also cites Robert Hard in stating that large roasting pits used for processing desert plants have "analogous distributions of debris at spatial scales similar to butchering areas" and are also located at a habitation's periphery. In contrast, small exterior hearths, which are more likely to be used while sitting, are more often in a central area. Small hearths are often expedient and can be changed according to need and wind direction. Binford also notes that retrieval of cooked foods can cause small exterior hearths to spread over a period of time, creating a large feature (Binford 1983).

Other cross-cultural morphological comparisons can be performed by considering the chemical and physical parameters necessary for optimal food processing. In her discussion of inulin hydrolysis, Wandsnider (1997) explores conditions necessary to process plant and animal foods to their best nutritional advantage and cross references the information with ethnographic data concerning pit dimensions, food, and preparation mode, excerpts of which are provided in Table 187. She observes that pit morphology reflects a cooking system conditioned by other factors such

Table 187. Ethnographic accounts of pit-hearth food preparation (from Wandsnider 1997: Appendixes 1 and 2)

Food	Group	Region	Insulation	Cooking Time (hours)	Length of Hearth (m)	Width of Hearth (m)	Depth of Hearth (m)	Quantity	Reference
					Meat				
Crickets	Surprise Valley Paiute	California, Nevada, Oregon	Grass	0.08-2.0	1.0	1.0	0.1	Catch varies in size	Kelly (1932:93)
Large piece of meat	San	Kalahari	None	1.5	-	-	-	-	Tanaka (1980:39)
Rabbits, squirrel	Surprise Valley Paiute	California, Nevada, Oregon	-	1.0-3.0	-	-	-	Several small packages	Kelley (1932:93)
Turkey	Havasupai	Northwest Arizona	None	4.0	-	-	-	-	Whiting (1985:180)
					Plants				
Camas	Nez Perce	Idaho	Grass, dirt	12.0-66.0	1.8	1.8	0.9	20-30 bushels	Spinden (1964:2001-2002)
Corn	Zuni	Western New Mexico	None	12.0	1.3	1.0	3.5	Large implied	Stevenson (1915:76)
Cholla buds (*Opuntia* sp.)	Apache	Arizona	Inkweed	12.0	-	-	-	-	Palmer (1871)
Cholla buds (*Opuntia* sp.)	Papago	Southern Arizona	Inkweed, grass	20.0	-	-	-	Mass collection	Castetter and Underhill (1935:5)
Prickly pear pads	Sanpoil	Northeast Washington	None	0.2	-	-	-	A quantity	Ray (1932:103)
Yucca baccata leaves	Cochiti Pueblo	New Mexico	None	20.0	-	-	-	Large (for fiber extraction)	Robbins et al. (1916:51)
Yucca stalk (Spanish bayonet)	Cahuilla	Southern California	Sand	20.0	-	-	-	-	Bean and Saubel (1972:150)
Acorn dough	Southern California	California	Leaves, dirt	0.5-0.6	0.5	0.5	0.5	Medium	Brown (1868: 383)

as fuel and labor availability. However, she is able to make some generalizations using ethnographic data.

Ethnographic accounts of food preparation involve three major strategies: boiling, roasting, or pit baking. Although they do not always conform to nor specifically take into account hunter-gatherer processing strategies, such accounts generally meet expectations regarding food processing. Dried, starch-rich foods and lean meat were usually boiled. Roasted foods included a combination of lean and less lean meat were generally cooked in ash coals or hot sand for a short time. In general, the foods most likely to be processed in a pit hearth needed to be cooked for a long time and subjected to moderate to high heat to maximize their nutritional value, such as fatty meat and inulin-rich foods (complex carbohydrates) such as camas. There are also ethnographic accounts of pit roasting pine nuts—process that would help press out the nuts and contribute to a prolonged storage life—and insects, including crickets and caterpillars. Cooking time for meat was approximately 10 hours, while plants such as cactus buds and maize took over 15 hours (Wandsnider 1997). Wandsnider noted that these generalizations may vary for mobile people who did not use large cooking vessels. Pit morphology along the Northwest Santa Fe Relief Route may reflect some of these differences in cooking requirements.

Plant Processing

In contexts like the Northwest Santa Fe Relief Route, sites are exposed, preservation is not optimal, and there are few artifacts, animal bones, or botanical remains (Moga, this volume; McBride and Toll, this volume). The correlation between attributes such as area, depth, morphology, fill, and condition may be some of the best data available to archaeologists trying to make inferences about subsistence and land use. Resource availability is also relevant. The following section looks at local plants that were probably available to the native population and the methods that could have been used to process and cook them. These include piñon nuts, acorns, soapweed yucca (*Yucca glauca*), biscuitroot (*Cymopterus bulbosus*, *C. fendleri*), cholla buds, seepweed, hedgehog cactus, and juniper seeds.

Piñon nuts were often gathered in late August or early September, when the nuts were still enclosed in the cone. The cones were heated, which caused them to open, exposing the nuts. This collection strategy avoided competition with birds and animals once the cones opened and dropped their bounty (Dunmire and Tierney 1995:96; Reagan 1928:146–147; Murphey 1959:23). Evidence of gathering and processing cones in this manner is present in several features where cone parts and nutshells were both recovered. Other features that contained either nutshell or pinecone fragments may have been used in a similar way; or just the nuts were parched after gathering and then ground into a meal, eaten whole, or stored for future use. The Havasupais added piñon twigs to roasting pits when preparing certain meats (especially porcupine, bobcat, and badger) because they protected the meat while it was roasting and gave it a distinctive flavor. They placed hot stones inside the abdominal cavity of larger animals that were cooked in these pits (Whiting 1985:62). Roasting pits that yielded cobbles and piñon wood and little else in the way of artifacts could have been used to roast meat in this way.

The extensive use of acorns from gambel oak (*Quercus gambelii*) is discussed in Castetter (1935:47) and Dunmire and Tierney (1995:115). These acorns contain little tannin and therefore could have been gathered and eaten raw or boiled and ground into a mush and made into cakes, unlike the California acorns that must be leached of their tannin for hours before they are edible. Although there are numerous ethnobotanical references to the use of acorns in New Mexico, and acorns would have been available in the Northwest Santa Fe Relief Route area, no evidence of their use was found,

The young flower stalks of *Yucca glauca*, which grows in the project area, could have been gathered in the spring and roasted on a bed of embers for about 15 minutes. The outer, burned portion was then scraped away, and the inner white portion was eaten (Bell and Castetter 1941:19). The fruits were not as favored as those of *Y. baccata*, but they were eaten by Navajos, who baked them in ashes (Bell and Castetter 1941:21). Although no evidence of stalks or seeds from the fruits was recovered, it is possible that these were part of the prehistoric diet in the project area.

Smith and McNees (1999) discuss the possible use of sandstone slab-lined roasting pits in southwest Wyoming for processing biscuitroot (*Cymopterus bulbosus*). It is possible that some of the pits excavated in the project area were used for a similar purpose—if not biscuitroot, perhaps another edible root. *Cymopterus fendleri* (Fendler's spring parsley) occurs in Santa Fe County (Martin and Hutchins 1981), growing among pebbles and cobbles on sandy hills. It prefers the underside of large cobbles, where moisture is more readily available. The fresh leaves (some of the first to sprout in March, April, and May) are most often collected, rather than the roots, which are difficult to dig (Dunmire and Tierney 1995:195). Castetter (1935:39) reported that Navajos occasionally peeled, baked, and ground the roots as a substitute for maize meal. Again, thermal pits in the project area may have been used this way, but no archaeobotanical evidence of such use was found.

Cactus seeds were recovered from a few roasting pits. Only the Pimas were known to roast cholla fruits (Castetter 1935:36). Curiously, Castetter's description is exactly like that of Greenhouse et al. (1981) concerning the preparation of pits and the roasting of cholla buds in the spring, including lining the pits with seepweed. It may be that Castetter mistook cholla buds for cholla fruit. Cholla bud roasting can be inferred when cholla pollen aggregates and charred seepweed seeds are present (Greenhouse et al. 1981). Cholla pollen was present in Feature 15 (associated with the Latest Archaic period) along with charred seepweed seeds. Despite the absence of pollen aggregates, the presence of both pollen and seepweed seeds strongly suggests that cholla buds were roasted in the pit. Seepweed seeds that were recovered from other features at sites in the project area could be residue from lining pits during cholla bud roasting in the spring.

Hedgehog cactus seeds were recovered from the roasting pit, Feature 22, LA 61289. The fruit has a relatively high sugar content and can be eaten raw or "sliced and baked like squash" (Castetter 1935:26). Considering the small size of hedgehog cactus fruit and the spotty distribution of the cactus, it is difficult to imagine having fruit large enough to slice and in sufficient abundance to require specialized baking features.

Juniper seeds were found in a number of thermal features. The fleshy cones of juniper were used to flavor meat, as at Acoma and Laguna, where the cones were mixed with chopped meat, stuffed in a deer stomach, and roasted (Castetter 1935:31). The cones were eaten by various groups, either ground and made into cakes or boiled. The cones were "regularly harvested by Rio Grande Pueblo Indians up until the supermarket era" (Dunmire and Tierney 1995:106). It is possible that the seeds found in 32 features were not just firewood residue, but food eaten by prehistoric people in the project area.

Evidence of Feature Function

Archaic populations in the Southwest were nomadic foragers dependent upon wild plant and animal resources gathered during a seasonal round (Irwin-Williams 1973). Agricultural Pueblo populations were more sedentary farmers/foragers who likely used wild plant species to supplement a more limited but stable diet of corn, beans, and squash (Wetterstrom 1986). Differences in feature construction and subsequent use may reflect changes in food procurement strategies caused by changing population density and changing lifeways. Feature function was evaluated using four criteria: feature morphology, presence of fire-cracked rock, feature condition as indicated by deposits, and the presence or absence of charred taxa.

Feature morphology and location can provide information about site use and suggest the mode and scale of food and material processing. Traits such as size and depth can suggest the possibility of processing certain foods or fibers (Wandsnider 1977). For instance, it is unlikely that a very small, shallow pit would hold enough coals to cook a large piece of meat.

Fire-cracked rock can indicate thermal activity. The use of rock as a heat sink (Binford 1983; Wandsnider 1997) or for boiling water has been noted in ethnographic literature (Cushing 1974:222–224; Woodbury and Zubrow 1979:57). The presence or absence of fire-cracked rock was monitored for all features; however, those with more than 20 fire-cracked rocks were considered separately as possible roasting facilities.

Wandsnider (1997) reported that rock elements were likely to be present 80 percent of the time in pits where plant material was processed, and 37 percent of the time when meat was baked. When baking mixed packages, it was nearly always present. Thus, the absence of fire-cracked rock does not preclude plant baking, but it most commonly relates to meat processing (Wandsnider 1997).

Burned strata in the pit can indicate whether it was used as a thermal pit or not. Although some thermal pits may have been cleaned out, the presence of burned fill in this assemblage was the best indicator of thermal use. Burned deposits provide the best possible context for recovering carbonized plant remains and can provide other evidence of subsistence, such as burned animal bone.

The recovery of charred seeds, nuts, grains, and fuelwood from burned feature fill can provide further information about activities that took place at the site. The absence of charred archaeobotanical and faunal remains can also be indicative of food processing strategies that do not produce many remains and are probably further conditioned by use-length. The presence of charred seeds can also be affected by preservation, which is poor on the Santa Fe Piedmont (McBride and Toll, this volume). Pits with charred seeds, fruits, and nuts were separated from those with only charred wood remains and cross referenced with attributes such as morphology, content, and condition in the hope of identifying the context in which recovered taxa were more common.

Features by Site

Feature types were derived from a database of 145 features. All but 11 were extramural pits. Feature classes were defined according to size, morphology, and construction. Unlined pits were broken down into four feature classes based on pit dimensions: small features, large shallow features, deep narrow features, and large deep features. Cobble-lined pits were separated into two groups based on size.

Unlined Pits

Unlined pits (124) were the most common feature at the Northwest Santa Fe Relief Route. Of these ubiquitous pits, 84 contained burned fill, and 45 had fire-cracked rock. Unlined features included six central hearths, one kiln, burned pits, and unburned pits, some of which were used for storage.

Small features had an area of less than 0.4 sq m and were less than 0.25 m deep. They had profiles ranging from steep to gentle depending on depth to area ratio, and they usually contained burned fill. Small features were the most common from Middle Archaic to Pueblo times. This class contains a mixture of storage and thermal features, including small roasting pits. Most Middle Archaic features (specifically dating from 3300 to 1800 BC) were small.

Large shallow features had an area greater than 0.40 sq m and a depth of less than 0.25 m. They tended to be burned and usually contained fire-cracked rock. This feature size was used during all time periods except the Latest Archaic period. Ancestral Pueblo groups appear to have been more likely to construct them: they account for a little more than half (8 of 17 features) used during that period. In contrast, only 5 of 69, or 7 percent, were used during the Middle Archaic period.

Deep narrow features (6) were approximately the same size as cobble-lined features. They were found in Middle and Latest Archaic assemblages and were most common at LA 61286, Middle Archaic, but contained no cultural taxa. Small deep features tended to be burned, and four had fire-cracked rock. They have an area of less than 0.40 sq m and a depth of more than 0.25 m.

Large deep features were more than 0.40 sq m in area and deeper than 0.25 m. Although they were always burned, they didn't often contain charred taxa. There were only three of these features: one Middle Archaic feature at LA 61289, one Latest Archaic feature at LA 61286, and a Pueblo feature at LA 61290.

Cobble-Lined Pits

Cobble-lined pits can be separated into two groups: Middle Archaic features from LA 61289, and other cobble-lined features. Middle Archaic pits ranged in area from 0.15 to 0.30 sq m and in depth from 0.15 to 0.45 m. They were usually round with a bowl-shaped or conical profile. The lining was generally a helix of river cobbles snugly placed into feature side walls incorporating one base cobble that acted as a key stone upon which 2–4 cobble tiers rested. Fill from all of these features was burned and lacked fire-cracked rock. Other cobble-lined pits ranged in area from 0.09 to 0.79 sq m and in depth from 0.12 to 0.8 m. Although construction in some is reminiscent of the Middle Archaic features, shape and cobble-lining construction were more variable, as was the incidence of burned fill. The majority of cobble-lined features were in arroyo cuts, and many of them were partially deflated by the drainage.

LA 61286

Early and Middle Archaic features. The Early and Middle Archaic components were made up of 34 features. Thirty-two were assigned to the Middle Archaic component, of which two were not sorted. Scatterplots show three major feature groupings (Figs. 286 and 287). Two of the groupings represent features that were roughly proportional in area and depth. One grouping ranges in depth from 10 to 20 cm, the other from 21 to 40 cm. The third grouping consists of three large shallow features.

Overall, feature condition does not appear to predict the presence of burned taxa. Of the 32 sorted features, 26 were burned, and all were unlined. Economic taxa were recovered from only 14 of these features, about half. The presence of fire-cracked rock in this group does not predict the presence of charred taxa. Of the 15 features that had cultural taxa, only 6 had fire-cracked rock (Fig. 287). Features without charred seeds and fruits (5) were nearly as likely to have fire-cracked rock in the fill as features with charred cultural taxa (6). Features with more than 20 pieces of fire-cracked rock were less than 0.2 m deep and were equally as likely to contain burned taxa as not. Feature shape may be related to the presence of charred taxa, but it was not a predictive factor. Shallow features were more likely to produce charred taxa. Of 23 features that were less than 20 cm deep, 13 (a little more than half) contained charred seeds and fruits, compared to 3 out of 8 features deeper than 20 cm.

The morphology of the three feature groupings may provide clues about feature specialization. The best example is the large shallow pits. All three such features were burned and contained cultural taxa, specifically weedy annuals. Two had fire-cracked rock. These attributes indicate that the features were used for some type of thermal processing.

Deeper features (21–40 cm deep) yielded very different results. Although four of the five features were burned, only one produced cultural taxa. The only unburned feature was not sorted. Of the four sorted features, two had fire-cracked rock. Neither contained any economic plant remains. More shallow features (10–30 cm grouping) contained a higher incidence of economic taxa. For our purposes, the group was made up of 12 features, 11 of which were sorted. Of eight features with burned fill, four contained economic taxa. Features with more than 20 fire-cracked rocks are all unlined and less than 0.25 m deep. All three of the unburned features contained economic plant remains. In this grouping, the ratio of burned features containing cultural remains is slightly lower but still roughly proportional to those of shallow features in the overall sample, but significantly higher than features in the 21–40 cm group. The presence of cultural taxa in unburned fill of one feature suggests that cultural taxa have washed in after abandonment, and natural processes may have contributed to charred taxa distribution, confusing the picture. Burning and fire-cracked rock content in these cases are not 100 percent predicative of charred taxa occurrence and could be related to factors unrelated to human activity.

Late to Latest Archaic features. The Late to Latest Archaic component was made up of 20 features; 16 were sorted. Economic taxa in this grouping were common but could not be correlated with the presence of any one feature trait such as depth, cobble lining, presence of fire-cracked rock, or burning. Of 16 sorted features, 5 were assigned to the Late Archaic component, all of which contained burned fill (Fig. 288). Of the 11 Latest Archaic features, 4 were burned. Scatterplots show that 12 of 16 features contained economic taxa. Charred taxa were prevalent regardless of feature condition. Cultural taxa are represented in roughly the same ratio in both Late and Latest Archaic features. All of the pits were unlined, and the presence or absence of fire-cracked rock is not indicative of cultural taxa (Fig. 289). Late Archaic features can be separated into two groupings by

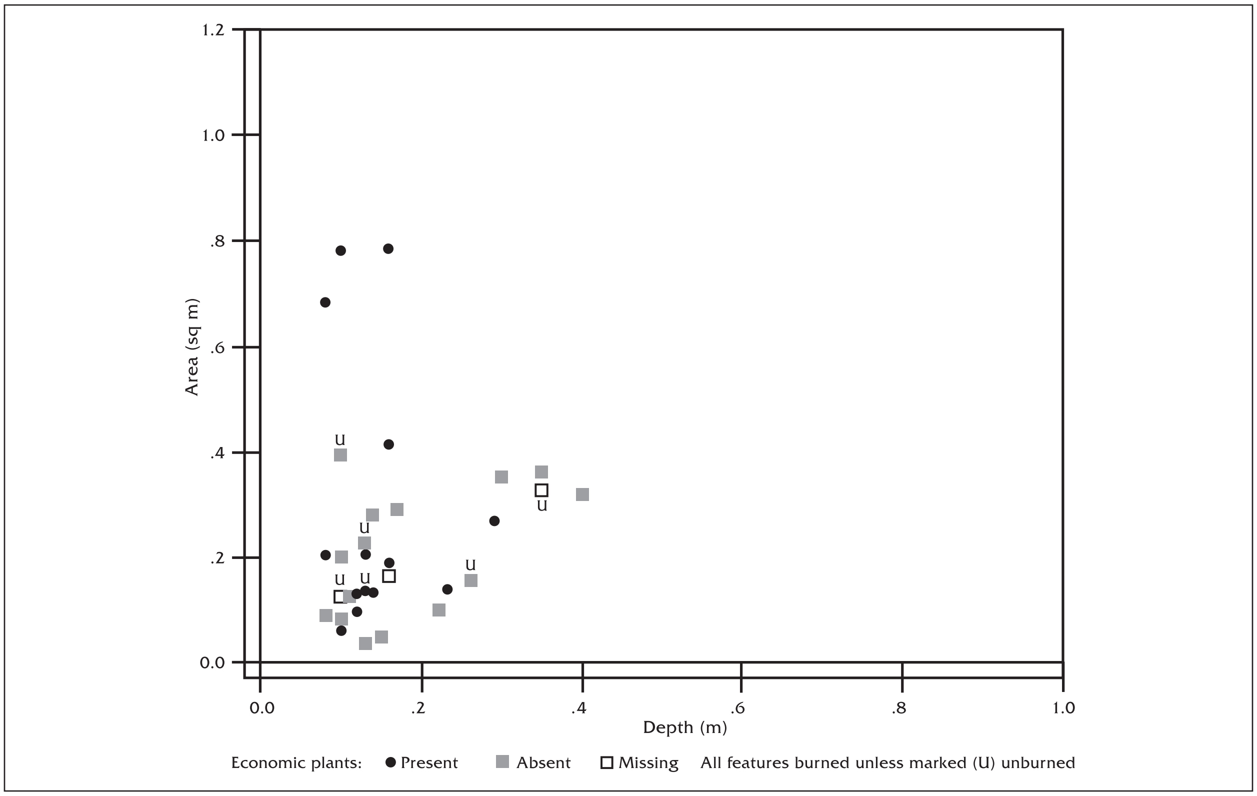


Figure 286. Depth by area by economic plants, condition of Early and Middle Archaic features, LA 61286.

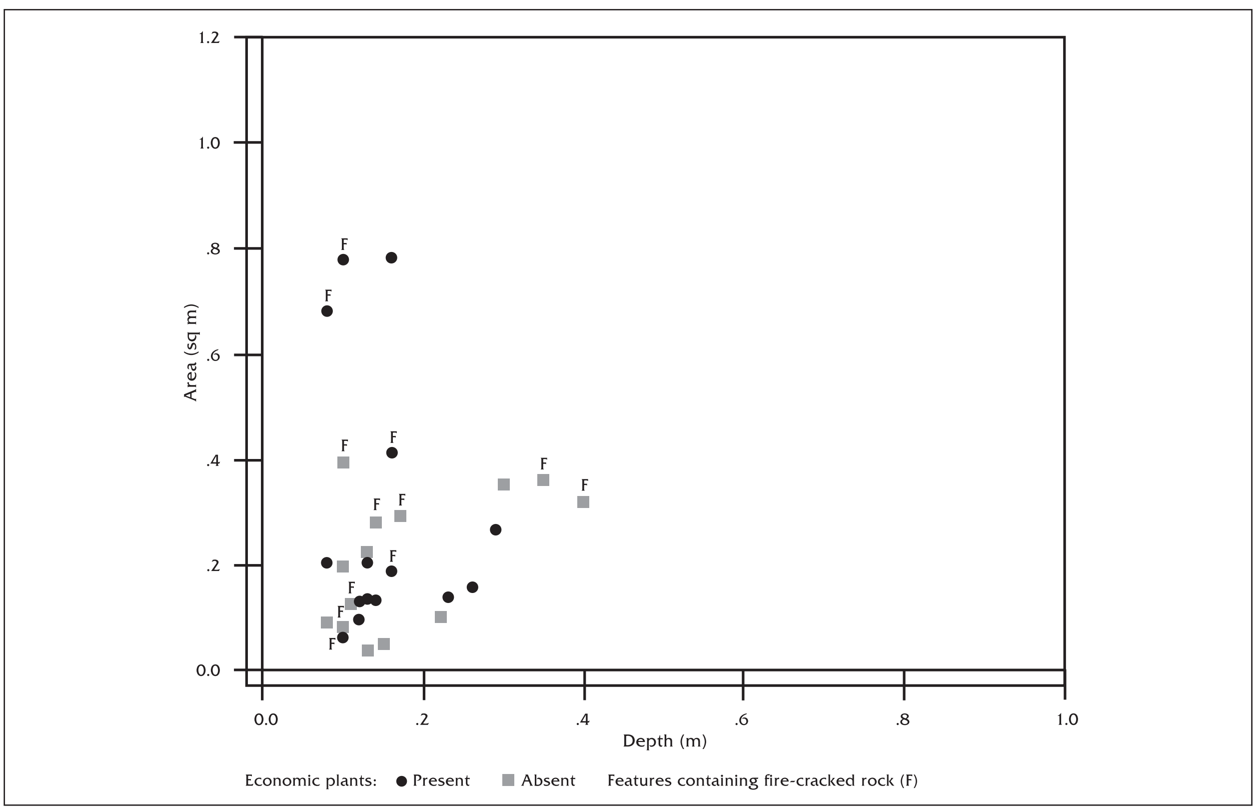


Figure 287. Depth by area by economic plants, fire-cracked rock, Early and Middle Archaic features, LA 61286.

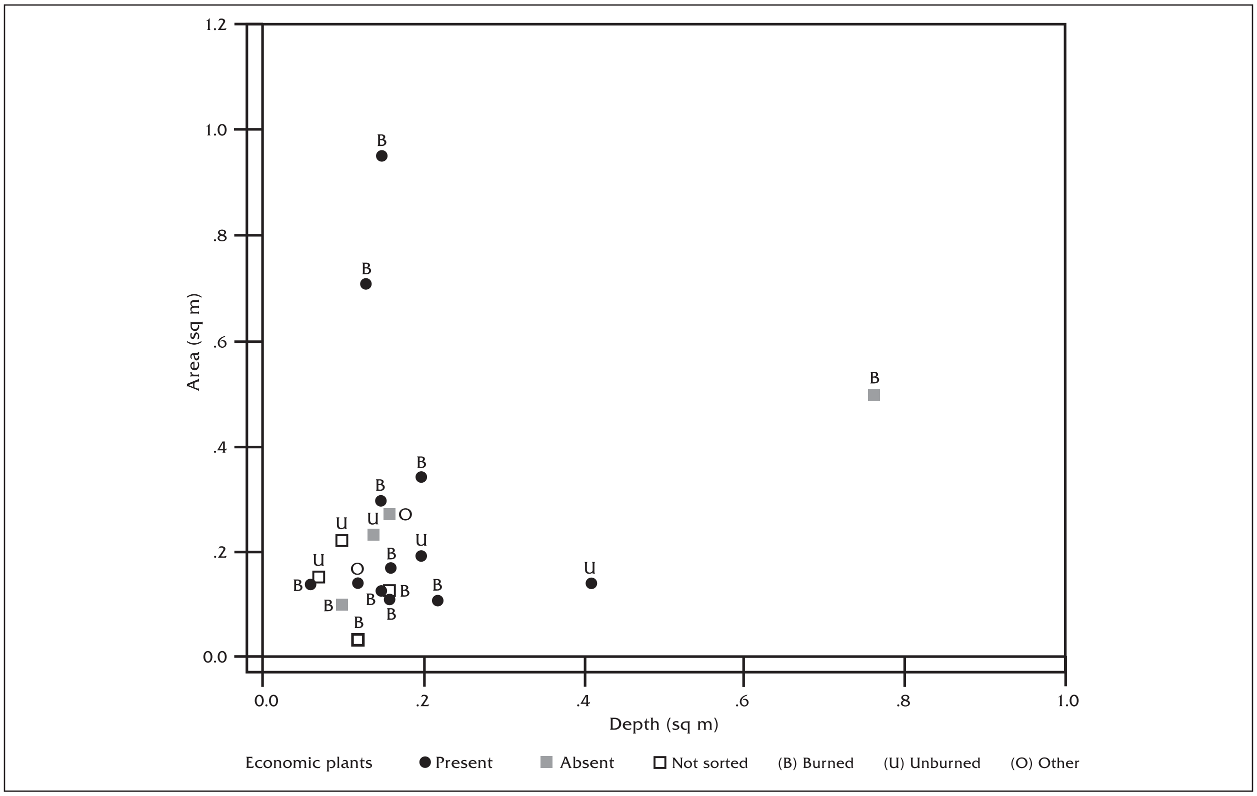


Figure 288. Depth by area by economic plants, condition of Late and Latest Archaic features, LA 61286.

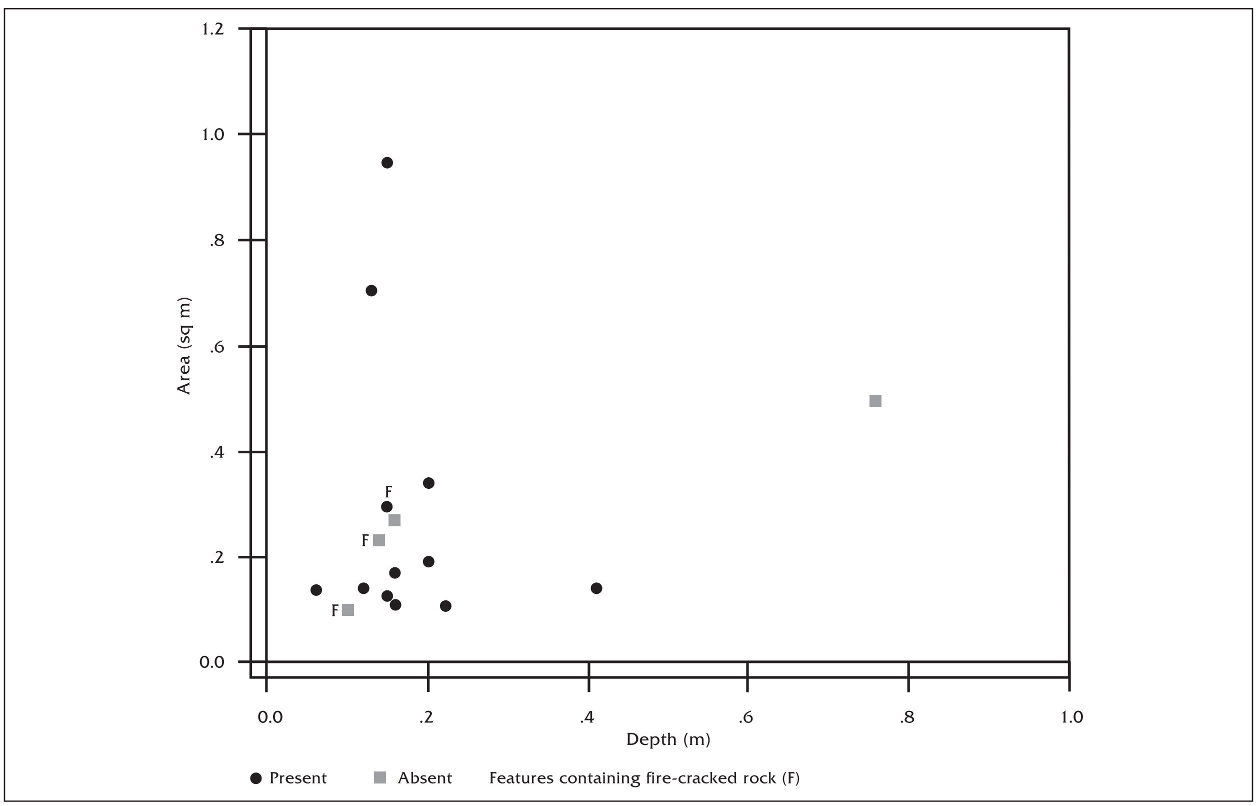


Figure 289. Depth by area by economic plants, fire-cracked rock, Late and Latest Archaic features, LA 61286.

the relative proportion of surface area to depth: small shallow pits, and features with large surface area in proportion to depth. Shallow features with large surface area were burned, with fire-cracked rock, and may have been roasting pits. Wandsnider (1997) has demonstrated that pits with rock are most commonly associated with plant processing.

Discussion. Two of the most productive samples from LA 61286 came from the two Early Archaic features (Features 55 and 56), which contained weedy annuals (goosefoot, cheno-am, and seepweed), juniper seed fragments, and prickly pair embryos. These adjacent features were shallow with flat bases (Figs. 290 and 93). Feature 55 contained more than 20 fire-cracked rocks that may been cleaned out of Feature 56. Early Archaic habitation of this site probably involved periodic use, during which one or a few seasonal visits were made to process plants, possibly cholla buds. The Pimas baked cholla buds in pits lined with seepweed (Greenhouse et al. 1981).

Middle Archaic features at LA 61286 reflect three feature groupings. All are shallow features (less than 25 cm deep) and are split between features of less than 0.4 sq m in area and those of more than 0.4 sq m in area. The small feature grouping is further split into features 20 cm or less deep and those 21–40 cm deep. Many of the smallest burned features contained juniper. Of 15 features that contained charred taxa, 10 had charred juniper seeds. Wood samples recovered from features was mostly mixed piñon and juniper. Juniper was not necessarily more abundant than piñon. Three small features had more than one seed per liter, a relatively high proportion along the Northwest Santa Fe Relief Route. Annuals include seepweed, purslane, goosefoot, and cheno-am. Small features were probably associated with the use of Feature 60, a pit structure. The small size and shallow depth of the burned features preclude the possibility of an extremely hot or long-lasting fire. The presence of both burned and unburned fills coupled with ethnographic information regarding the use of small extramural hearths (Binford 1983) suggests that they may have had a variety of expedient everyday uses.

Preservation in deeper features was not as good, or they may not have been used in plant processing. Although some of the deeper small features had fire-cracked rock and burned fill, only one yielded charred economic taxa. Small deep features with charred fill such as Feature 30 may have been used as meat-roasting or plant-baking pits. Cooking without insulative layers might have reduced the potential for seeds from weedy annuals to enter a hot charcoal bed. Unburned features may have been used for exterior storage. Small features were not as common during later site occupations.

Large, very shallow pits such as Features 29 and 37 (Figs. 46 and 52) could have been used for surface roasting. If the site had a residential area when these features were in use, their apparent location on the periphery of the main activity area would agree with Binford's (1983) description of deep pit baking as an activity conducted away from the central activity area. Very shallow features with abundant fire-cracked rock may indicate plant processing (Wandsnider 1997). Besides being a fire hazard, these larger features may have required more activity space than was readily available in the main activity area. Taxa recovered from these features was not similar to those found in earlier shallow features, but feature profiles were similar. There is no evidence that features were used to process the same foods as in the Early Archaic component, but similarities in morphology and the presence of fire-cracked rock suggest that they had similar thermal qualities.

Features from the Late Archaic component indicate a more limited use of the area than during the Middle Archaic period. Lack of a pit structure and few features indicate that the area was less intensely used for a shorter period of time. Two Late Archaic features (Features 18 and 19) were large and shallow (Fig. 291), and both contained over 100 fire-cracked rocks but only trace amounts of amaranth and juniper. Feature 18 had much steeper side walls than Feature 19, and fire-cracked rock was dumped to one side, as if it had been dug out. Feature 19 is more similar to large, shallow, Early and Middle Archaic pits (Figs. 39 and 41). Although Features 22 and 23 were smaller and shallow, they were paired and may have been used together.

Latest Archaic features (Fig. 292) follow the same size pattern as the Middle Archaic features. Small, shallow, multipurpose features

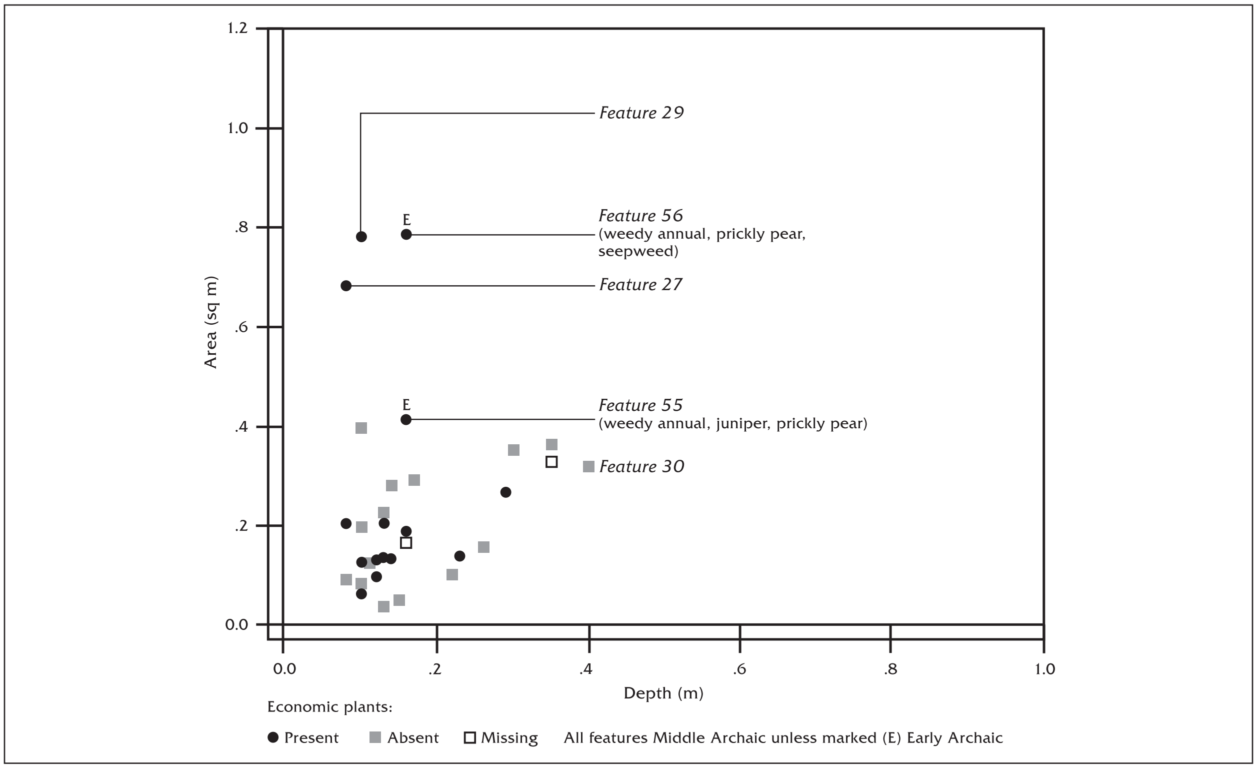


Figure 290. Depth by area by economic plants, period of Early and Middle Archaic features, LA 61286.

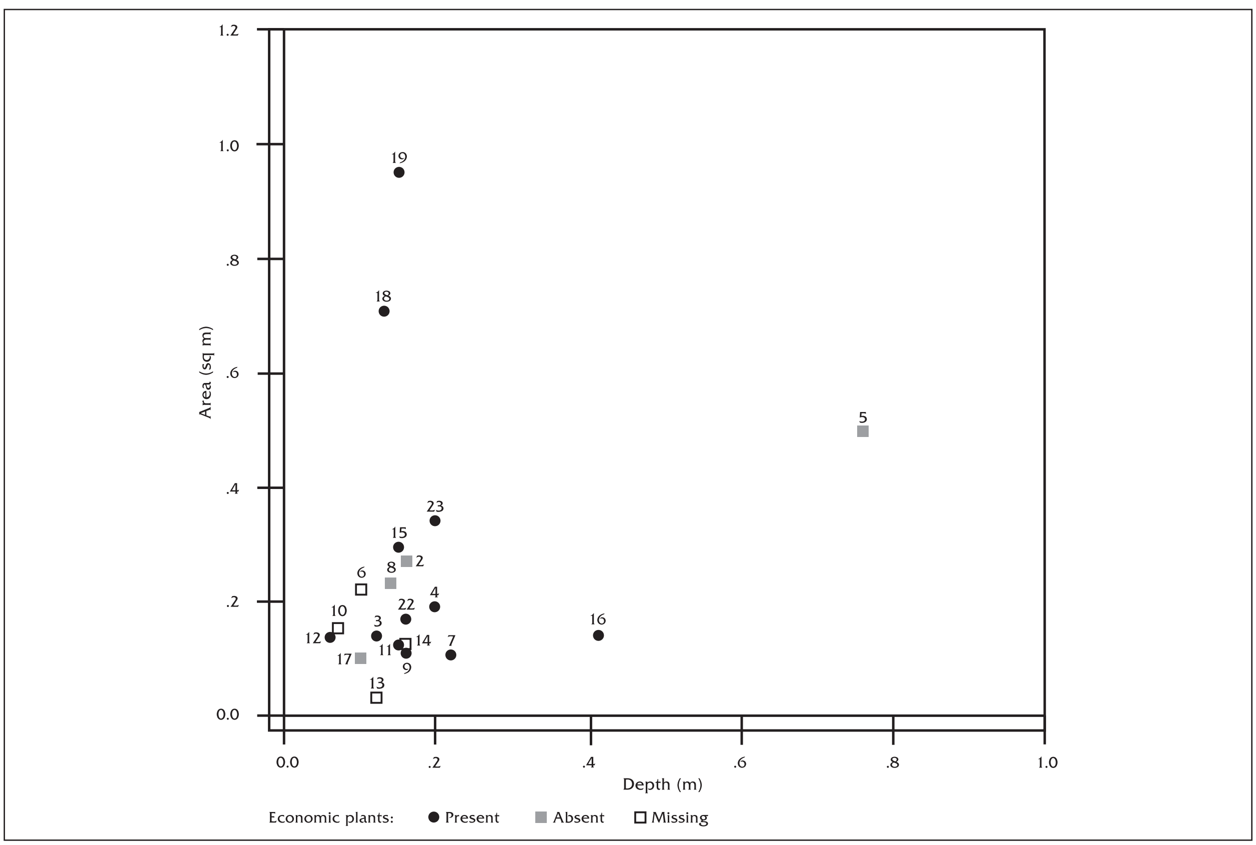


Figure 291. Depth by area by economic plants, feature number of Late and Latest Archaic features, LA 61286.

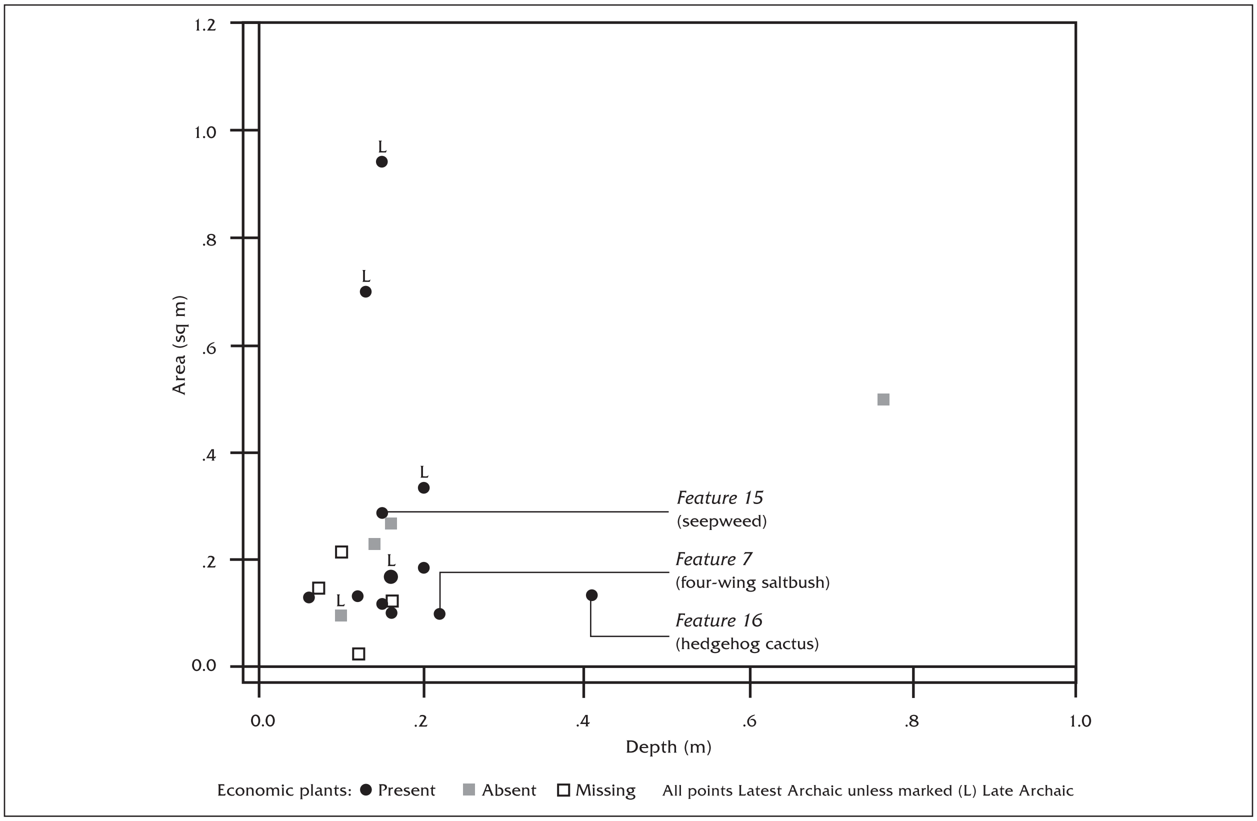


Figure 292. Depth by area by economic plants, period of Late and Latest Archaic features, LA 61286.

were probably associated with Feature 11, the pit structure. Taxa did not reflect the abundance of juniper found in Middle Archaic features. Although there were trace amounts of juniper, the archaeobotanical assemblage mainly consists of goosefoot and cheno-am. Taxa that were not recovered from similar small Middle Archaic features was limited to saltbush. One small shallow feature, Feature 15, had fire-cracked rocks associated with seepweed. Their occurrence could indicate cholla bud roasting (Greenhouse et al.1981).

One narrow deep feature contained a charred hedgehog cactus seed. Other evidence of possible deep-pit roasting during the Latest Archaic occupation was provided by Feature 5, a large, deep, extramural feature with burned fill but no fire-cracked rock (Fig. 26). Nearly 48 liters of soil was processed from this feature, which yielded one pinecone scale. Wandsnider (1997) provides ethnographic data that associates deep-pit roasting with the processing of large packages of meat or foods with a high inulin content, which need to be processed for a long time to maximize their nutritional value. The feature is isolated from the pit structure, supporting Binford's model of feature and space use (1983).

LA 61286 was repeatedly but periodically used during Early to Latest Archaic times. Large shallow features with an abundance of fire-cracked rock suggest that populations returned to the area to process the same or similar plant resources. Large numbers of smaller shallow features appear during the Middle and Latest Archaic time periods and are likely to be associated with residential base camp occupations. These more expedient features may be associated with everyday activities that went on during periodic but longer episodes. Small deep features were not as prevalent and may be evidence of deep-pit roasting. These features also seem to co-occur with structures and residential occupation.

LA 61289

Middle Archaic features. This component was made up of 22 features, 20 of which were sorted. Of the 20 features sampled, 12 contained burned plant remains, and 8 did not. The presence of economic species may be loosely correlated to feature condition, type and depth. Attributes such as burning (Fig. 293) and cobble lining (Fig. 294) appear to be linked to each other, but the combination is not strongly predictive of charred remains. Cobble-lined features were only 10 percent more likely to contain charred plant remains than unburned, unlined features. Of the 14 features that were burned, 12 were cobble-lined, and 7 had burned taxa. Five of the 6 unburned features were unlined, and 3 contained charred seeds and fruits.

There is no strong correlation between feature depth and the presence of cobble lining or burned fill. However, scatterplots (Figs. 293 and 294) distinguish a cluster of small features that are shallow (less than 25 cm deep) from deeper, more narrow features that were more likely to have been burned and cobble lined. Half of the features from the small shallow group contained cultural plant remains. The majority of these features were unburned. Conversely, six of the eight deeper, burned, cobble-lined features contained cultural taxa. Samples from shallow, unburned features may have been more likely to contain charred contaminants as products of slope wash. The two groupings demonstrate a weak correlation between feature depth and the presence of economic species, which may reflect a relationship between feature morphology and specialized use.

Middle Archaic features were mostly small burned and unburned pits. Half were cobble lined, but some were reduced by erosion. Deeper cobble-lined burned features and large shallow unlined features were also found in the Middle Archaic component. Cobble-lined features were usually round with a bowl-shaped or conical profile. The lining was generally a helix of river cobbles snugly placed into feature side walls incorporating one base cobble that acted as a keystone upon which 2B4 cobble tiers rested (Figs. 120 and 121). Fill from all of these features was burned without fire-cracked rock. Fill from deep cobble-lined features may have been only 10 percent more likely to produce charred seeds, but the taxa recovered from deep features included piñon nutshell fragments, hedgehog cactus, juniper, and prickly pair seeds, evidence of mid to late summer/ fall occupation as well as piñon nut processing (McBride and Toll, this report). Large shallow unlined features tend to be more basin shaped than flat-bottomed features. Seepweed, which has been associated with cholla bud roasting (Greenhouse et al. 1981), was found in Feature 29.

Pueblo and unknown features. There were no small cobble-lined or unlined pits in the Pueblo and unknown grouping. Two of the four features contained more than 20 pieces of fire-cracked rock. One of the Pueblo features is cobble lined and very large. The Pueblo and unknown features were bowl shaped or flat bottomed. A decrease in the number of features from Middle Archaic to Pueblo occupations and a change in feature morphology from a mixture of small cobble-lined features and unlined basin shaped pits to a large rock-lined pit with fire-cracked rock suggests that the site was being used more intensively for a shorter period of time during later periods. When citing factors that influence cooking strategies, Wandsnider (1997) included as a variable the number of people available to process a given resource. Changes in land use from many small cobble-lined pits constructed over a series of years to larger more shallow pits could indicate a change in availability of wild food resources. This change in morphology could also reflect a more intensive procurement strategy of the same resource by a larger population of more sedentary foragers and farmers.

LA 61290

Middle Archaic features. This component was made up of 11 features, of which 8 contained economic plant remains. Features tended to become smaller in diameter with depth, were unlined, and with the exception of one deep feature (Feature 23), did not contain fire-cracked rock. Of the eight burned features, seven produced cultural remains. Only one of the unburned features contained burned seeds and fruits. Burning appears to be the only attribute predictive of cultural taxa (Fig. 295).

Pueblo and unknown features. Eleven features were assigned to the Pueblo and unknown components. Six of the 11 were Pueblo. Scatter plots show that the majority of the features in this grouping were very shallow (Fig. 296). Six of the features were less than 10 cm deep; all were unlined. Half of the economic species from this group were recovered from shallow features.

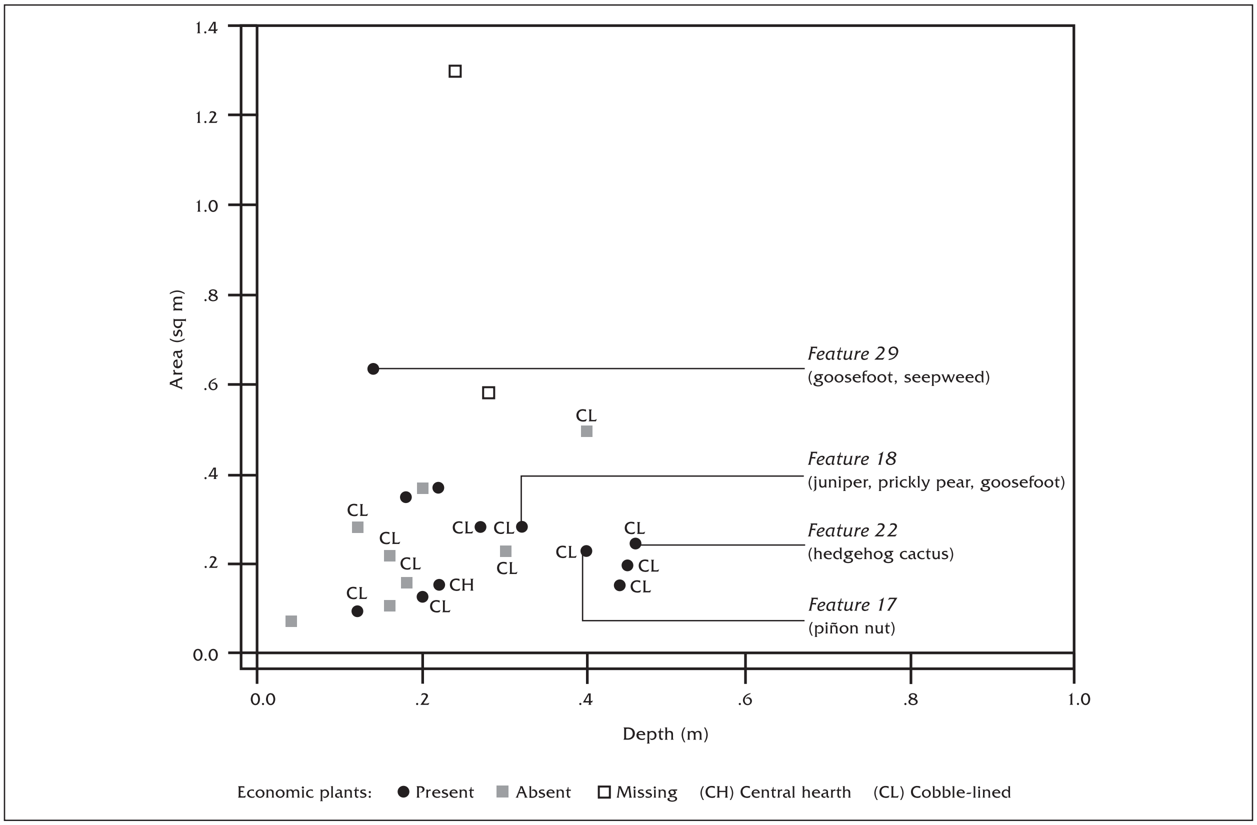


Figure 293. Depth by area by economic plants, type of Middle Archaic features, LA 61289.

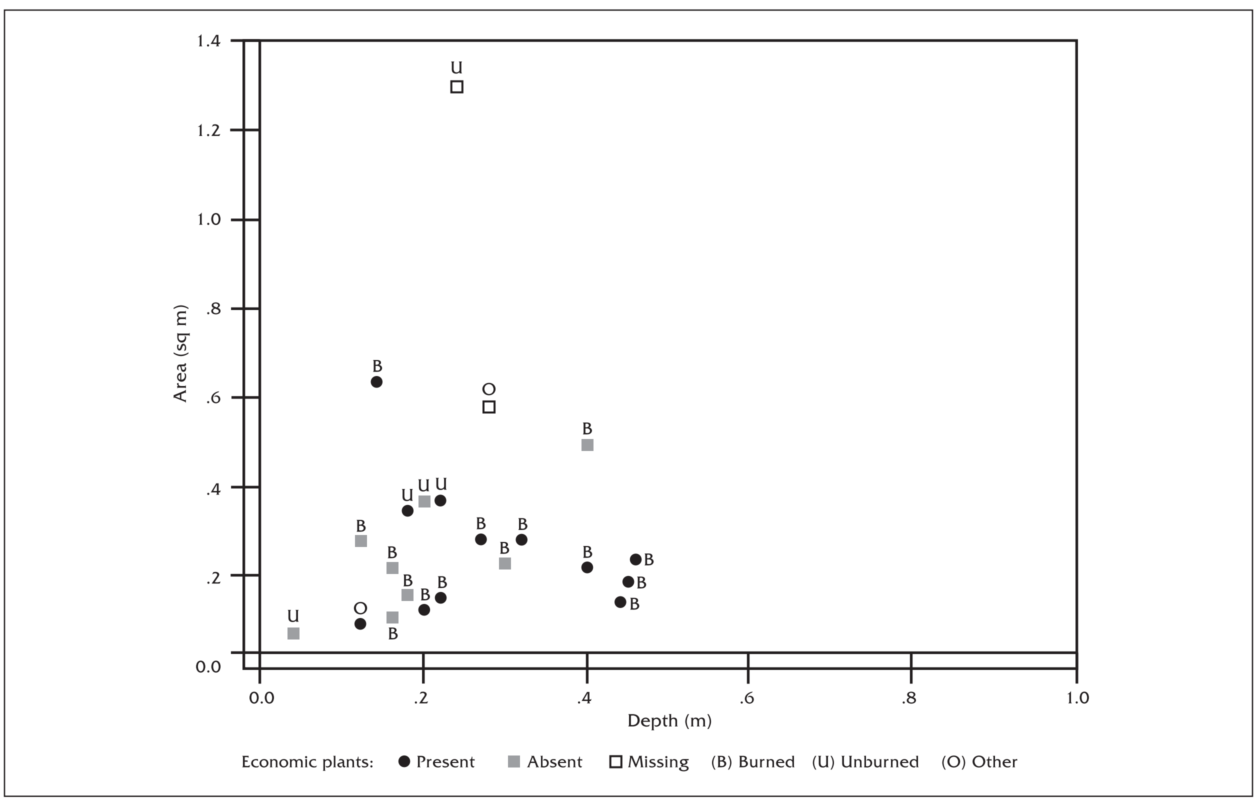


Figure 294. Depth by area by economic plants, condition of Middle Archaic features, LA 61289.

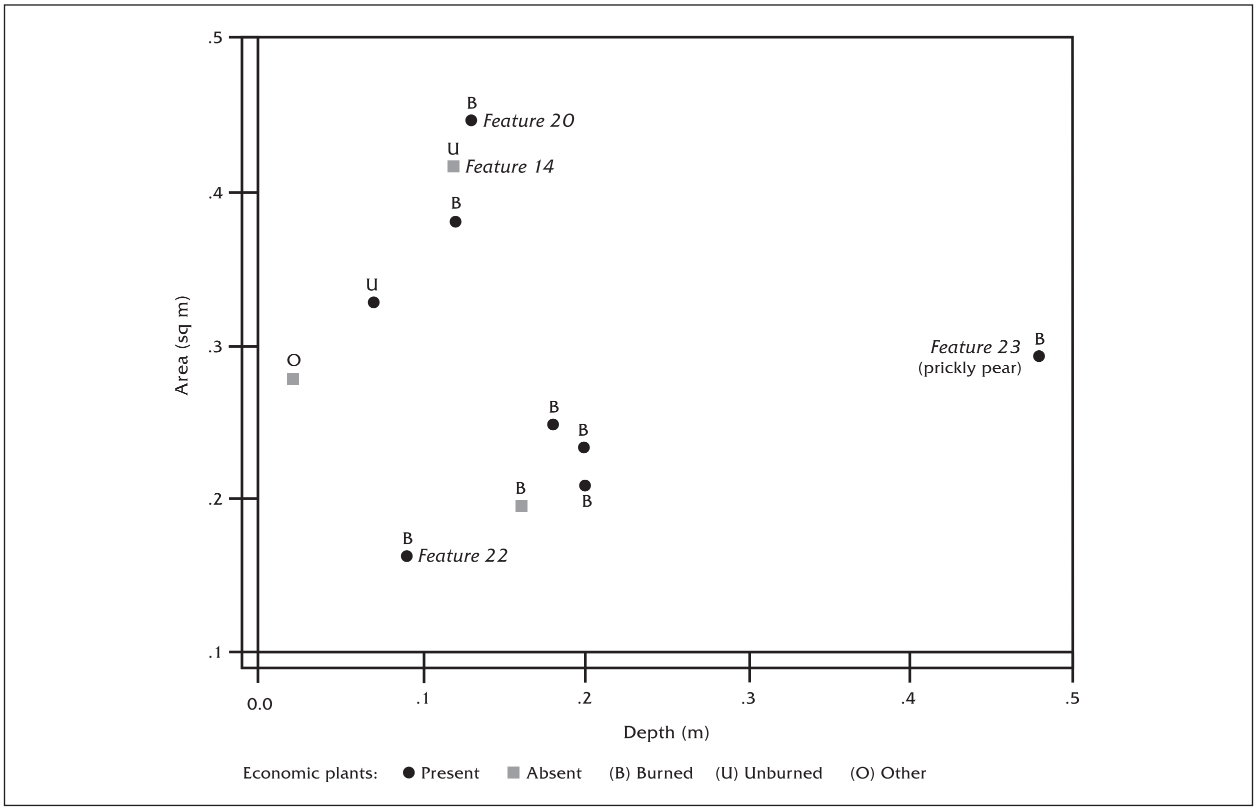


Figure 295. Depth by area by economic plants, condition of Middle Archaic features, LA 61290.

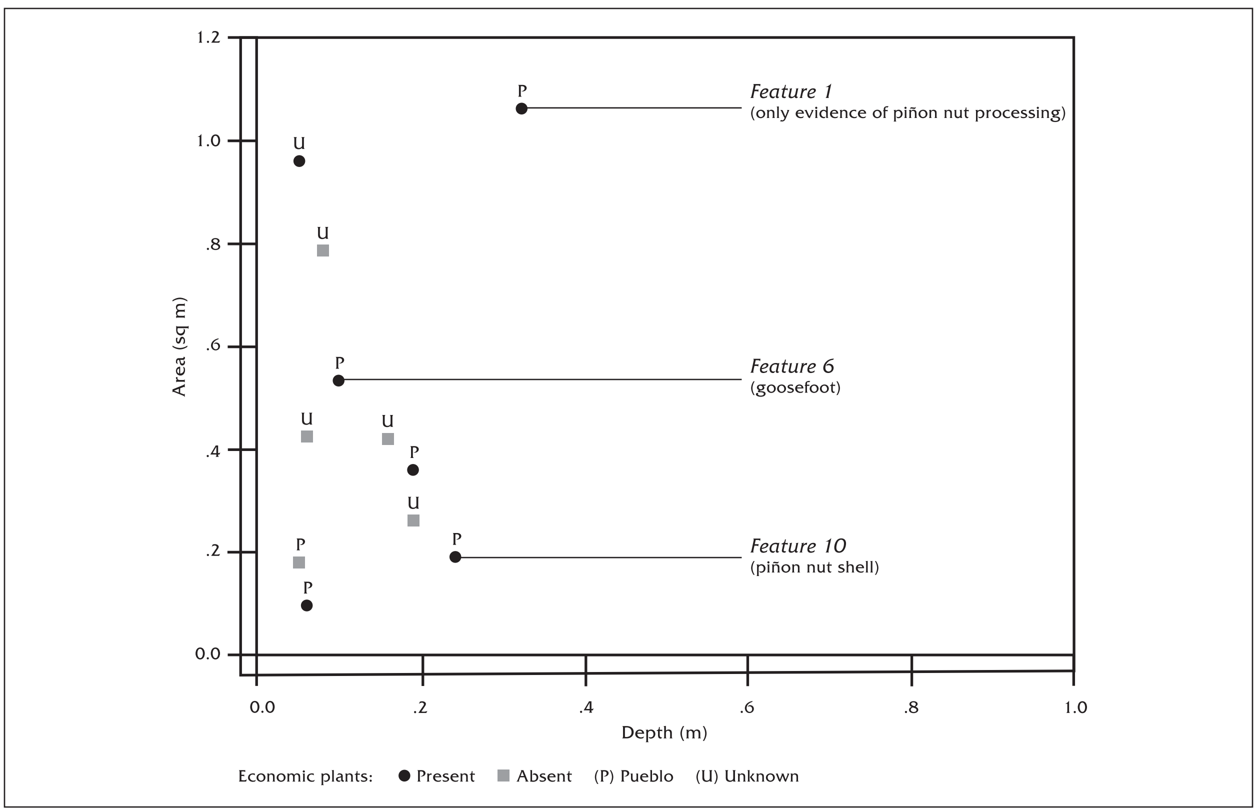


Figure 296. Depth by area by economic plants, period of Pueblo and unknown features, LA 61290.

Although Pueblo feature depth was evenly distributed, features tended to be narrower and deeper than features from the unknown component.

The single strongest predictor of economic taxa was temporal assignment. The majority of Pueblo features contained charred seeds and fruits, while most of the features assigned to the unknown category did not. Fire-cracked rock content associated with the unknown component linked it to the absence of cultural taxa (Fig. 297). A majority (four of five) of the unknown features had fire-cracked rock, compared to one out of six Pueblo features. Feature condition in itself was not predictive of economic taxa. There were nine burnt features in this grouping. Five contained charred seeds and fruits; four were Pueblo features. Most (three of the four) of the unknown component pits did not contain charred plant remains. Differences in overall feature sizes, association with fire-cracked rock, and economic taxa demonstrate a morphological difference between features from each component. This may reflect specific use during the Pueblo period. Wandsnider associates the presence of fire-cracked rock with plant processing or the processing of "mixed packages," that is, a mixture of plant and animal foods. The presence of fire-cracked rock in the absence of plant remains and burnt animal bone may reflect an emphasis on processing and little or no consumption, evidence of a short-term, targeted foraging strategy.

Discussion. Middle Archaic features at LA 61290 tended to be small unlined pits that were shallow (less than 0.20 m deep), as wide as they were deep or wider, and often oval. These pits were more numerous and tended to be deeper than Pueblo and unknown features. Recovery of small amounts of charred weedy annals was typical of such features. Two large shallow features (Features 14 and 20) ranged in shape from narrow and elongated to slightly oval and did not contain fire-cracked rock (Figs. 156 and 167). Feature 20 was adjacent to a small shallow feature, Feature 22. This overlap was reminiscent of Pueblo features used to process piñon at this site (Figs. 174 and 176), but both features were shallow, and neither contained piñon except as fuelwood. The only deep feature was small in area, somewhat V shaped, and oval, and it produced one charred prickly pair seed. The fill was burned and contained small amounts of fire-cracked rock. This feature was 0.3 m deeper than the rest. Deep roasting pits are often associated with processing large packages of fatty meat or inulin-rich foods. Open shallow pits are more versatile and may be suited for parching or lean-meat roasting (Wandsnider 1997).

Pueblo period features exhibited evidence of piñon processing where Middle Archaic features did not. A slab-lined feature (Feature 10) was excavated into the side of Feature 1, a large shallow roasting pit with approximately 100 fire-cracked rocks. Both contained charred piñon debris and may have been used for nut processing. The Pueblo component did not have as many small features, and small features tended to be shallower. Large shallow Pueblo pits were conversely quite a bit larger in area than Middle Archaic features, and features that were proportional in area tended to be deeper. Two of the largest features contained fire-cracked rock. With depths of approximately 0.1 m, they resembled Middle Archaic features from the same site. Historic and unknown features also contained a higher incidence of fire-cracked rock. Three features had more than 20 fire-cracked rocks in fill. Recovered taxa were extremely sparse and consisted of the goosefoot/pigweed found in features throughout the Southwest.

Large, deeper Pueblo features may be indicative of longer, slower dry-pit roasting, whereas shallower features may have held spread coals that would have provided a less intense heat for a shorter amount of time. The deep Middle Archaic pit may be indicative of a completely different food-preparation strategy involving the need for a large amount of coals and prolonged cooking time, possibly for meat.

LA 61293

Late to Latest Archaic features. Fifteen Late and Latest Archaic features were recorded at LA 61293. The majority of charred plant remains came from Latest Archaic features. Of the 12 samples sorted, 4 contained charred plant remains. The small sample size of burned features makes it difficult to draw strong correlates predicting the presence of cultural taxa in this grouping. All of the features contained burned fill, and most were unlined. Three of the four Latest Archaic features containing economic taxa were intramural

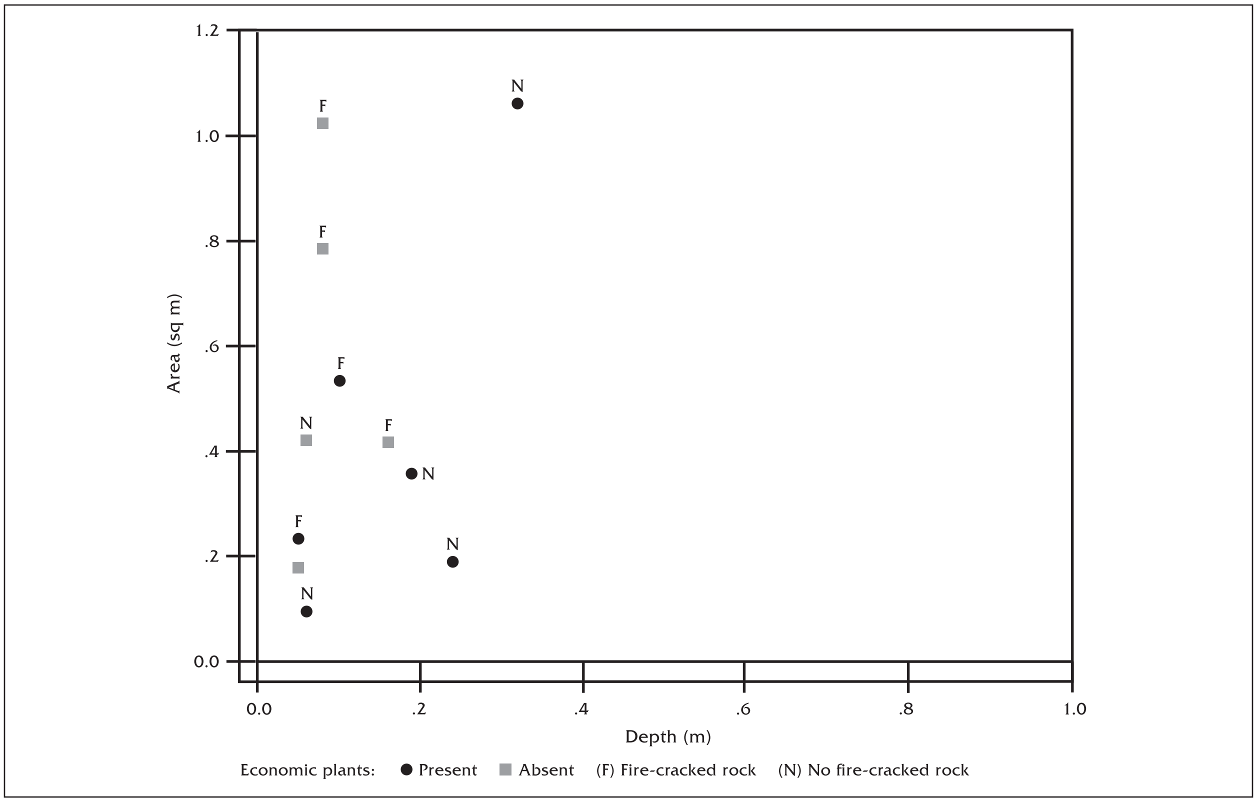


Figure 297. Depth by area by economic plants, fire-cracked rock, Pueblo and unknown features, LA 61290.

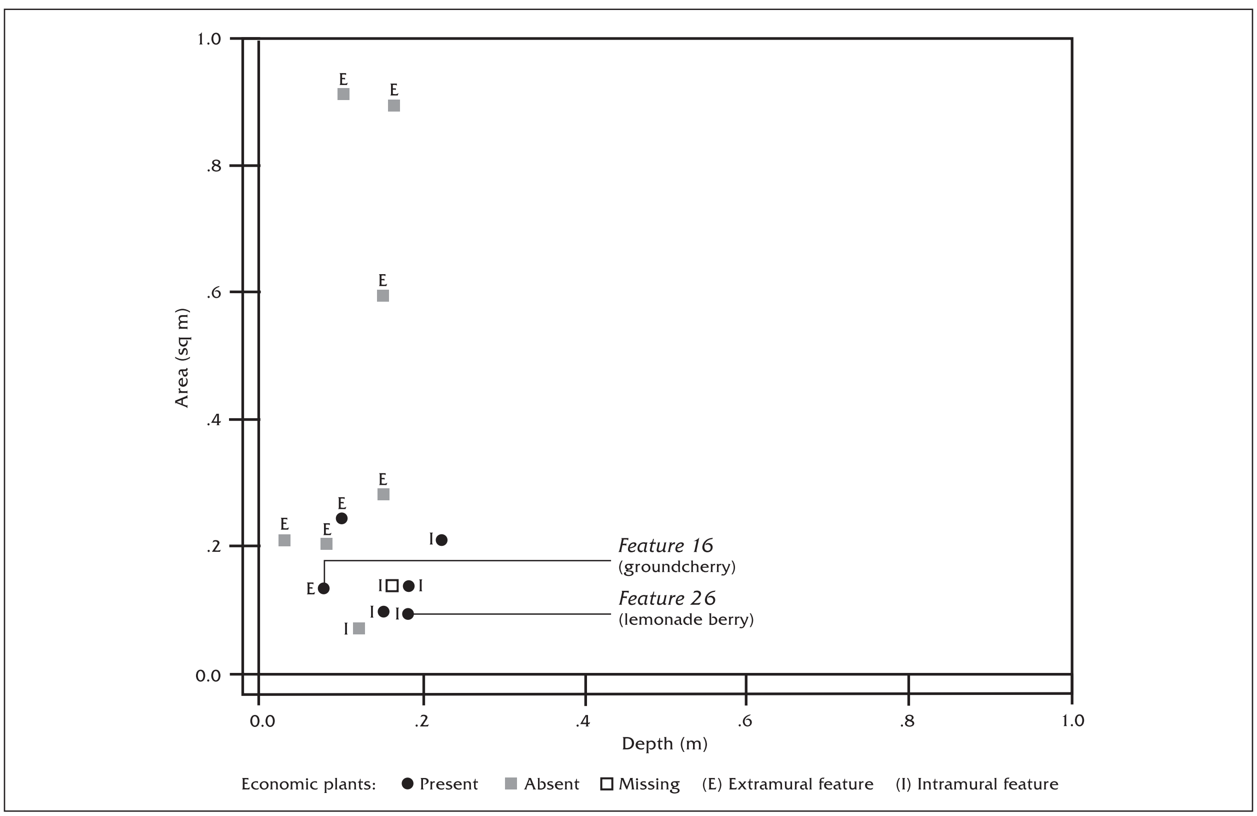


Figure 298. Depth by area by economic plants, location of Late and Latest Archaic features, LA 61293.

and deeper than their area (Fig. 298). All of the features in this grouping were small unlined pits less than 30 cm deep. The cluster of three with burned taxa were from 15 to 20 cm deep. Most of the Late Archaic features were shallower and had a larger area than features in the Latest Archaic component, which tended to have a relatively smaller surface area to depth ratio (Fig. 299).

The majority of the features that did not contain economic taxa contained fire-cracked rock (Fig. 300). In this grouping, it is unclear if the presence of fire-cracked rock is connected to the absence of economic taxa or if preservation is responsible for the lack of cultural remains. Three of the Late Archaic features were shallow pits larger than 0.4 m in area and shallower than 0.2 m. All of these features were on gentle slopes and contained over 20 fire-cracked rocks. However, no cultural plant remains were recovered from feature fill. Features were nearly round with one side that dipped in slightly, as if a person were working from the down hill side. This morphology could also be a result of slope wash or other natural processes. Taxa from intramural features were unremarkable, including goosefoot, pigweed, and cheno-am.

Pueblo and unknown features. Seven features made up the Pueblo and unknown component. Four were assigned to Pueblo, and three were unknown. Scatterplots show a correlation between economic plant remains and temporal component. All Pueblo features contained charred seeds and fruits, while two of the three unassigned features did not have any economic plant remains (Fig. 301). All features with fire-cracked rock also had burned plant remains (Figs. 302 and 303), and three of the five burned features had more than 20 fire-cracked rocks. In fact, the correlation between the presence of fire-cracked rock and presence of plant remains is stronger than that of fire-cracked rock to burned features. Presence of economic remains is also predicted by but not dependent upon feature condition. Four of the five burned features contained cultural taxa. There were only two unburned features, one of which contained charred cultural remains. The sample of unburned features in this group is not big enough to conclude that unburned features contain plant remains half of the time or that unburned features with fire-cracked rock have economic taxa. It is enough to demonstrate that unburned features may contain cultural taxa. The presence of cultural taxa is unaffected by feature depth, suggesting that deeper pit preservation may have less effect on the recovery of plant materials than previously thought. Both cobble-lined pits have burned taxa. Cobble lining could be a predictor of economic plant remains, but in this grouping the sample size is too small to say. It would be reasonable to assume that a burned pueblo component feature with fire-cracked rock would have charred economic remains.

Discussion. Feature morphology and size groupings for Late and Latest Archaic features are consistent with groups identified in sites across the project incorporating small unlined features and large shallow features. Late to Latest Archaic features at LA 61293 were made up of intramural and extramural features, mostly small unlined pits. Late Archaic features also included three large shallow features with abundant fire-cracked rock and no cultural taxa. The presence of a pit structure in the Latest Archaic and exclusivity of intramural features may indicate a difference in land-use and possibly subsistence patterns and social structure that is further suggested by the absence of large shallow features, which could have been used for communal roasting during previous Late Archaic occupations. This site pattern may also reflect the amount of excavated area and the number of features reported as "unknown." Interior features contained a mixture of goosefoot, pigweed, and cheno-am, while earlier extramural roasting features lacked charred cultural remains.

Features from the Pueblo and unknown grouping tended to be shallow and large, with a higher ratio of large shallow thermal features with more than 20 fire-cracked-rocks to small-cobble features. Of only two features that were deeper than they were wide, one, of Ancestral Pueblo age, was cobble-lined. Unknown large shallow pits were not as well preserved as those from the Late Archaic component and tended to be deflated, but it appears that their original shape was similar to that of pits used in the Late Archaic. The deepest of the features is morphologically distinct. It had a pavement of very large burned cobbles set into its base that reduced the total depth from almost 0.2 m to less than 0.05 m. (Fig. 303). This feature was clearly used for shallow cooking. Taxa included many unknown and trace Leguminaceae.

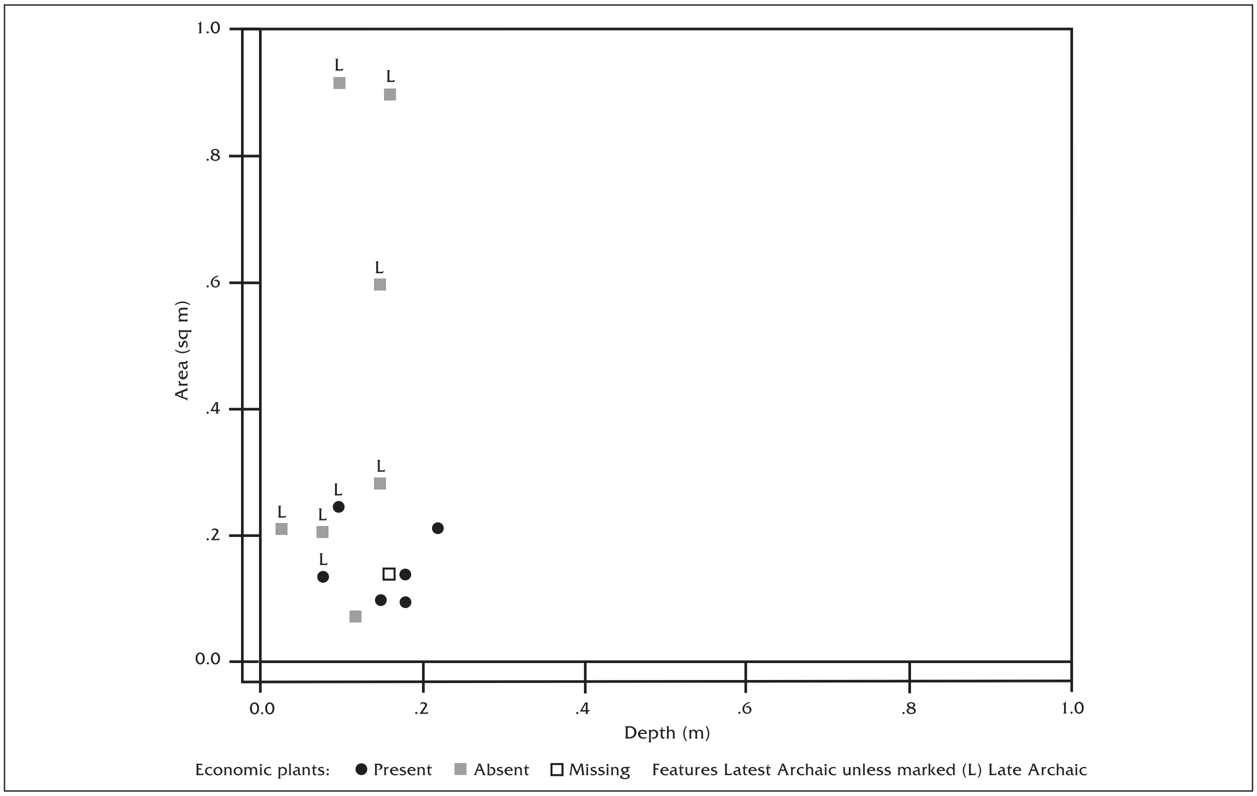


Figure 299. Depth by area by economic plants, period of Late and Latest Archaic features, LA 61293.

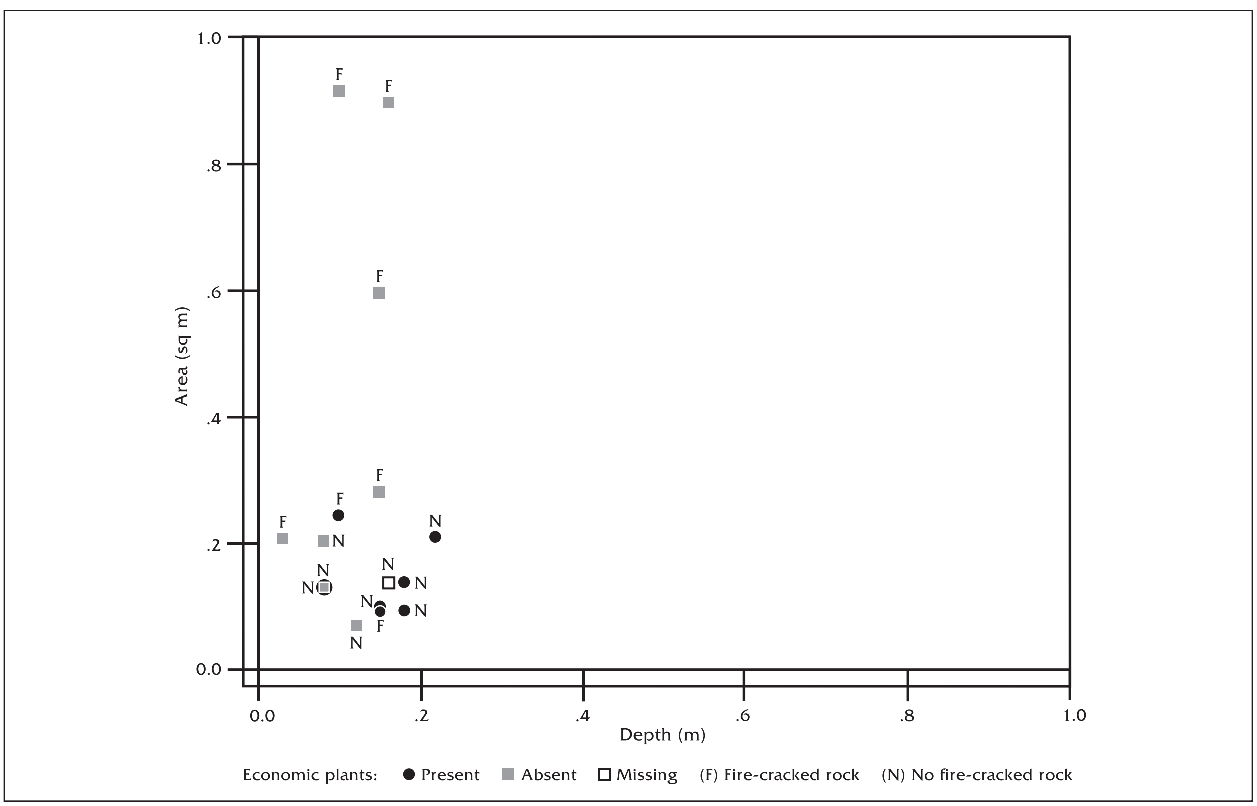


Figure 300. Depth by area by economic plants, fire-cracked rock, Late and Latest Archaic features, LA 61293.

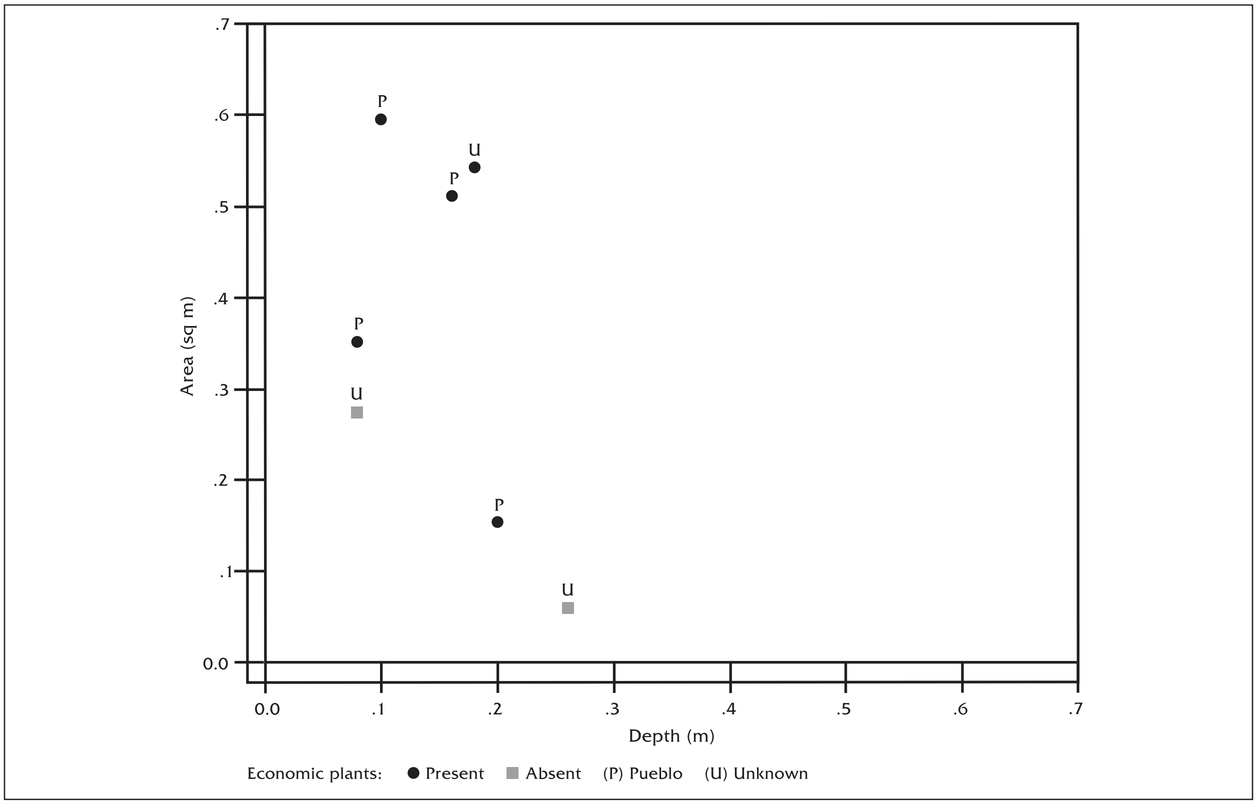


Figure 301. Depth by area by economic plants, period of Pueblo and unknown features, LA 61293.

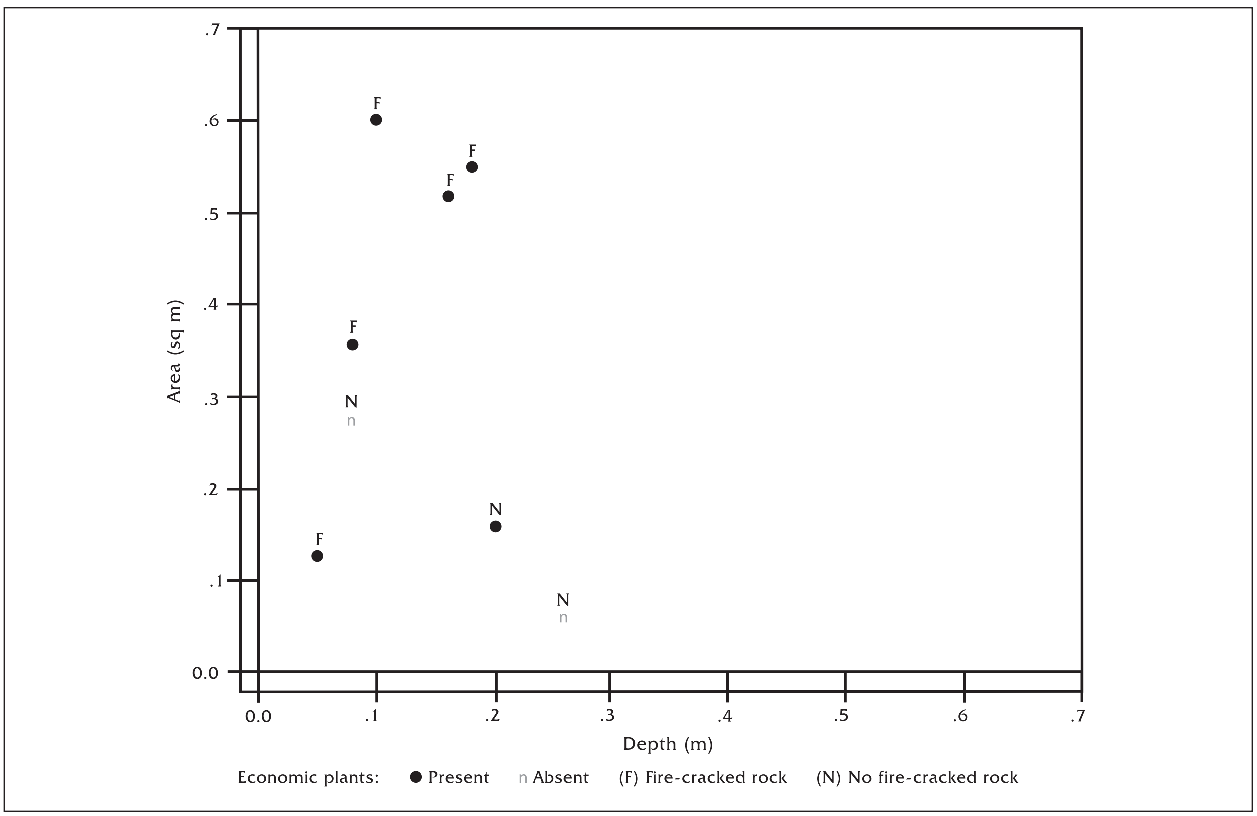


Figure 302. Depth by area by economic plants, fire-cracked rock, Pueblo and unknown features, LA 61293.

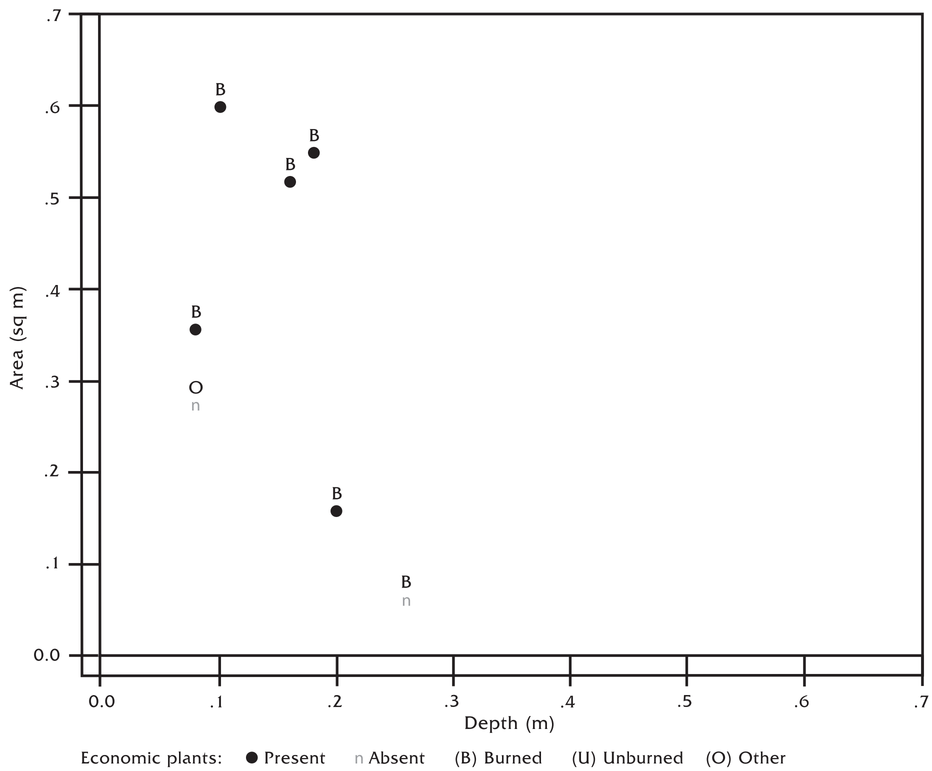


Figure 303. Depth by area by economic plants, condition of Pueblo and unknown features, LA 61293.

Small Sites

LA 61299, LA 61302, LA 67959, LA 108902, LA 113946, LA 113954, and LA 114071 each had fewer than four features. LA 61299 and LA 67959 were the only multicomponent sites. Of 18 features in this grouping, 14 were assigned to the Pueblo and unknown grouping. Three from LA 67959 were Middle Archaic (Fig. 304).

Pueblo and unknown. The majority of the features were assigned to the unknown component (9) and ranged from less than 0.1 m in area and less than 0.1m deep to large and shallow, more than 0.8 sq m in area and a little more than 0.3 m deep. With the exception of the large shallow feature, most unlined features (7) were small and shallow (Fig. 305). The large deep feature from LA 108902 contained large and very large mammal bone. Only four of the nine features in the assemblage were sorted. Two had charred taxa. Contextual variability and small sample size make it unwise to speculate about the presence or absence of charred taxa in relation to morphology within this grouping. All three of the cobble-lined pits were burned and contained fire-cracked rock. (Figs. 306 and 307) They all contained economic taxa.

Pueblo features (5) tended to be large and shallow. Four had an area of more than 0.6 sq m and were less than 20 cm deep. One was a kiln. All three of the sorted features contained cultural taxa. Two were burned. Two contained fire-cracked rock. The single small feature was less than 0.1 sq m in area and was approximately 0.1 m deep. Unlined and unburned, it was not sorted.

Middle Archaic features. The Middle Archaic component was represented by three small burned features, one cobble lined, two of which were sorted. Neither contained charred seeds (Fig. 308). The sample size is too small to make any meaningful inferences about feature morphology and the presence or absence of charred taxa.

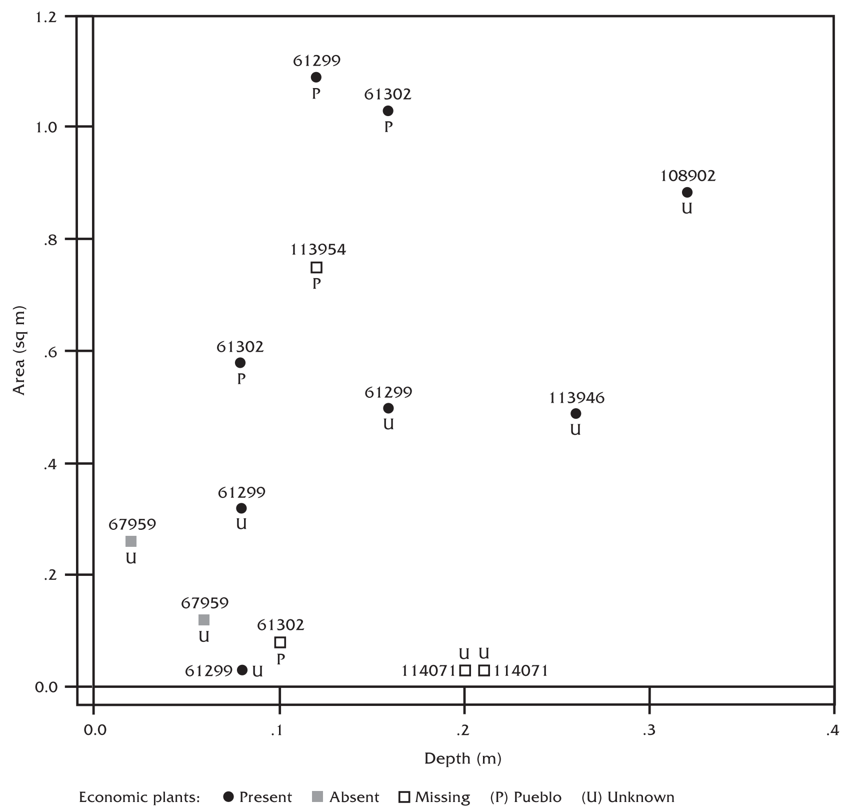


Figure 304. Depth by area by economic plants, site number and period of Pueblo and unknown features, small sites.

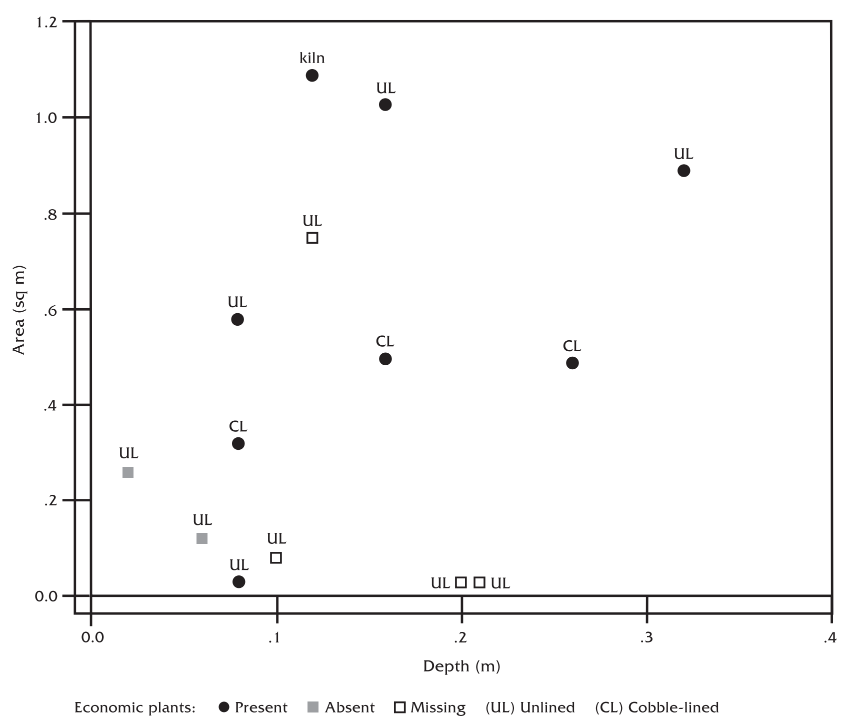


Figure 305. Depth by area by economic plants, type of Pueblo and unknown features, small sites.

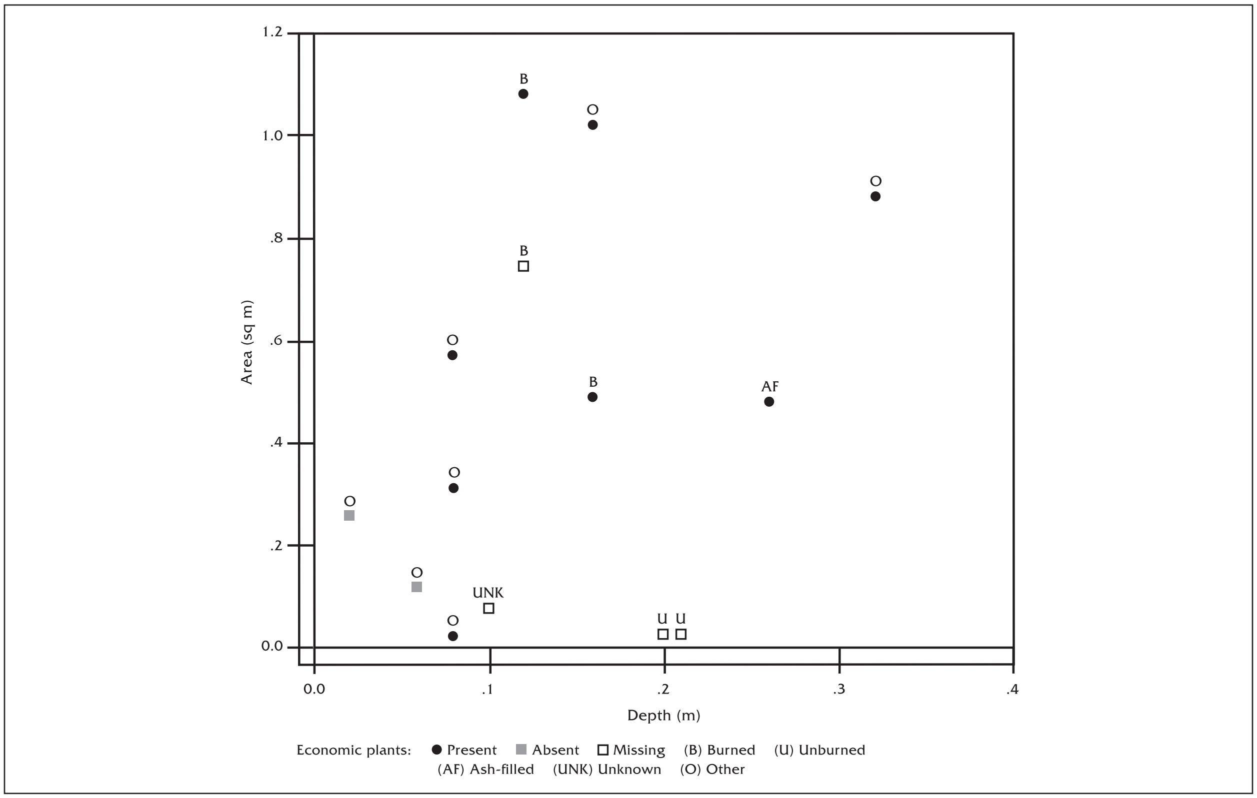


Figure 306. Depth by area by economic plants, condition of Pueblo and unknown features, small sites.

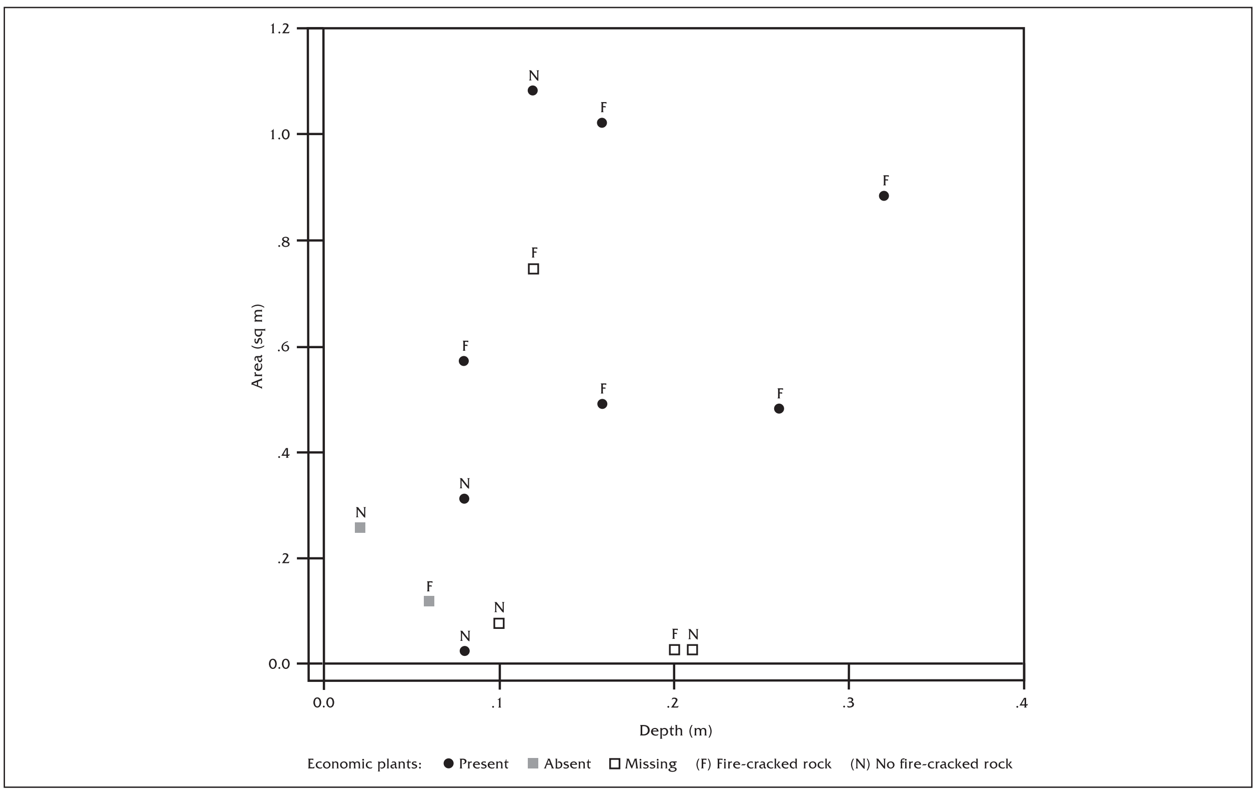


Figure 307. Depth by area by economic plants, fire-cracked rock, Pueblo and unknown features, small sites.

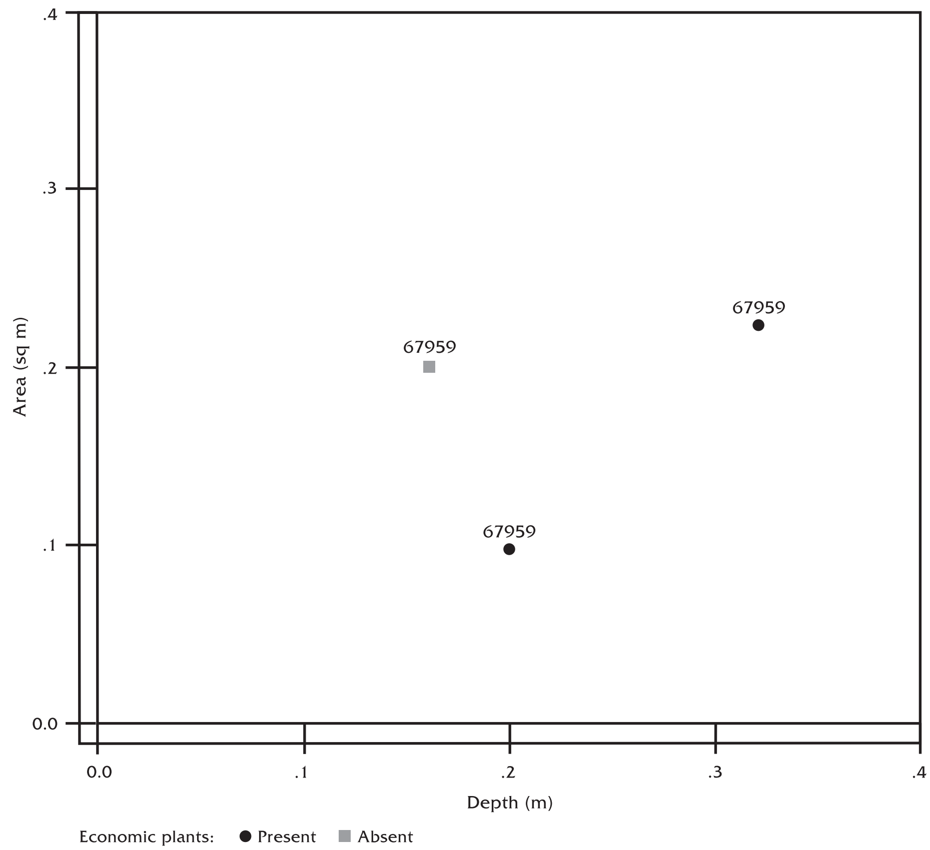


Figure 308. Depth by area by economic plants, Middle Archaic features by site, small sites.

Comparison across Sites by Period

Early Archaic Period

The only Early Archaic features included in this study were at LA 61286. Features 55 and 56 were large, shallow, overlapping pits with fire-cracked rock, similar to those found at sites during different time periods. The Early Archaic features were not the deepest at LA 61286 (Fig. 309). They contained juniper and prickly pair as well as a variety of weedy annuals including goosefoot, cheno-am, and some of the only seepweed found during the project, which may indicate that the pits were used to roast plant foods that were best cooked in a rock-lined pit. Keeping in mind that many factors such as drainage and freeze-thaw cycles can affect preservation (Cronyn 1990), charred taxa in these early, shallow, extramural feature indicates that preservation is not universally poor in the Santa Fe area and that extramural features should be sampled.

Middle Archaic Period

The largest and most diverse feature assemblage (68 features) from one period came from Middle Archaic components at LA 61286, LA 61289, and LA 61290 (Fig. 309). Small shallow and large shallow features were common to these sites. Cobble-lined features and large deep features were specific to LA 61289, and small deep features were found at LA 61286 (Figs. 310–313).

Small shallow features were ubiquitous at all three sites. The majority of small shallow features were burned, and 17 contained charred taxa. Of these, 6 had fire-cracked rock. With the exception of small features at LA 61286, which contained relatively large amounts of juniper, none contained charred taxa that could be specifically attributed to small features. Weedy annuals were common at LA 61290, which was mostly made up of small features.

Cobble-lined features at LA 61289 were the most distinctive Middle Archaic features (Fig. 27).

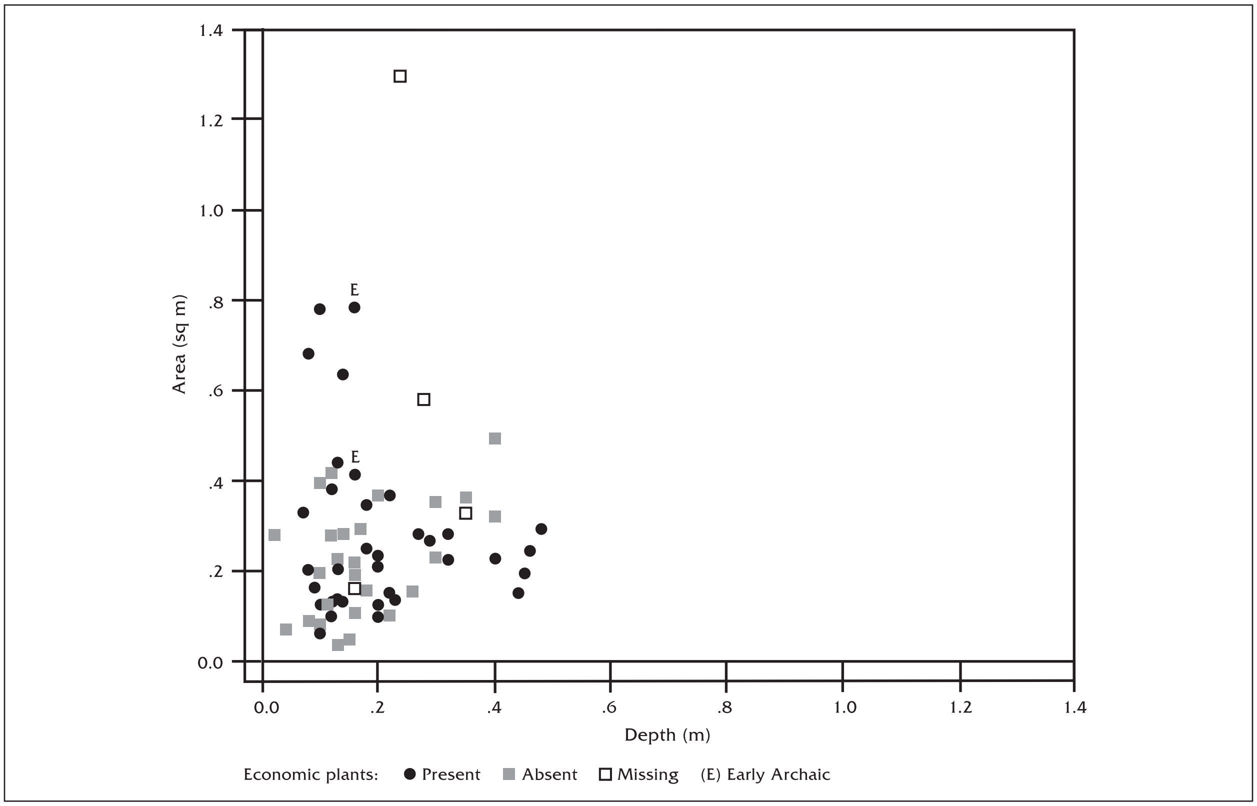


Figure 309. Depth by area by economic plants, period of Early and Middle Archaic features, all sites.

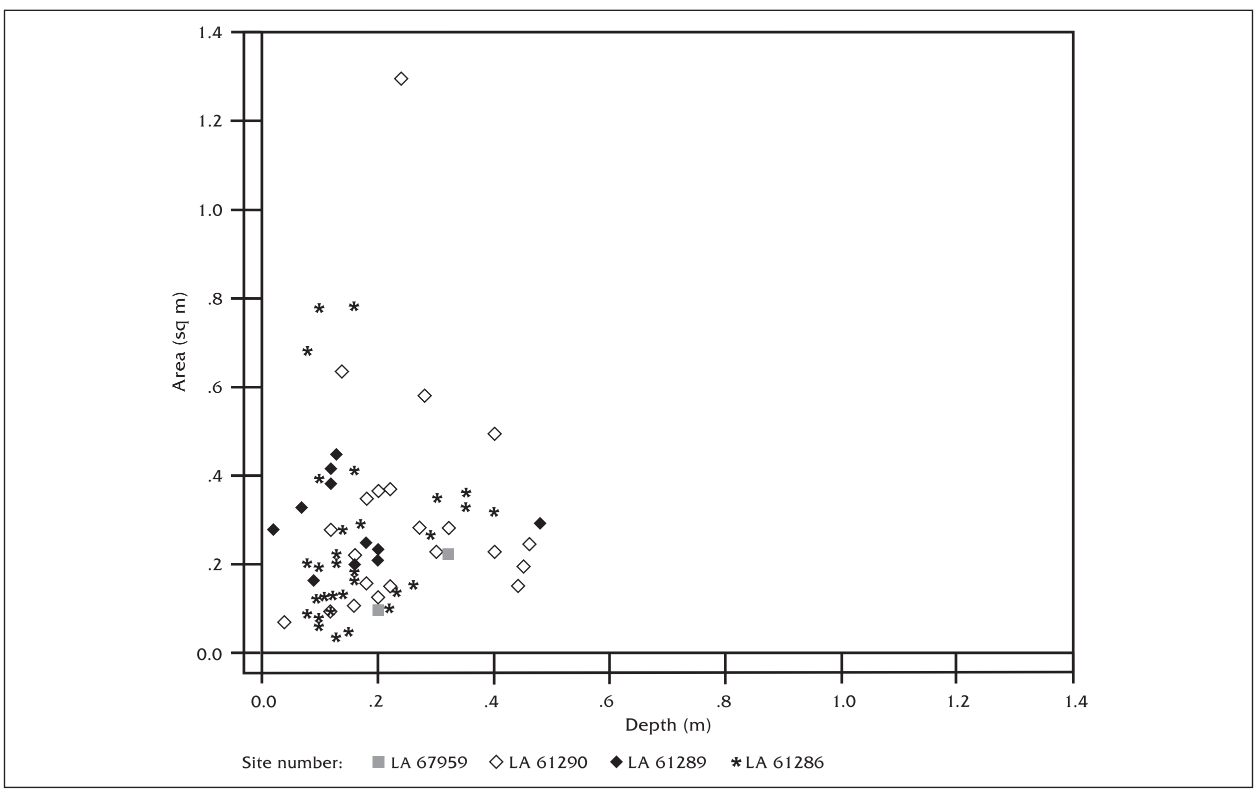


Figure 310. Depth by area, Early and Middle Archaic features by site, all sites.

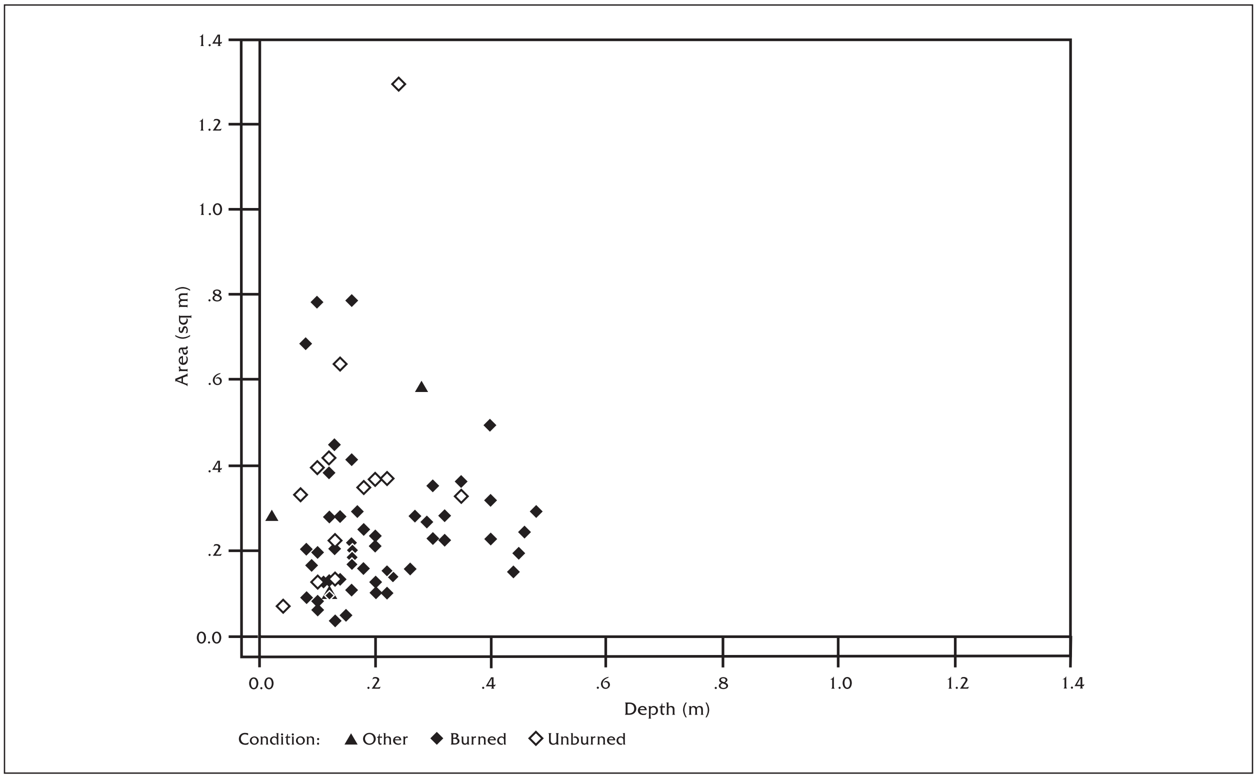


Figure 311. Depth by area, condition of Early and Middle Archaic features, all sites.

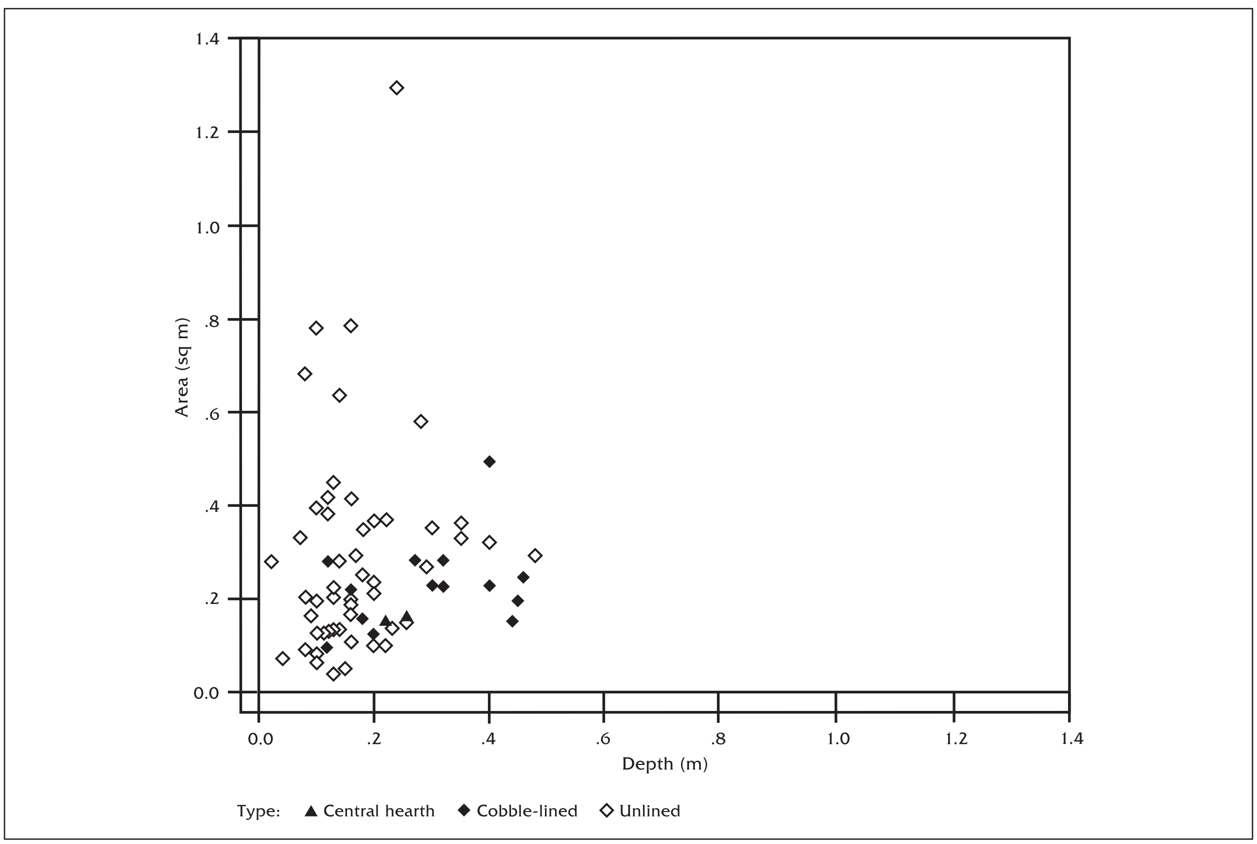


Figure 312. Depth by area, type of Early and Middle Archaic features, all sites.

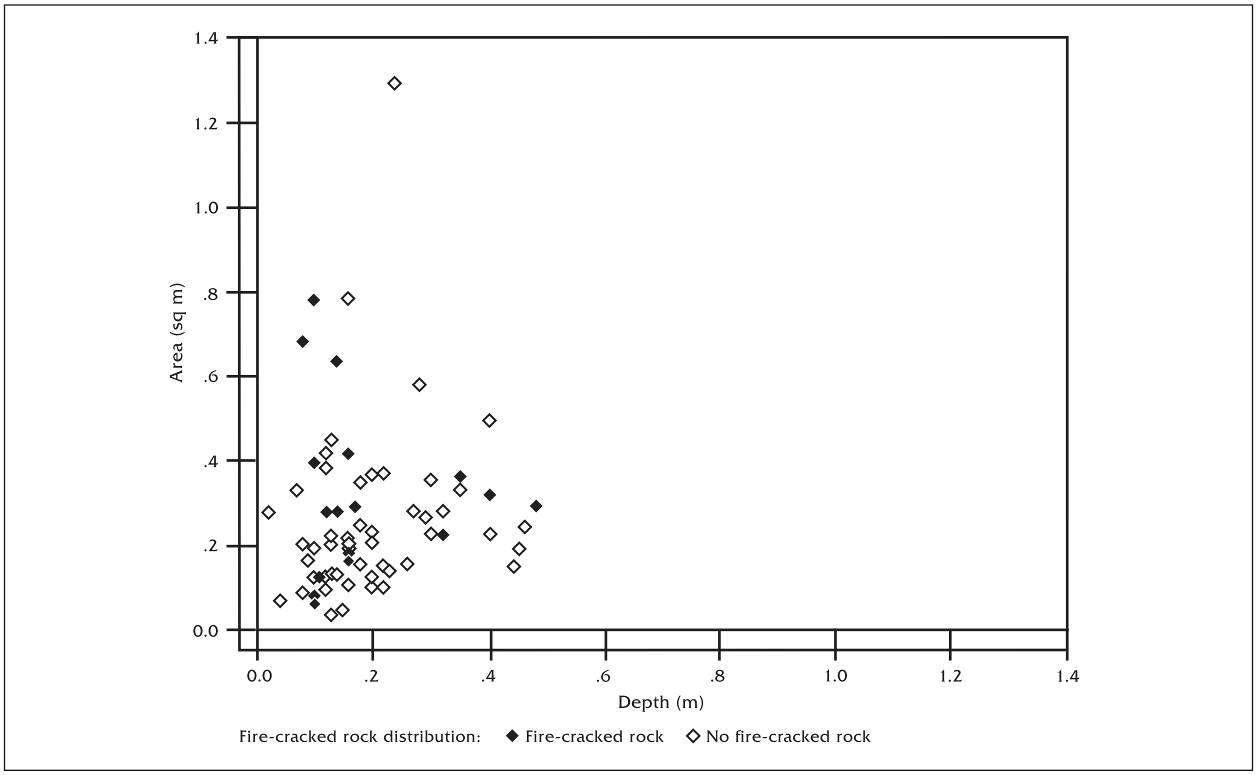


Figure 313. Depth by area, fire-cracked rock, Early and Middle Archaic features, all sites.

Pits deeper than 25 cm were much more likely to have charred seeds, and they produced hedgehog cactus, juniper seeds, and piñon nutshells—evidence of piñon nut processing and mid to late summer and fall occupation.

Although other cobble-lined features were found in Pueblo components along the Northwest Santa Fe Relief Route, those at LA 61289 are distinctive for their depth, number, and tight construction. The presence of these features in a specific place during one time period could indicate a special processing technique, possibly tied to specific resources.

Four small, deep, unlined features at LA 61286 were slightly larger in area than cobble-lined pits but fell in the same general depth range. Three of them were burned but didn't contain charred taxa.

Seven large shallow pits varied in size from the smallest, at LA 61290, to the largest, at LA 61289. Six were sorted. Four contained burned fill. Three had charred taxa. The presence of fire-cracked rock was also restricted to LA 61286. Two of the three features with charred taxa had more than 20 pieces and burned fill, and they produced cultural taxa. One was unburned and contained no cultural taxa.

The smaller pits at LA 61290 were the shallowest and did not contain fire-cracked rock. One was burned and contained charred taxa. One of the small pits at LA 61289 was burned and contained seepweed but no fire-cracked rock. Greenhouse et al. (1981) reported that seepweed ("black salt") was used by Pimas to roast cholla buds. Seepweed was included as a pit lining and for flavor. Despite the presence of seepweed, no observable trend linked specific taxa to the presence or absence of fire-cracked rock.

LA 61289 had the only two large, deep Middle Archaic features. One had indeterminate fill and was not sorted. The other was cobble lined and contained burned fill but did not have fire-cracked rock and yielded no cultural taxa. Burned fill and a cobble lining (including two ground stone artifacts) suggest that this feature was used as a roasting pit.

Late Archaic

Thirteen Late Archaic features were found at LA 61286 and LA 61293 (Fig. 314). They may reflect a much more limited use of the area than during

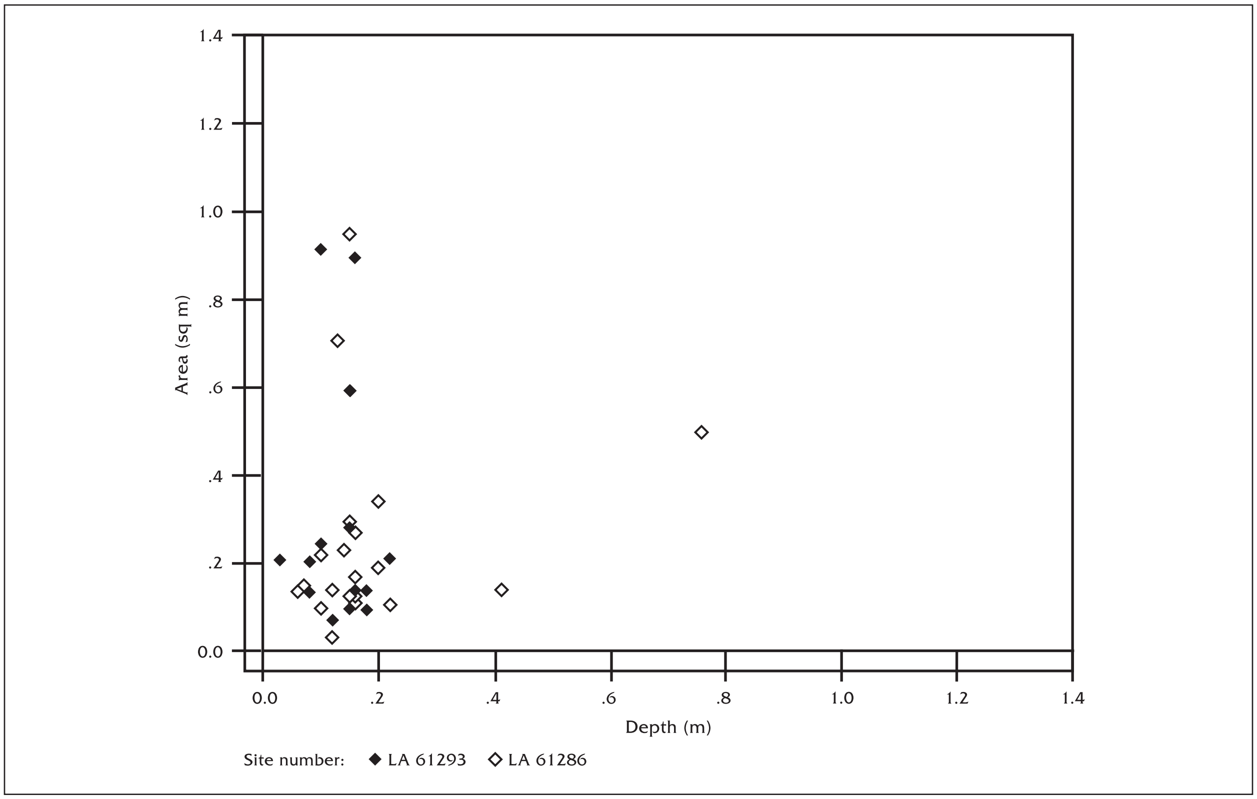


Figure 314. Depth by area, Late and Latest Archaic features by site, all sites.

the Middle Archaic. The features were either small and shallow or large and shallow with fire-cracked rock. Figures 315–317 illustrate Late and Latest Archaic features.

Small shallow features (8) were the most common. LA 61286 had three small features, two of which may have been paired; one had burned seeds. Pits at LA 61293 (5) were all burned, but only one had charred economic taxa.

Large shallow features were relatively numerous (5). All but one contained burned fill, but only two from LA 61286 had charred cultural taxa. All contained more than 50 pieces of fire-cracked rock. Features at LA 61286 had fire-cracked rock counts in the hundreds, but only two had trace amounts of amaranth and juniper in the fill. These two were adjacent to fire-cracked rock concentrations or charcoal stains. One of them was large and shallow, while the other was more bowl shaped, and fire-cracked rock was dumped to one side, as if it had been dug out. The latter feature was more like the large, shallow, Early and Middle Archaic pits discussed previously.

The three pits from LA 61293 had lower fire-cracked rock counts than LA 61286 and contained no cultural taxa. Feature profiles were gentle and sloping. Features from this site had a flat side on the downhill slope, which could have given access to the feature to someone seated on that side. Very shallow fire-cracked rock features may have been used for roasting, and repeated use and cleaning may have caused them to spread out (Binford 1983). The features could be attributed to a seasonal round during which a group returned to process a certain plant, as suggested by the absence of small-animal bone at the site. Local plants that are roasted include narrow-leaf yucca stalks and fruits (Opler 1941). Although not a favored resource, yucca stems come up in the spring and were an important resource for Apaches when food was scarce. The tender shoots were roasted on coals and eaten. Another more likely and possibly more abundant resource is piñon (Opler 1941). Hedgehog cactus was recovered from Middle Archaic and Latest Archaic features at LA 61289 and LA 61286, but it was not present in Late Archaic features, and there was no archaeobotanical evidence of the use of piñon or yucca, either.

Features from LA 61286 hint at a shorter

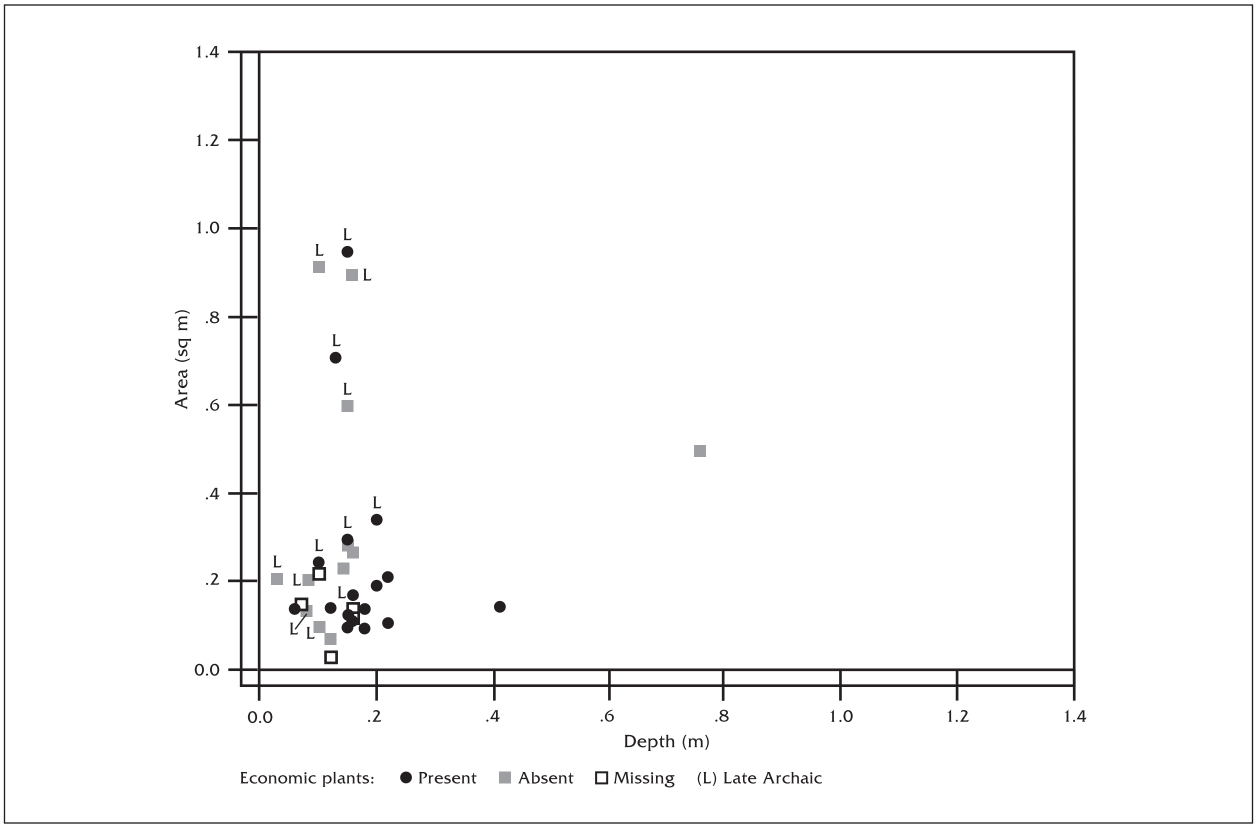


Figure 315. Depth by area by economic plants, period, Late and Latest Archaic features, all sites.

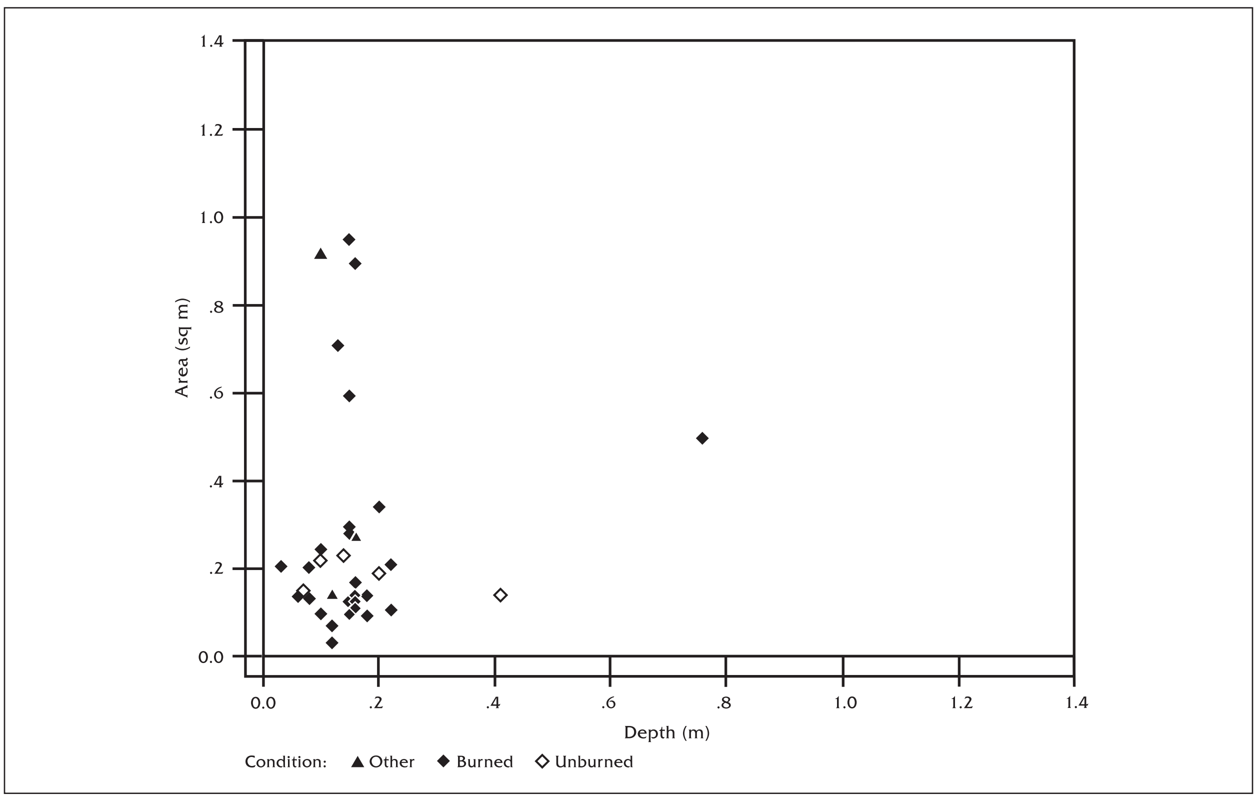


Figure 316. Depth by area, condition of Late and Latest Archaic features, all sites.

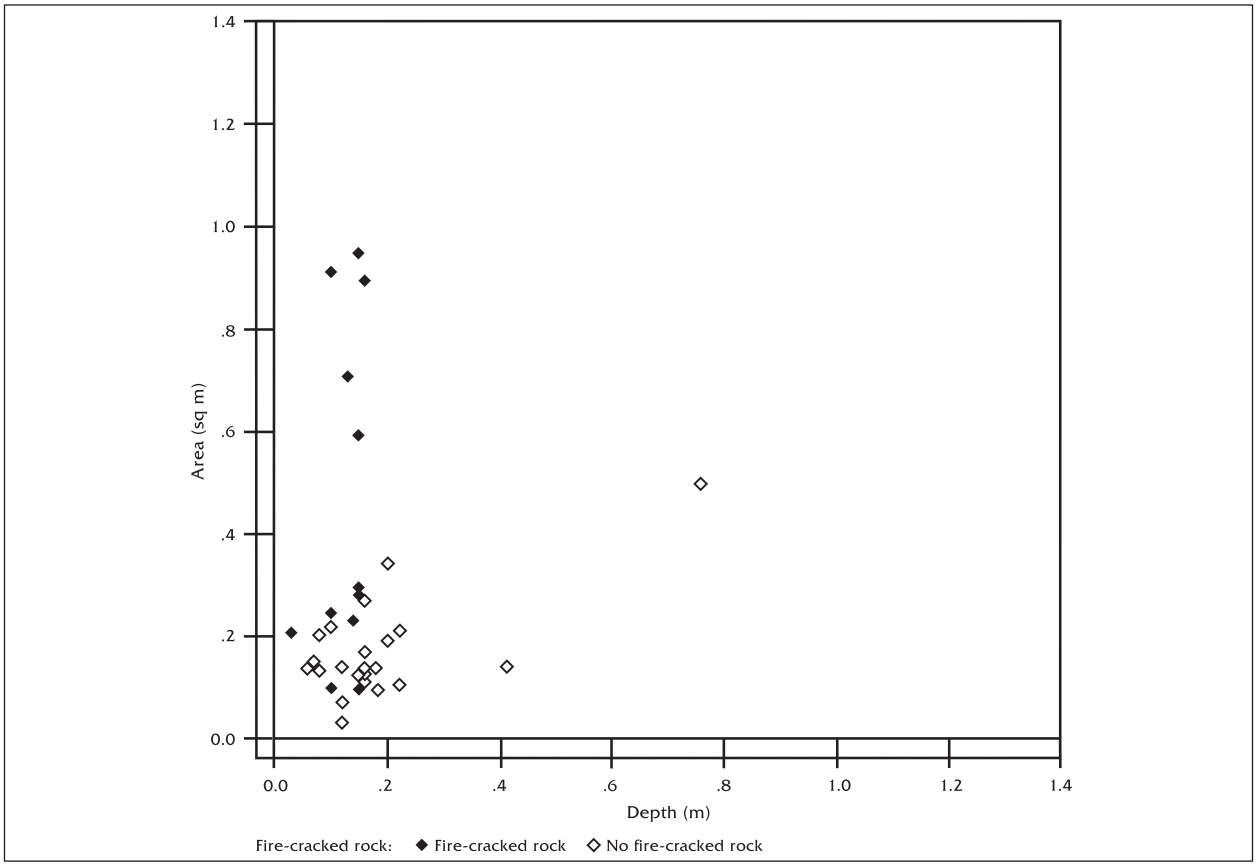


Figure 317. Depth by area, fire-cracked rock, Late and Latest Archaic features, all sites.

period of site use during the Late Archaic than at LA 61293. Two large shallow pits were similar to those at LA 61293, although they were not as deflated and slightly deeper. The large amounts of fire-cracked rock suggest that more heat was used, possibly for processing tough or carbohydrate-rich plant remains or meat. Juniper berries mature in the fall, and although they stay on the plant over the winter, they are often eaten by birds (Schopmeyer 1974). Castetter (1935:31) reported the use of juniper cones to flavor meat at Acoma and Laguna. Dunmire and Tierney (1995:106) reported that it was ground and made into cakes or boiled. Evidence of seasonality is limited to nonexistent for both components, and it is hard to say if different materials were processed at LA 61286 and LA 61293.

Latest Archaic Period

Latest Archaic features (23) were also found exclusively at LA 61286 and LA 61293 (Fig. 314). They included small shallow features, one narrow deep feature, and one large deep pit.

Small shallow features (20) made up most of the sample. Most of the pits were burned. The seven pits from LA 61293 were intramural features. They were deeper than they were wide, and five of them were burned. One pit had fire-cracked rock. All but one of the intramural features contained charred taxa (Figs. 315–317).

The extramural features were all from LA 61286. They tended to have charred taxa, but 4 of the 13 were not sorted, potentially skewing the ratio of features with charred seeds (4) to features with no cultural taxa (2). Only two of the extramural features contained fire-cracked rock, and one of those contained charred seeds.

Taxa from the Latest Archaic period did not reflect the abundance of juniper found in Middle Archaic features. Although there were trace amounts of juniper, the archaeobotanical assemblage consists mainly of goosefoot and cheno-am. Hedgehog cactus and saltbush were not recovered from the Late Archaic component. The presence of different taxa suggests that the focus of foraging may have been different for later site inhabitants.

Two other feature groupings were represented only at LA 61286. One was a narrow deep feature containing a hedgehog cactus seed. The other was a large, deep roasting pit with no fire-cracked rock or charred seeds.

Although none of the small features evaluated were intramural, the presence of more small features at LA 61286 than at LA 61293 may be attributable to a longer habitation, during which more expedient features were excavated for various everyday tasks during one or repeated short occupations.

Ancestral Pueblo Period

Fifteen of the 19 Ancestral Pueblo features from six sites (LA 61289, LA 61290, LA 61293, LA 61299, LA 61302, and LA 113954) were sorted. Pits were small and shallow (8); cobble lined (1); large shallow (9), of which one was cobble lined; and large deep (1). Seven of the eight small shallow features were sorted. Of these, all were burned, and one had fire-cracked rock. All produced cultural taxa. Figures 318–321 illustrate Ancestral Pueblo and unknown features.

Large shallow features (7) made up the majority of Pueblo features. One was burned with fire-cracked rock but was not sorted. The remaining six were sorted, and all contained cultural taxa. Two of the sorted features had indeterminate conditions, and most of them (5) were burned. Six had more than 20 fire-cracked rocks, and a large feature at LA 61302 had 207. Maize was recovered from a kiln at LA 61299. The fire-cracked rock counts did not appear to be tied to feature depth or size. Some of the shallowest of the large features had from 43 to 90 fire-cracked rocks. Four of the features contained unknown taxa.

Large shallow Pueblo period features at LA 61290 showed evidence of piñon processing. Feature 1, a large shallow roasting pit with approximately 100 fire-cracked rocks, appeared to be associated with a small slab-lined pit. Both pits contained charred piñon nut shell and may have been used for nut processing. The other large shallow pit (Feature 6), which also contained fire-cracked rock, was shallow and contained charred goosefoot.

There were two large shallow features at LA 61293. The deeper one was morphologically distinct in that it had a pavement of very large burned cobbles set into its base. The cobbles were 15 cm thick and made a pavement about 0.5 cm below ground surface. This feature was clearly used for shallow cooking. Taxa included trace Leguminaceae and a lot of unidentified seeds. This change in morphology could signal a difference in processing technique in a population with pottery and a diet supplemented by corn. Although maize wasn't processed at the site it was presumably available to the population.

One large, deep Pueblo feature was cobble lined, had burned cultural taxa, and contained 100 fire-cracked rocks. The purpose of this feature was clearly to hold and radiate heat for an extended period of time. No bone was found in the feature, and the recovered taxa were primarily weedy annuals.

With the exception of LA 61290, which had features of all three sizes, Pueblo features tended to be narrower in their size range than features from earlier periods. Small features tend to occur at sites that display heavier or more intensive use (Fig. 318). A decrease in the number of features and a change from small shallow pits to larger pits suggest that the area was being used more intensively for a shorter period of time during the Pueblo period. Changes in land use from many small cobble-lined pits constructed over a series of years to larger more shallow pits could indicate a change in availability of wild food resources, as suggested by pollen results indicating climatic change (Holloway, this report). This change in morphology could also reflect a more intensive procurement strategy of the same resource by a larger population of more sedentary foragers and farmers.

Unknown Period

Unknown features (21) were excavated at eight sites along the project corridor. Thirteen were small shallow pits. Of the features sorted (11), three were burned, one was ash filled, one was unburned, and six had fill of an indeterminate nature, most likely because they were deflated. Half of the sorted features contained charred taxa, most of which were from features with indeterminate fill. Eight were large shallow features, seven of which were sorted. Two of the seven had charred cultural taxa (Figs. 318–

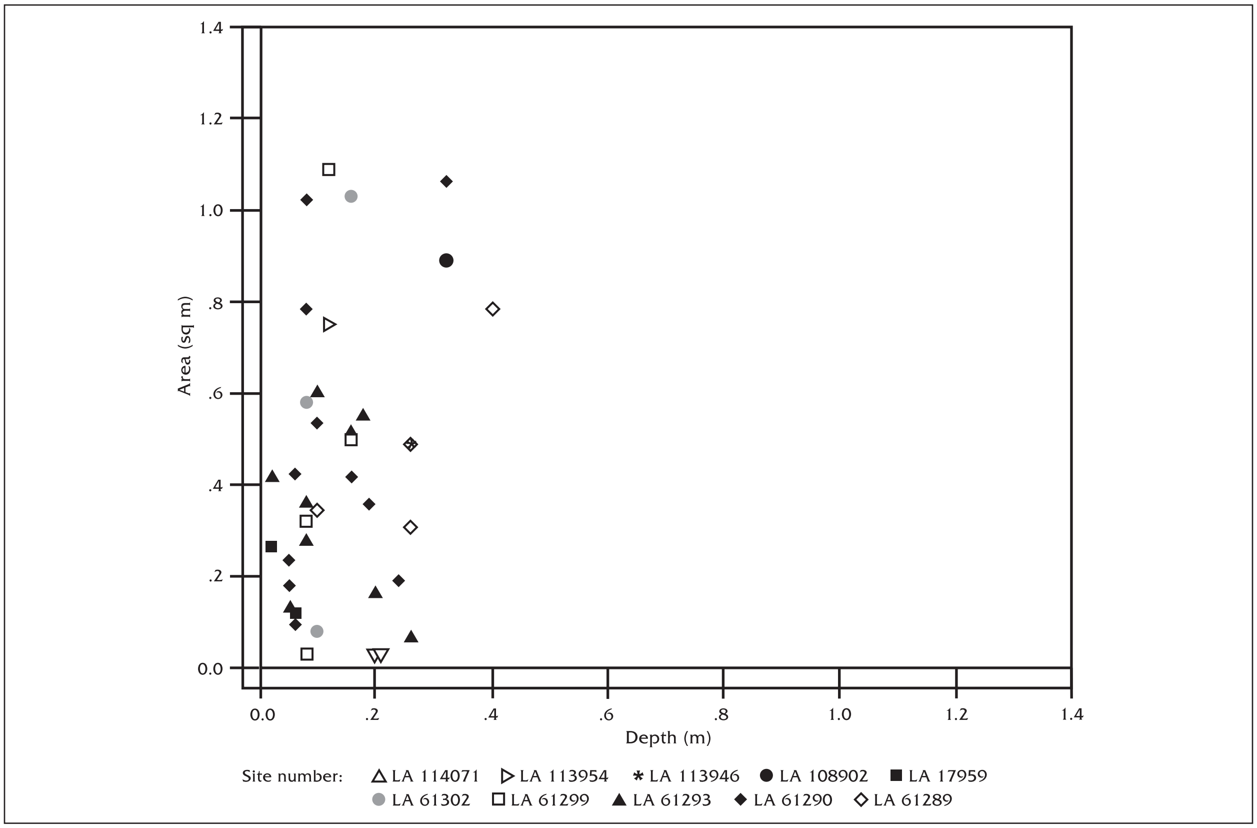


Figure 318. Depth by area, Pueblo and unknown features by site number, all sites.

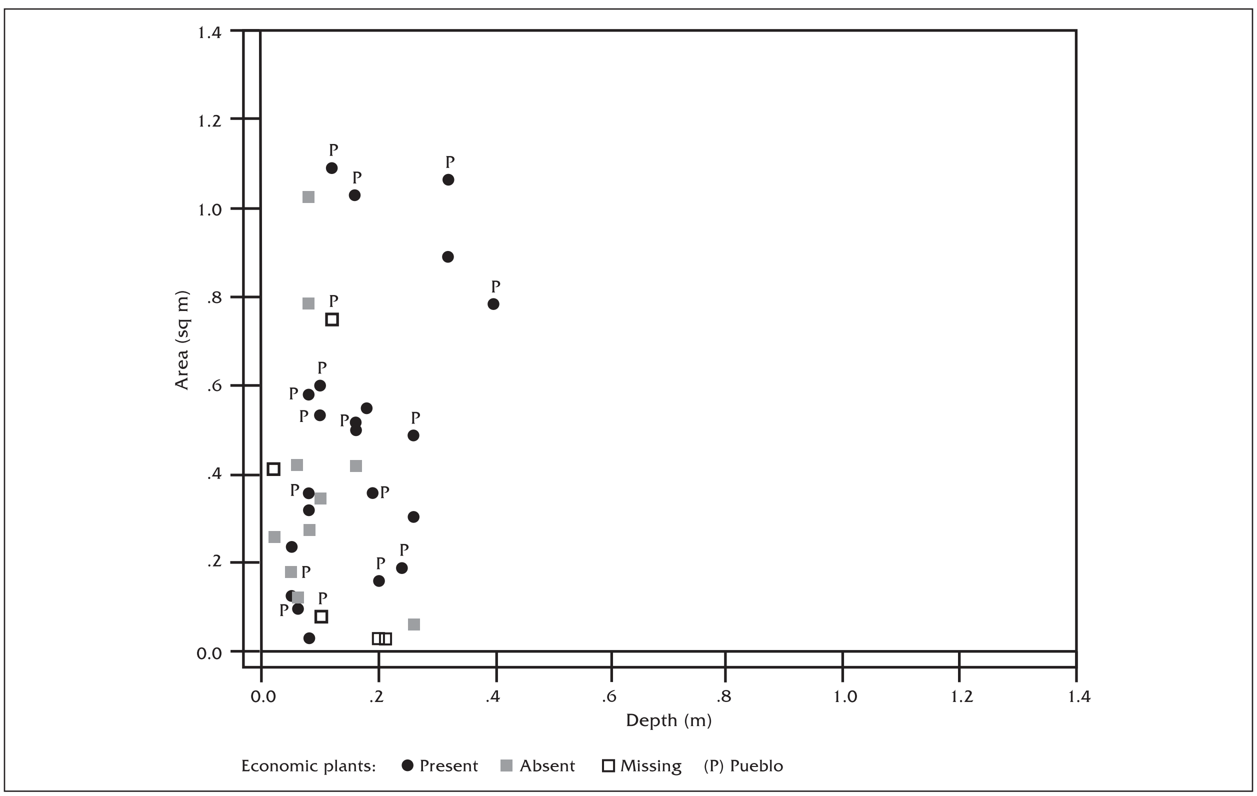


Figure 319. Depth by area by economic plants, period of Pueblo and unknown features, all sites.

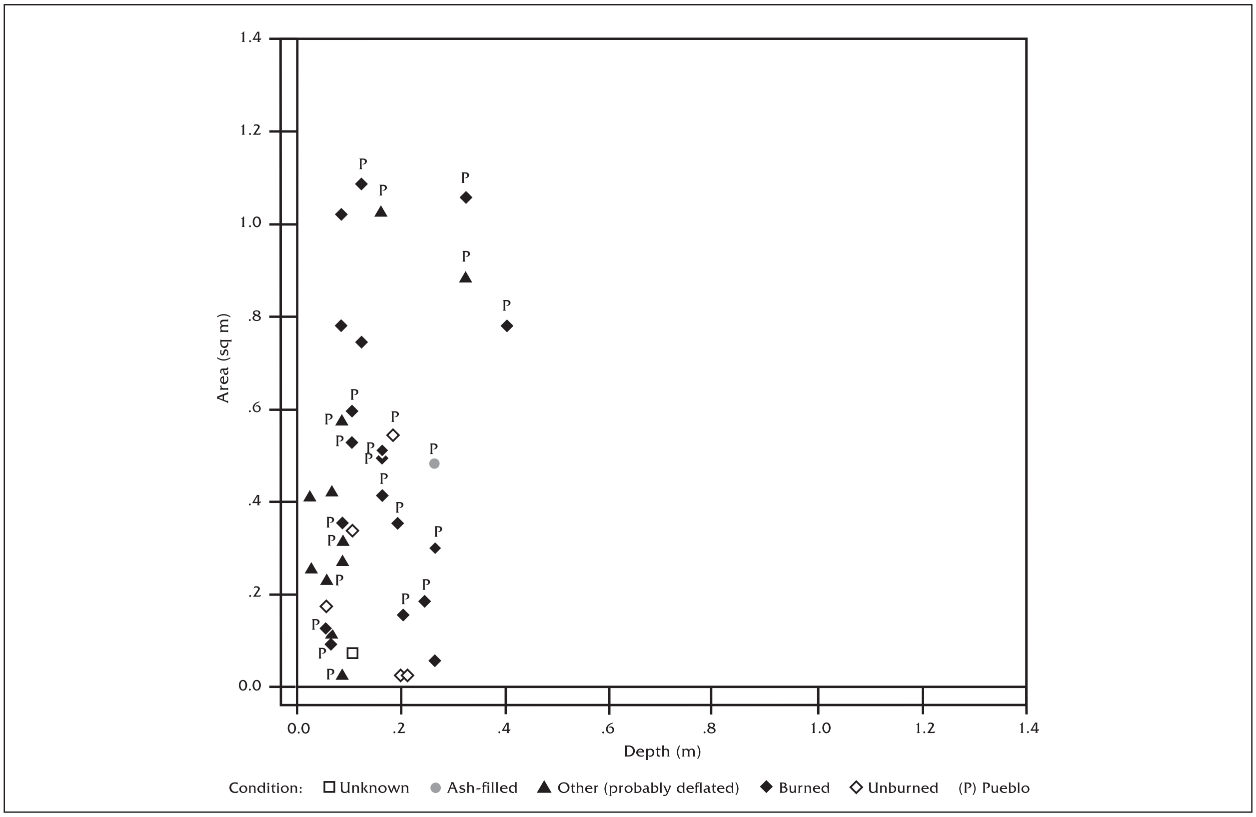


Figure 320. Depth by area, condition of Pueblo and unknown features, all sites.

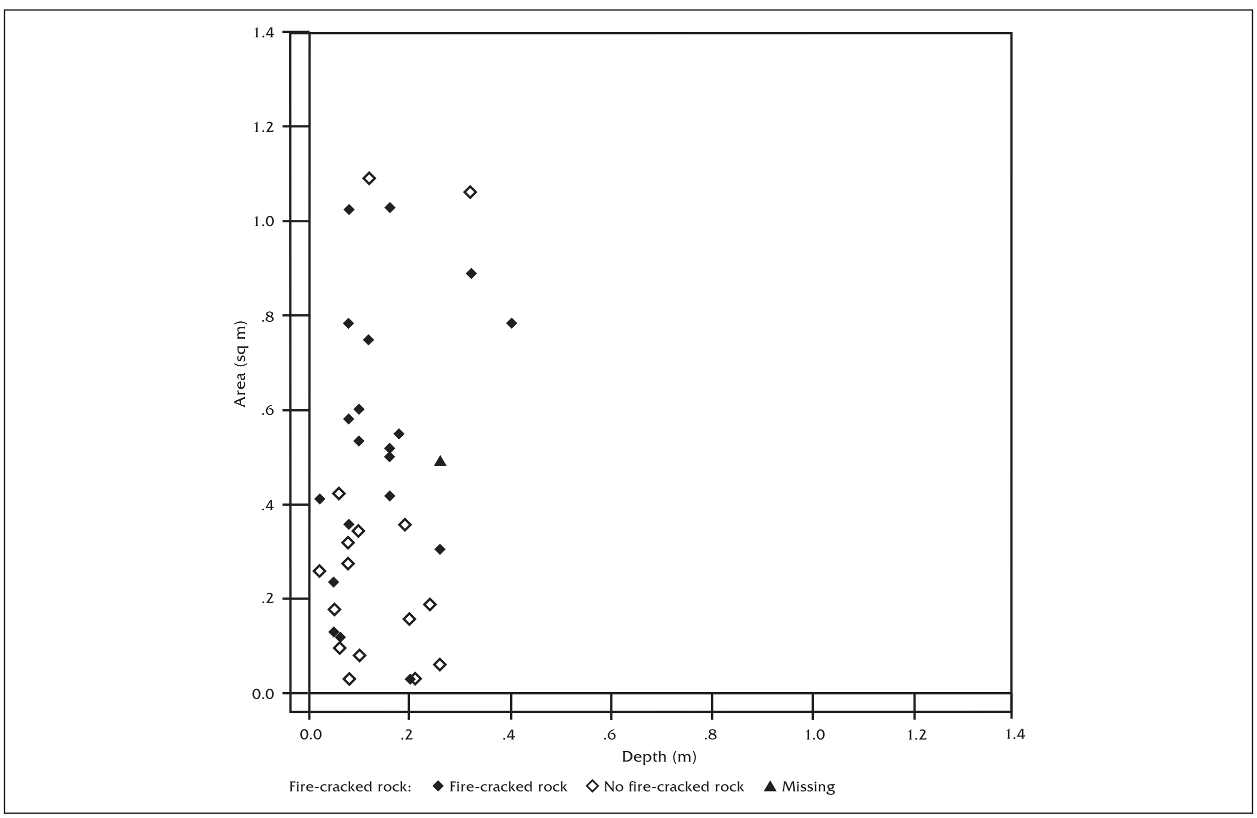


Figure 321. Depth by area, fire-cracked rock, Pueblo and unknown features, all sites.

321). This poor recovery rate from large shallow features is more likely a measure of feature deflation than of taxa in burned features.

Comparison across Time

Middle Archaic features, the most variable and the most numerous, reflected the widest range of distribution and morphology of any temporal grouping. Cobble-lined pits were specialized features. Middle Archaic feature clustering was unique in that there were more pits that were decisively large and shallow, or deep and narrow than during other time period (Fig. 309). Small deep pits were a category not exclusive to, but most prevalent in, the Middle Archaic and may be linked in some way to the presence of small cobble-lined pits that were also deep (Table 188).

When features from all time periods are compared, another cluster becomes apparent—shallow features that are about 0.4 sq m in area and from 15 to 25 cm deep, mostly made up of Middle Archaic features (Figs. 309, 314, and 315). This clustering is not evident within the Late and Latest Archaic group, in which there is a break of almost 0.2 sq m in area between small and large features. The temptation is to attribute this transitional category to a longer Middle Archaic reoccupation that focused on daily needs rather than processing resources for transport and planned or anticipated needs. But Latest Archaic sites (though not as intensely or repeatedly used as LA 61286 during the Middle Archaic) do not have a feature cluster in this size range, and both have a pit structures as evidence of longer occupation.

As a group, Late and Latest Archaic features were the most consistently shallow. They are either large in area or they are small. There is no intermediate feature size. Late Archaic large shallow features maintain a depth range of approximately 10 to 20 cm. Though they had the least variable depths, they had the widest continuous area range of any Archaic group. The majority of Latest Archaic features were small, owing in part to the exclusivity of intramural features at LA 61293. There were no large shallow features. However, the one large deep, feature from the Latest Archaic component at LA 61286 was the deepest of any time period relative to its surface area.

Pueblo and unknown feature scatterplots were the most dispersed and the least likely to have small features. They demonstrate a reliance on large shallow features spaced over a greater area on the landscape. One of the largest features was a kiln. Although small features were found at sites with larger Pueblo occupations (LA 61290 and 61293), they made up just over half of Pueblo features as compared to 93 percent of Middle Archaic features. Obviously, the Middle Archaic component is a larger sample, but maybe there are more features for a reason, such as longer stays or more intensive land-use patterns by the earlier inhabitants. Large shallow features showed greater size range. One large shallow feature with a cobble pavement was unique to the Pueblo period. Unlike Middle Archaic cobble-lined features, presumably constructed to direct heat in upon themselves, this feature seems to have been constructed to radiate heat upwards. Large deep pits tend to be shallower than those from Middle and Late Archaic times. Three of them are barely 0.4 m deep, but they are larger than 0.75 sq m in area. In contrast, earlier pits of similar depth are consistently less than 0.6 sq m in area, thus showing a preference for larger rather than deep pits.

Large deep features were not common, accounting for five of the features along the project corridor. The largest was a Latest Archaic feature at LA 61286 that was 0.3 m deeper than any other feature in the project (Fig. 315). Presumably used as a roasting pit, it was one of the only features that had animal bone. This feature may indicate that the inhabitants roasted something for a long time, presumably different resources than were processed using large shallow pits with fire-cracked rock. Pit size and morphology varied. One Middle Archaic pit was relatively smaller than the rest and was cobble lined (Fig. 312). Pueblo and unknown pits were larger overall but shallower in proportion to their surface areas.

The ratio of productive to unproductive samples in small features during the Middle Archaic was surprisingly low. Charred seeds were found 61 percent of the time. But in small features, burned fill did not seem to affect the chances of recovering charred taxa. The recovery rate for burned and unburned features was roughly the same. Small, Late Archaic features were also

Table 188. Feature type, period, and selected taxa by site

Site	Early Archaic	Number of Features	Middle Archaic	Number of Features	Late Archaic	Number of Features	Latest Archaic	Number of Features	Pueblo and Unknown	Number of Features (Pueblo)	Number of Features (Unknown)
LA 61286	LS with FCR; seepweed	2	SS; juniper	26	SS (2)	3	SS; seepweed	13*			
			LS with FCR	2	LS with FCR; juniper	2	SD; hedgehog cactus	1			
			SD	4*			LD no FCR; burned piñon cones but no shell	1			
LA 61289			SS	6					SS	1	2
			CL; prickly pear, piñon, hedgehog cactus	12					CL large	1	0
			LS no FCR; goosefoot, seepweed	2*							
			LD no FCR	2*							
LA 61290			SS	8					SS; possible piñon	4	1
			LS no FCR	2					LS; goosefoot	2	3
			SD prickly pear	1					LD; piñon	1	0
LA 61293					SS; ground cherry	5	SS (intermural only); lemonade berry	7	SS; possible	2	2
					LS with FCR	3			LS with cobble base	2	1
Small Sites									SS	1*	6
									LS	4*	1
									LD	2	0

SS small shallow; LS large shallow; CL cobble lined; LD large deep, SD small deep; FCR fire-cracked rock.
* Features not sorted are included in count. Shaded areas denote pit structure.

equally likely to have charred taxa regardless of fill type. Latest Archaic features were different. The vast majority of samples from burned features were productive, although unburned features were still as likely as not to have burned taxa. This Late Archaic pattern is seen in Pueblo recovery rates. Burned features all had charred taxa, and samples from unburned features were as likely to have burned taxa as not.

This repeating pattern may be a trick of preservation, or sample size, or both. Age of deposits varies, and many of the Late Archaic features were intramural, which may have enhanced preservation. Sorted unburned features at Late Archaic and Pueblo sites were significantly less numerous, so even though the recovery rate in unburned features was still approximately 1:1 at Latest Archaic and Pueblo sites, there were not as many unburned features with charred taxa.

Large shallow features tended to be burned and to contain charred taxa, though burned features at one Late Archaic site (LA 61293) had poor return rates. Fire-cracked rock was also found in large shallow features. Fire-cracked rock was present in both large and small features, but counts over 20 were more often found in large shallow features (Figs. 322 and 323). Overall, there was a very low frequency of small shallow features containing large amounts of fire-cracked rock, and most of them were Middle Archaic. Large shallow Middle Archaic features were not as likely to have fire-cracked rock as large Late Archaic features, which were proportionally more common for their time period than Middle Archaic features. Late Archaic features were all burned and had from 50 to 339 fire-cracked rocks. Middle Archaic feature fill was less consistently burned. Large, shallow Pueblo features were also mostly burned, and the majority contained large amounts of fire-cracked rock. Early and Middle Archaic features tend to cluster in a smaller area range than Late and Latest Archaic features. Pueblo features had the most dispersed area range of any group. Specific fire-cracked rock counts appeared to be random. A Late Archaic feature approximately 0.3 m in area and less than 0.2 m deep had 35 fire-cracked rocks, while a slightly deeper Pueblo feature with an area of 0.5 m had the same count. Although the largest features had more fire-cracked rock more often, small features had rock counts that were often higher than larger features. In other words, fire-cracked rock counts were not predicated on feature size, depth, or time period.

Conclusions

On a project-wide level, feature morphology had a very weak correlation to specific species or the amount of charred taxa recovered from burned features. Morphology across time may have been a more successful indicator of increased population and concurrent intensification of land use. Patterns punctuate one or two instances of specific use and a general pattern of broad-based use, rather than reflecting a trend toward procurement or processing of any specific resource.

The only confident statement that can be made concerning the relationship of feature morphology to specific charred taxa is that cactus species were not found in small shallow features. They were found in every other feature type along the Northwest Santa Fe Relief Route except for large deep features, which did not have high recovery rates of charred remains. The other very tentative observation that can be made (keeping in mind that there were only four features) is that seepweed was found more often in large shallow features than in any other feature category. Although it is found in Feature 15, a small shallow Latest Archaic feature at LA 61286, the feature is wider than it is deep and would probably be considered a small roasting pit. If this observation is correct, it could tentatively imply that cholla buds were roasted in shallow fire-cracked rock features.

Recovery rates of charred taxa for features with burned fill was variable over time. In general (with the exception of Late Archaic features), large shallow features had the best recovery rates. The recovery rate of charred taxa in small features was variable. Small features from Latest Archaic and Pueblo contexts were more likely to have good recovery rates than older features. Recovery rates for large features were generally not good, possibly a signal that meat was being roasted rather than plant material.

The correlation between charred taxa and fire-cracked rock depended on rock counts. Overall, the presence of fire-cracked rock was not predictive

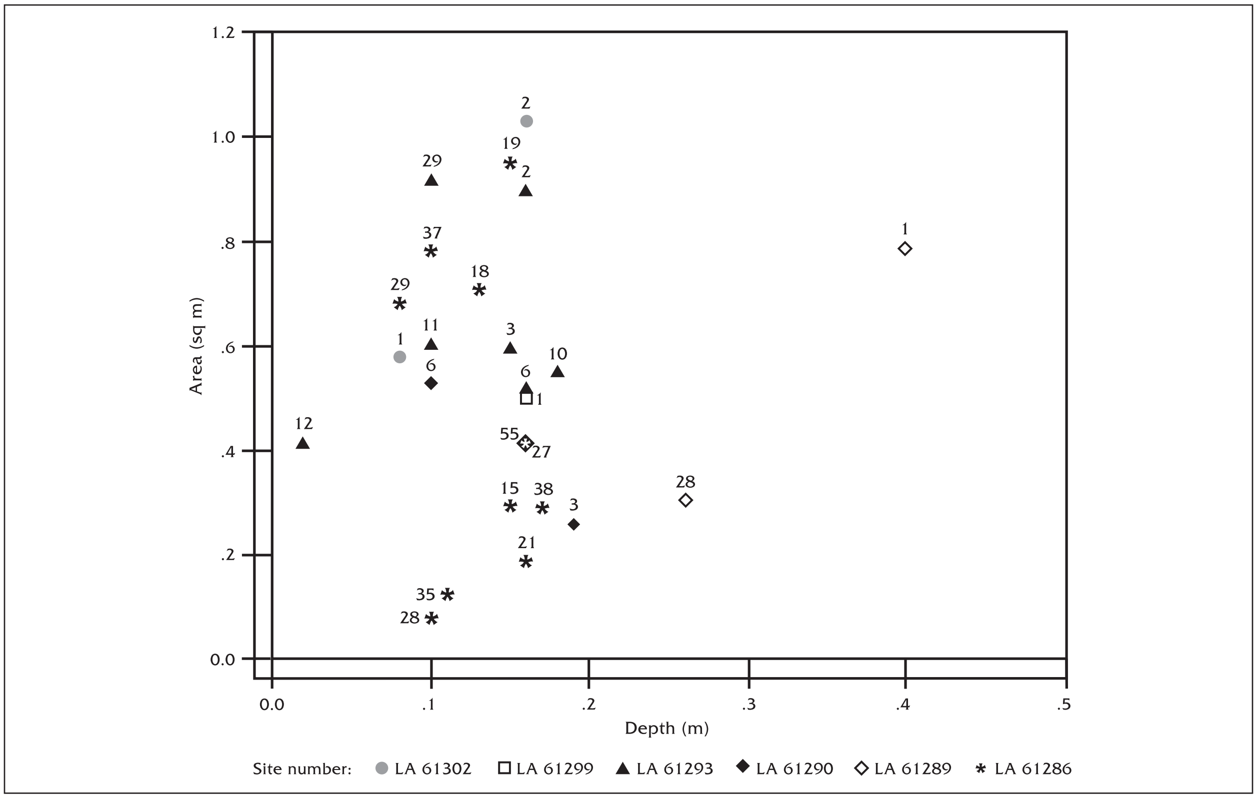


Figure 322. Depth by area by feature number, features with more than 20 fire-cracked rocks, all sites.

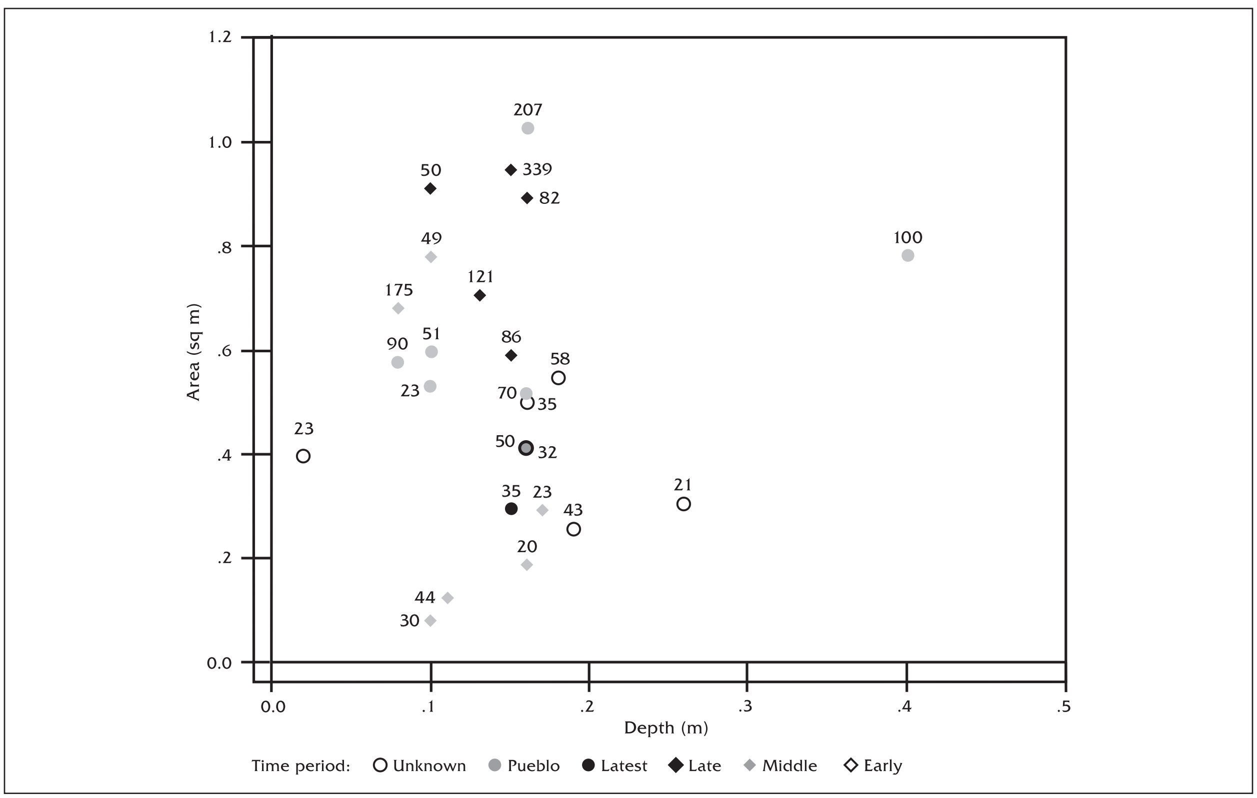


Figure 323. Depth by area by rock count, features with more than 20 fire-cracked rocks, all time periods, all sites.

of charred taxa during any time period. In fact, when features from all sites and time periods are considered, those without fire-cracked rock are twice as likely to contain charred taxa as features with it. One hundred twenty-nine features were sorted. Charred taxa were found in 41 burned features without fire-cracked rock, compared to 22 features with fire-cracked rock. Within individual time periods, the correlation between the absence of cultural remains in features with fire-cracked rock seems to hold, but there are not enough features to confidently characterize this as a tendency by time period. Conversely, the 25 features with more than 20 fire-cracked rocks were more likely to have charred taxa.

Site- and time-specific correlations of feature morphology and charred taxa may be more successful, but there is less data to draw from. Relatively high concentrations of juniper in small shallow pits at LA 61286 during the Middle Archaic were unique in that a similar number of features at the same site did not produce juniper during later periods. Large shallow Latest Archaic pits at LA 61293 were interesting because of their shape and shallow depths, and because they contained no cultural taxa.

Middle Archaic cobble-lined pits at LA 61289 were among the most distinctive features in the project. They were not found anywhere else. Smith and McNees (1999) report sandstone slab-lined pits similar to pits at LA 61289 in a survey of lined pits from the Wyoming Basin in southwestern Wyoming. Similar characteristics include shape, size, carefully constructed lining that protrudes form the surface, and semiarid site settings. Citing Wandsnider (1992), Smith and McNees contend that construction of relatively more costly facilities that would be used briefly but repeatedly "implies a multiyear planning depth." That is, people planned to return to a site at which processing facilities themselves become a resource. Referring to ethnographic evidence associating rock heating in deep pits with processing of plant resources containing complex carbohydrates (Wandsnider 1997), they also state that slab-lined pits were probably used to bake roots and hypothesize the use of biscuitroot or sego lily. Another suggested use when considering form and depth was storage (Smith and McNees 1999).

Considering the similarities in morphology between features at LA 61289 and the Wyoming data set, the connection with possible root processing is intriguing, particularly in an area with few useful inulin-rich resources (Wandsnider 1997; Martin and Hutchins 1981). Could the local population have been processing biscuitroot or a crop such as yucca fruits? Biscuitroot grows in Santa Fe County, as does wide-leaf yucca (Martin and Hutchins 1981), but there was no evidence of its use, and no yucca seeds were found. Although hedgehog cactus, prickly pair, juniper, and piñon are not inulin-rich crops, they were recovered and give some hint of the use of these features.

The number and type of features per period indicate considerable variability over time and changing use of the landscape. The two large shallow Early Archaic features at LA 61286 imply short-term, limited use of the area. This changes during the Middle Archaic, when the number of occupations and, in turn, the number and diversity of feature types peaks. Small features, which may often be associated with pit-structure use, were probably often expediently constructed pits used for a variety of tasks. They may also indicate periodic recurrent Archaic occupations, at which time certain target resources may have been processed. The best evidence of resource targeting is cobble-lined pits at LA 61289. Large shallow features may also act as barometer of this recurring use. Large shallow features are constructed into Pueblo times, when small shallow features are scarce. The transition from large numbers of small features to a few large shallow features may reflect a change in land use. This pattern can be characterized as intensive periodic use in the Archaic to extensive shorter use during the Pueblo period, when the population was presumably on the landscape for less time.

When citing factors that influenced cooking strategies, Wandsnider (1997) includes the number of people available to process a given resource as a variable. Changes in land use at LA 61289 from many small cobble-lined pits constructed over a series of years to larger more shallow pits could indicate a change in the availability of wild food resources. This change in morphology could also reflect a more intensive procurement strategy of the same resource by larger population of a more sedentary farmer foragers. Feature morphology may also reflect technological change adapted to a certain food source. Again, cobble-lined pits could reflect this type of adaption. So could a large shallow cobble-based feature at LA 61293, a well-burned feature with a 15 cm deep, single-course pavement of large cobbles limiting its depth to 5 cm. This new type of pit could signal a change in processing techniques in a population with pottery and agriculture.

Conclusion

Stephen S. Post

Completed over the course of fourteen years, the Northwest Santa Fe Relief Route Project identified and investigated sixty archaeological sites that were subdivided into a minimum of 77 temporal components. These sites were distributed along a 22.6 km (13.6 mi) long by 90 to 122 m (300 to 400 ft) wide corridor that encompassed about 276 ha (700 ac), including interchanges and added access roads. The 77 temporal components encompassed 7,000 years, from the Early Archaic to historic Pueblo and Euroamerican use of the area. The linear nature of the road project provided a narrow but long transect of the full range of environmental zones available at the foot of the Sangre de Cristo Mountains. Thus, the archaeological components within the project corridor reflect human behavior related to the organization of settlement and subsistence.

By examining component spatial and temporal distribution, it is possible to obtain a perspective on 7,000 years of subsistence and settlement organization. Given the narrowness of the project corridor, this is necessarily a limited view. To more fully examine long-term land-use patterns in the piedmont, the Northwest Santa Fe Relief Route components can be compared with testing and excavation data from the Las Campanas project (Lang 1997; Post 1996a) and other projects completed in the piedmont and juniper-grasslands transition (Anschuetz 1998; Kennedy 1998; Schmader 1994a). The Las Campanas project sites are in a similar environmental setting, but they are 4.2 to 9.1 km from the Santa Fe River. In contrast, the Northwest Santa Fe Relief Route components were 0.7 to 2.8 km from the same perennial water source. While it is likely that early ancestral and historic populations extracted or exploited many of the same resources found in the piñon-juniper piedmont and lower-elevation grasslands and riparian environments, the organization, scope, and timing of that use was undoubtedly very different, and the differences should be evident in the archaeological record.

From the Northwest Santa Fe Relief Route and Las Campanas projects, 203 separate temporal or spatial components were identified. Table 189 shows the temporal distribution of the components by project. Appendix 2 contains site and component data from the two study areas. Figures 324–330 show the spatial distribution of components by time for the two project areas. The Northwest Santa Fe Relief Route project has more Archaic period components (16) than the Las Campanas project (10). The majority of the Las Campanas Archaic components were from the Late and Latest periods (1800 BC to AD 850), with only one Middle Archaic period component. The Northwest Santa Fe Relief Route project had a more balanced distribution of Early and Middle and Late to Latest Archaic components. Ancestral Pueblo and unknown components were similarly represented in the two projects. There was a slightly higher percentage of unknown components in the Las Campanas project.

Table 189. Components by period for the Northwest Santa Fe Relief Route and Las Campanas projects

Count Row % Column %	NWSFRR	Las Campanas	Total
Early Archaic	3	-	3
	100.0%	-	100.0%
	3.9%	-	1.5%
Middle Archaic	4	1	5
	80.0%	20.0%	100.0%
	5.2%	0.8%	2.5%
Late Archaic	7	6	13
	53.8%	53.8%	53.8%
	9.1%	4.8%	6.4%
Latest Archaic	2	3	5
	40.0%	60.0%	100.0%
	2.6%	2.4%	2.5%
Ancestral Pueblo	35	58	93
	37.6%	62.4%	100.0%
	45.5%	46.0%	45.8%
Unknown	26	58	84
	31.0%	69.0%	100.0%
	33.8%	46.0%	41.4%
Total	77	126	203
	37.9%	62.1%	100.0%
	100.0%	100.0%	100.0%

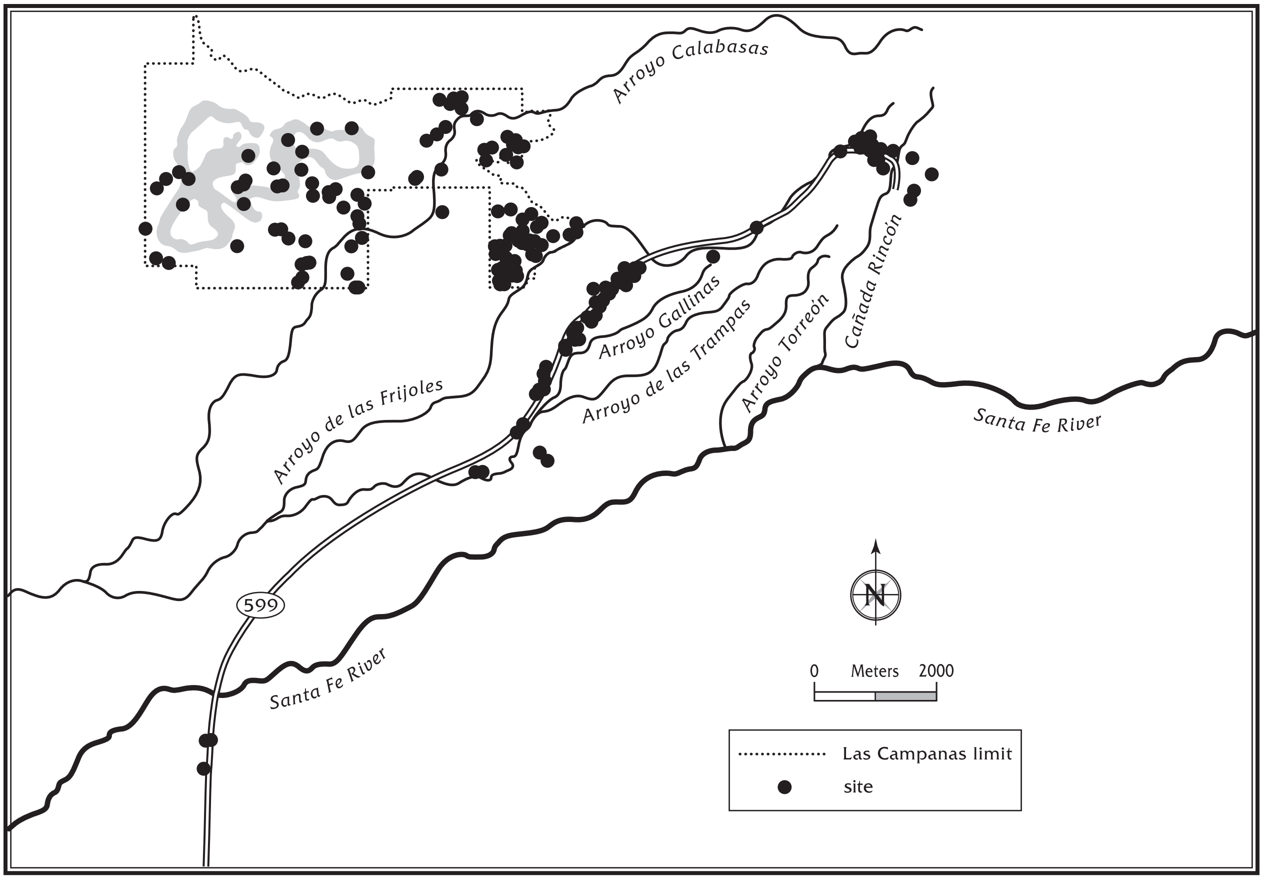


Figure 324. Tested and excavated sites along the Northwest Santa Fe Relief Route and in the Las Campanas area.

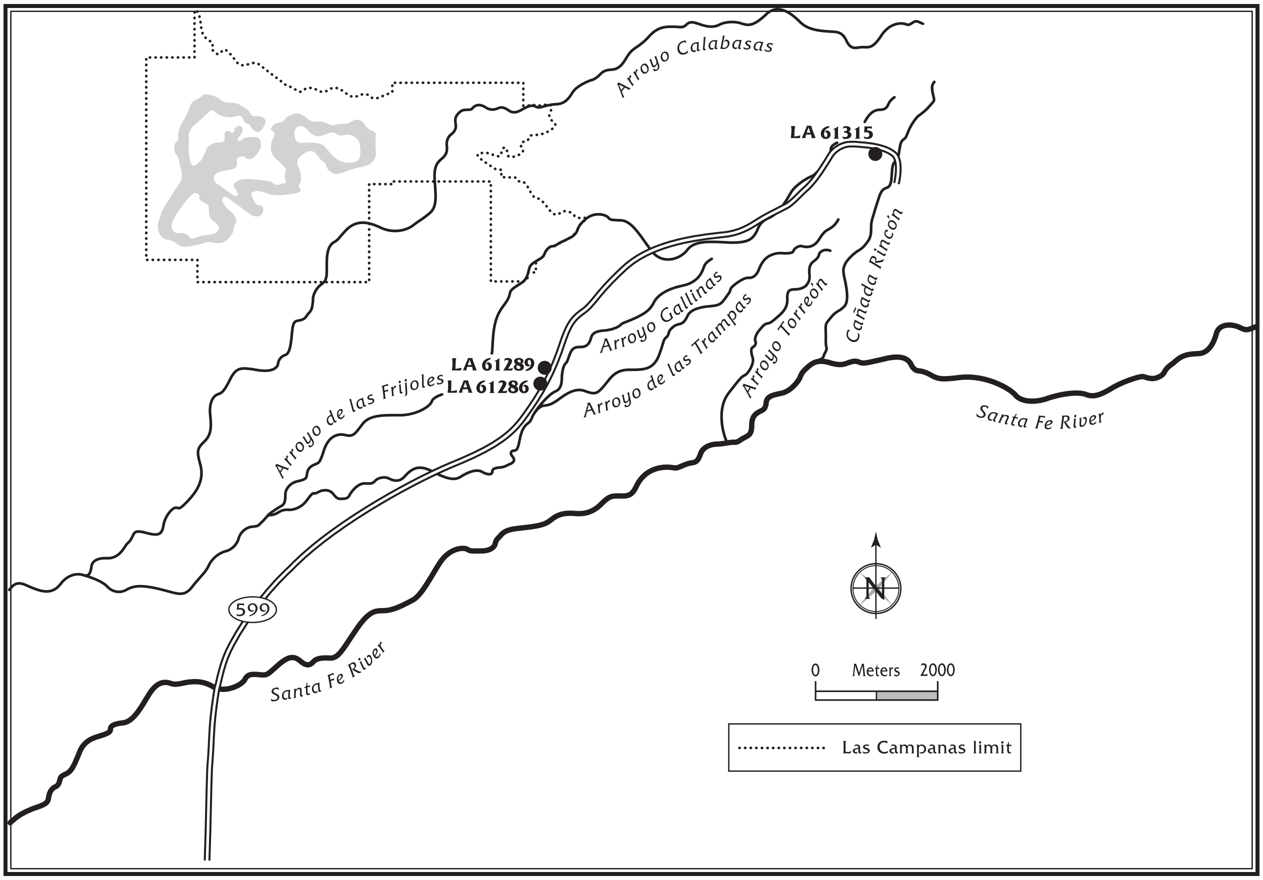


Figure 325. Early Archaic sites along the Northwest Santa Fe Relief Route and in the Las Campanas area.

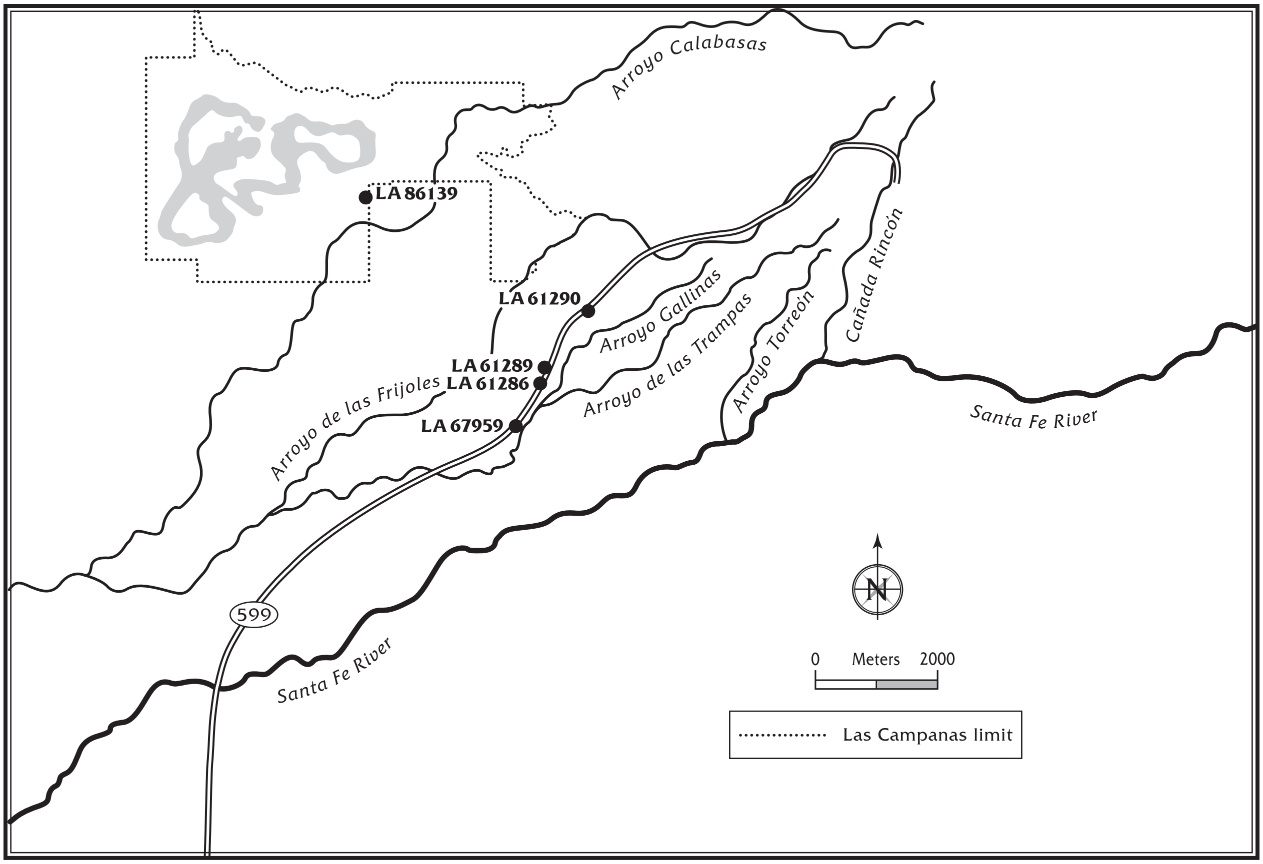


Figure 326. Middle Archaic sites along the Northwest Santa Fe Relief Route and in the Las Campanas area.

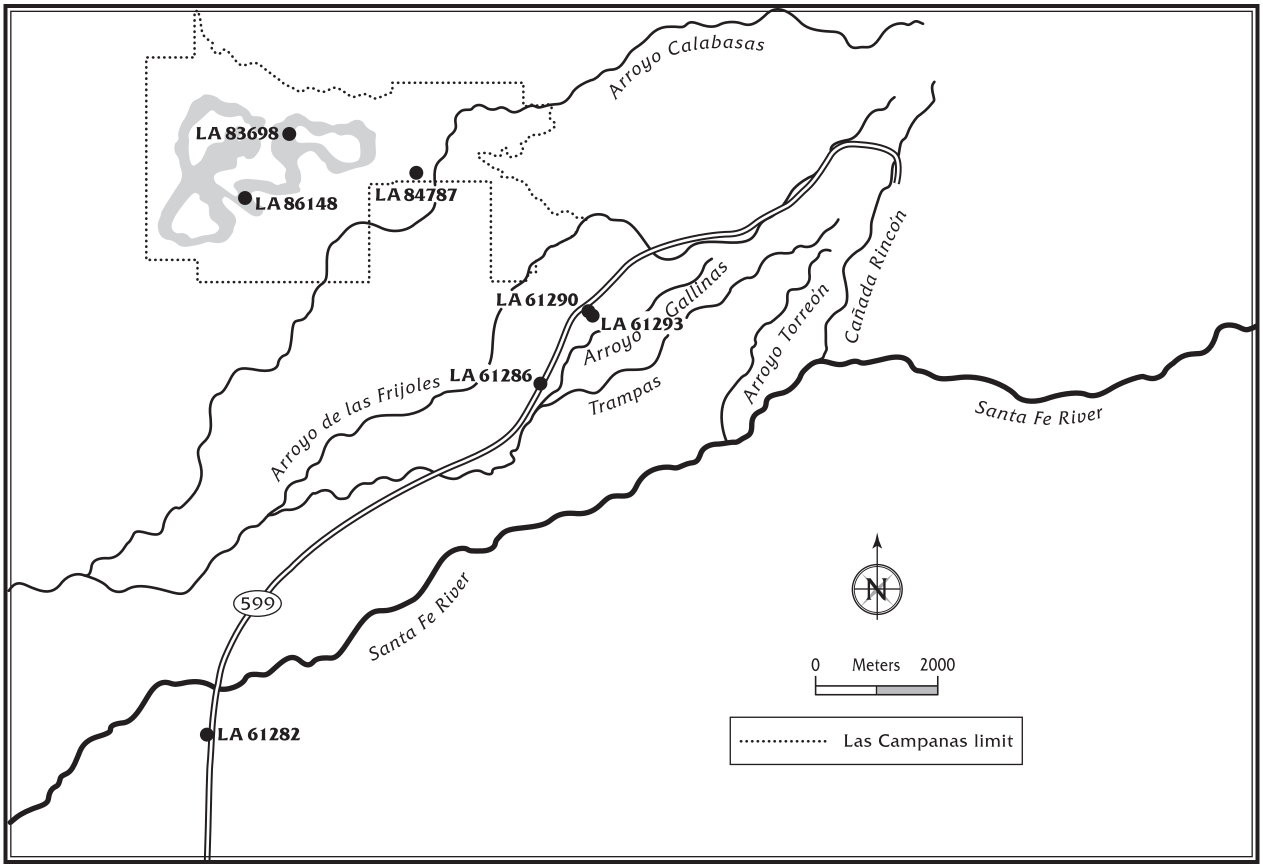


Figure 327. Late Archaic sites along the Northwest Santa Fe Relief Route and in the Las Campanas area.

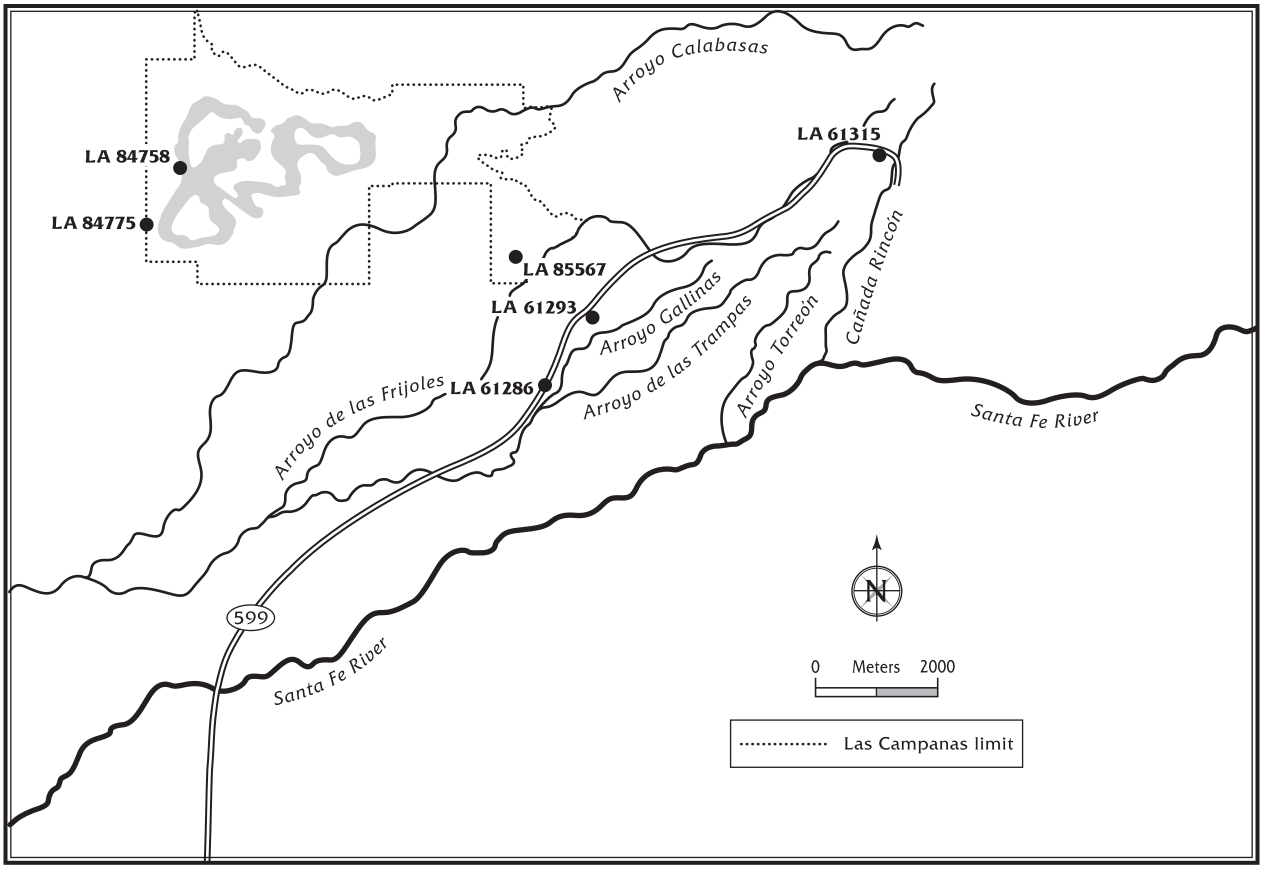


Figure 328. Latest Archaic sites along the Northwest Santa Fe Relief Route and in the Las Campanas area.

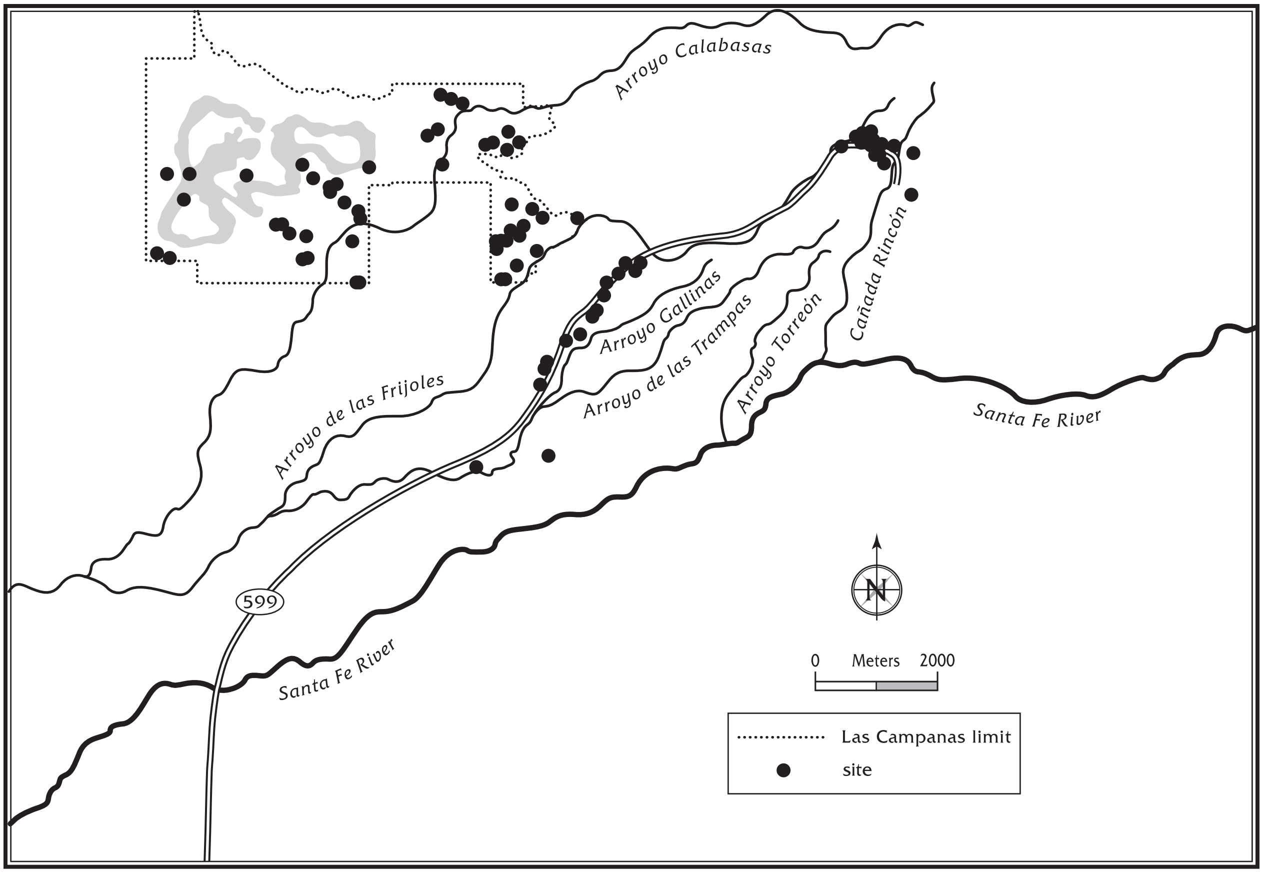


Figure 329. Ancestral Puebloan sites along the Northwest Santa Fe Relief Route and in the Las Campanas area.

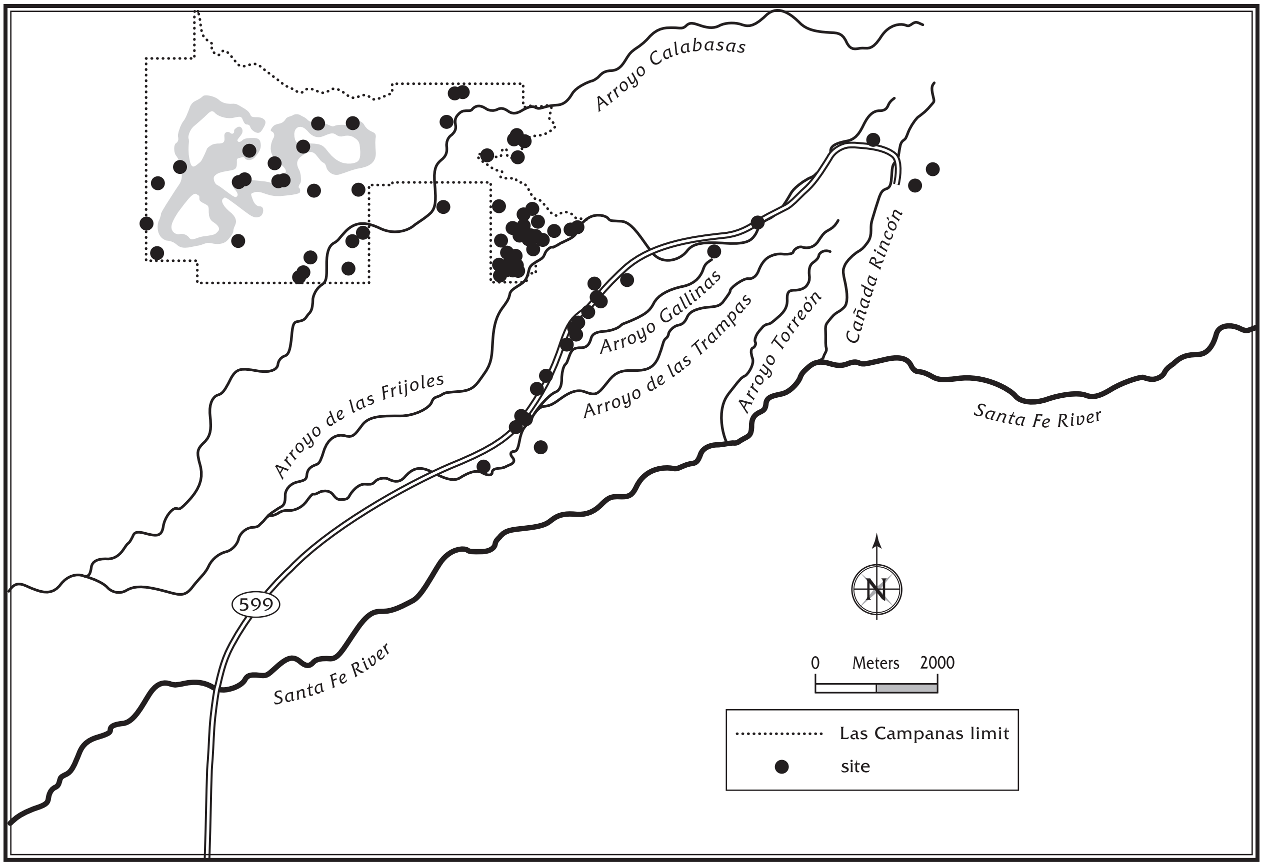


Figure 330. Unknown and mixed sites along the Northwest Santa Fe Relief Route and in the Las Campanas Area.

Archaic Hunter-Gatherers on the Piedmont

The 26 excavated components from the Northwest Santa Fe Relief Route and Las Campanas projects reflect seasonal occupation by highly mobile groups during the Archaic period (5500 BC to AD 850). Differences in site structure and assemblages indicate that this long-term Archaic adaptation to the piedmont environment was not monolithic.

For the Archaic period, it is useful to think of the Santa Fe area and specifically the piedmont as a locale within an annual and lifetime territory of a band or bands (Binford 1980; 1982; Wandsnider 1992; Dewar and McBride 1992; Ebert and Kohler 1988; Smith and McNees 1999). A locale can be defined as consisting of a number of locations and resource patches (Smith and McNees 1999:117). Resource patches contain biotic and geologic resources that are critical to a group's survival. The tempo and periodicity of locale use is determined by a complex interaction of climatic, environmental, and human factors that affect and influence viability and productivity (Smith and McNees 1999:118; Wandsnider 1992).

A location can be defined as a specific place used for occupation (Smith and McNees 1999). A location will be nearest to resources that have a patchy distribution and that are critical to group survival. Watering holes or springs are often cited as the most critical locations for hunter-gatherers in arid environments (Binford 1980). Locations are the focus of a wide range of domestic and productive activities. They may have structures or shelters, facilities, and workshops, or they may only accumulate debris from resource extraction and processing. Locations incorporate the more fine-grained distinctions of residential base camps, limited base camps, limited-activity sites, logistical sites, and resource-extraction sites that differentiate hunter-gatherer spatial and economic organization on a landscape or within annual and lifetime territories (Binford 1980; Vierra 1985; Hudspeth 1997; and many others).

From an optimal foraging perspective, locations are positioned near resource patches to maximize the resources procured relative to the energy invested in their procurement and processing (Hudspeth 1997; Simms 1989). Occupations focused solely on procuring meat for large game mammals for long-term consumption will be located where herds can be effectively tracked and hunted without altering their behavior. Foraging camps should be located to take greatest advantage of the broadest or most abundant array of food sources. Resources that require high-energy input to gather and process relative to their expected energy yield will be exploited by positioning a residential base camp where transport can be minimized and final processing, consumption, and storage maximized (Hudspeth 1997). High-yield resources that provide energy beyond the costs of acquisition and transport and that can be acquired by a few individuals will be exploited through logistical sites or locations.

Expected long-duration occupation or anticipated future occupation of a location results in the construction of stable or semipermanent facilities (Simms 1989; Wandsnider 1992). Construction of durable facilities may both encourage future occupation and reduce energy expended in establishing a camp within a particular location. Facilities with anticipated long-term use obviously would be located where a group or band would expect productive resource patches to occur with some predictability (Smith and McNees 1999:118). For plant resources, this anticipated reoccupation would be heavily conditioned by the health and viability of the resource patch and the time needed for regeneration of a patch following degradation of patch productivity or viability.

In building a model for examining slab-lined cylindrical basins in southwest Wyoming, Smith and McNees (1999) outline four possibilities for repeated occupation of locations based on Wandsnider's (1992) "rules" for the relationship of location use and previously constructed facilities: "1. If the location is (or has become) attractive and facilities remain functional, groups will reoccupy the same specific location and reuse the facilities (complete congruence); 2. If the location is attractive but the facilities are no longer worth using, groups will shift the location slightly within the locale (moderate congruence); 3. If the site is attractive but the facilities are longer extant (e.g., no longer visible), then the previous occupations of the site will have no influence on the specific position of the new occupations at the site; and 4. If the location is not attractive, groups will avoid reoccupying it" (Smith and McNees 1999:118).

A stable mobility pattern based on attractive locations, abundant resources, and viable facilities will result in the reoccupation of locations and long-term use of locales. A long-term stable pattern is strong evidence that exploitable resources within the locale were predicable and occurred in definable, optimally exploitable patches.

Productive and attractive locales were occupied and reoccupied for a long time. Settlement patterns and site structure within a locale such as the Santa Fe River piedmont can be examined from the perspective of reoccupation and spatial congruence. In the case of the Northwest Santa Fe Relief Route project and other recent excavations, Archaic subsistence and settlement within the piedmont and grasslands can be viewed at varying levels of specificity for a 7,000-year period.

Early Archaic Subsistence and Settlement on the Piedmont

Prior to the Northwest Santa Fe Relief Route (Post 2000b) and College Hills (Anschuetz 1998) projects, there was no reported excavation of any Early Archaic sites in the Santa Fe area, a lack that was noted in earlier archaeological literature (Cordell 1979; Peckham 1984; Ware 1984). Excavations at Las Campanas failed to add any components to the lean Early Archaic database (Lang 1997; Post 1996a). Three Early Archaic components were identified on the Northwest Santa Fe Relief Route through excavation and radiocarbon dating (Post 2000b; and this report) and one component from the College Hills project (Anschuetz 1998). These components exhibit a number of similar characteristics that can be enumerated relative to expectations for the occupation of specific locations and the exploitation of locales within an annual or lifetime territory.

All of the sites were on southeast- to south-southwest-facing colluvial slopes. LA 61289, LA 61286, and LA 115598 were in lower slope settings

150 to 380 m from Arroyo Gallinas. LA 61315 was in a upper-slope setting, in a swale or bench overlooking Cañada Rincón, 380 m to the east. All of the sites are more than 1 km from the nearest perennial drainage, the Santa Fe River. This suggests that the nearer, now-seasonal drainages may have carried water from upland springs that are not evident today. All sites except LA 115598 were associated with now-buried outcrops of Tesuque sandstone. Site and landform association suggest that locations were selected for the shelter provided by intermittent sandstone breaks, a setting that corresponds well with evidence from pollen and ethnobotanical studies in this report (McBride and Toll; Holloway). The pollen and ethnobotanical studies suggested that both a piñon-juniper woodland and a shrubby grassland woodland were present during the Early Archaic period. This combination of plant communities suggests that Early Archaic hunter-gatherers focused on a patchy environmental setting that provided fuelwood while depending on seasonal nuts, grass seeds, and shrub fruits.

Figure 331 shows the sites, encompassing landforms, and associated biotic environments that were accessible through daily foraging within 2.5 and 5 km. LA 115598 was not plotted, but it exhibits the strong relationship between location and locale. Eighty percent of the 2.5 km radius and 50–75 percent of the 5 km radius falls within the piedmont environment, including major portions of the primary tributary arroyos and their floodplains. All sites are within 2.5 km of the Santa Fe River floodplain. LA 61315 was more closely linked to the marshy environment that once covered the downtown Santa Fe area (Tigges 1990:75–84).

In terms of locations and their relationship to resource patches within locales, these sites reflect interesting patterns. The westernmost sites—LA 61286, LA 61289, and LA 115598—have 5 km radii that extend into the juniper grass lands to the south-southwest. This location provided access to game such as pronghorn that preferred open environments. However, no evidence of large-mammal exploitation or hunting was recovered from the three components. The large, open, thermal features excavated at LA 61286 and LA 61289 did contain evidence consistent with plant processing, although it was inconclusive. No evidence of food processing was recovered from LA 115598. The lack of large-mammal remains and evidence of grass-seed processing suggests that occupation at LA 61286, LA 61289, and LA 115598 focused on the resources available in the piñon-juniper piedmont locale. Overlapping features were observed at LA 61286, indicating moderate to complete congruence in occupation relative to facilities within the piñon-juniper piedmont locale. The single features found at LA 61289 and LA 115598 may reflect incomplete excavation as much as low congruence in occupation relative to features. The evidence of low-intensity use makes it unlikely that failure to reoccupy these locations was the result of human factors such as site or patch degradation or depletion.

LA 61315, which represented the more eastern and upland portion of the piedmont locale, had a 5 km radius that extended well into the higher foothills of the Sangre de Cristo Mountains and north into the Tesuque Valley. The small hearth may be more consistent with meat roasting and plant processing. Small- and large-mammal bone fragments were recovered, and nonlocal lithic raw materials were present, along with a nearly complete basalt dart point (Post 2000b). The LA 61315 component may have been positioned to exploit game and plant resources, with more focus on hunting than at LA 61286 and LA 61289. Again, only a small portion of LA 61315 was excavated, making an evaluation of occupation and facility congruity tenuous. However, the slightly more diverse aspects of the LA 61315 artifact assemblage and subsistence remains suggest that occupation was positioned to exploit the piedmont locale and, perhaps, the higher-elevation Sangre de Cristo foothills. The lack of evidence of reoccupation or facility reuse suggests low congruence between occupation and facilities for LA 61315, a pattern that may strongly characterize the Early Archaic settlement pattern in the Santa Fe area.

While the differences between LA 61315, LA 61286, LA 115598, and LA 61289 site positioning and structure may relate to exploitation of different resources, it is also possible that the 500-year earlier dates for LA 61315 and LA 115598 indicate a resource distribution that is not present today or was no longer present when LA 61286 and LA 61289 were occupied. Other factors that may strongly influence the settlement pattern are low population levels and short occupations. These factors might negate the need for complete

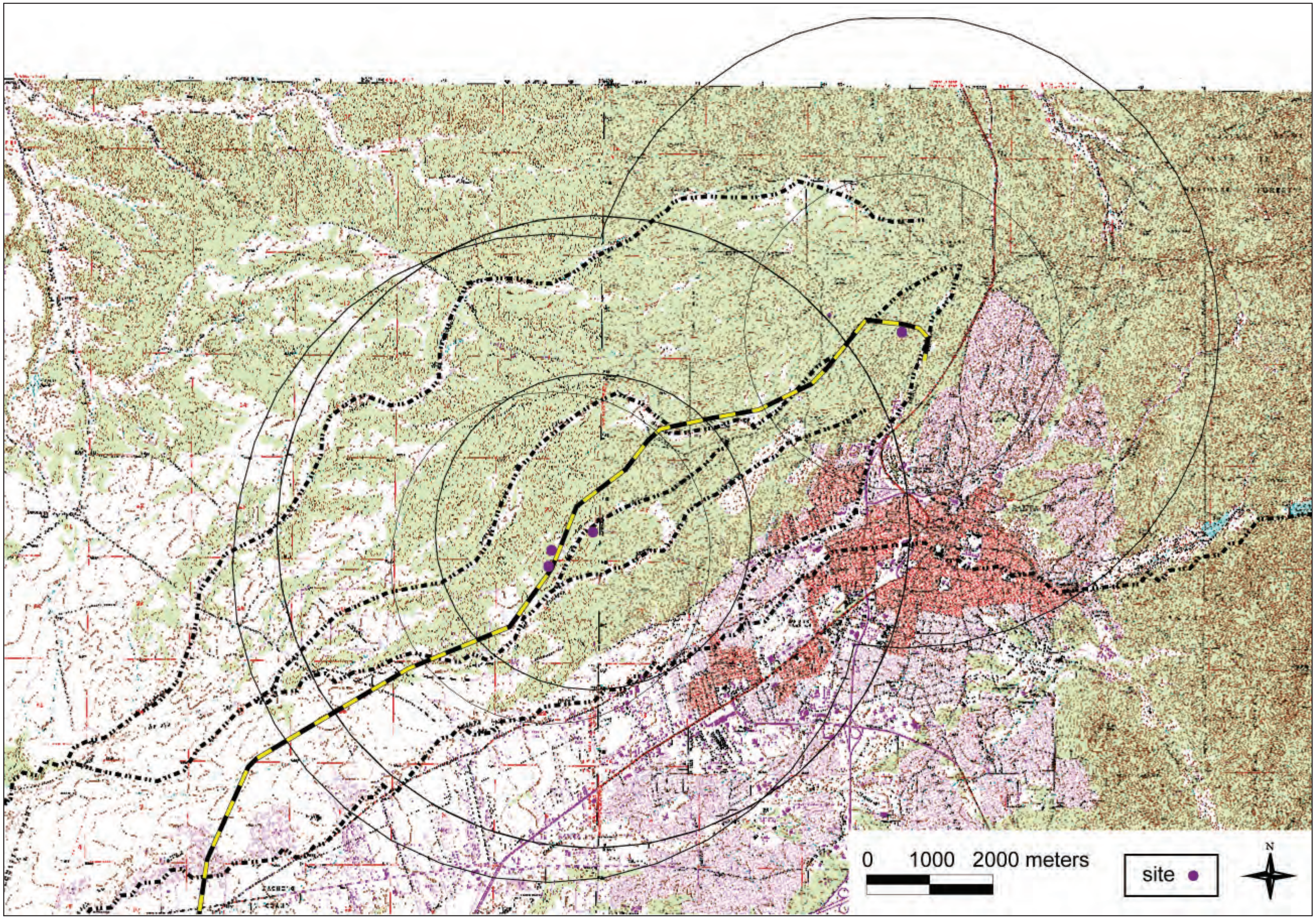


Figure 331. Early Archaic sites with 2.5 and 5 km foraging radii plotted on four 7.5′ USGS topographic maps (Santa Fe, Seton Village, Turquoise Hill, and Agua Fria).

or even moderate congruence of occupation and facility use. Obviously, a four-site sample limits interpretation, but it may be important that within such a small sample, clear or at least intriguing differences exist.

The Early Archaic population in the Santa Fe area can be characterized as highly mobile groups that were organized as small-scale commensal units. This small-scale level of social and economic organization may have characterized part of the seasonal pattern for Early Archaic populations in the Northern Rio Grande. A similar pattern was observed in the OLE project area, near Abiquiu and Coyote, New Mexico (Acklen 1997). This small-scale, low-intensity pattern contrasts with the large-scale hunting camp represented by the Bajada site (Hicks 1982) and its smaller, peripheral Early Archaic hunting sites on the Caja del Rio plateau (Doleman 1996; Snead 1997).

The differences between the Santa Fe Piedmont and Caja del Rio plateau sites suggest two components of a low-intensity, land-extensive, logistically mobile residential and subsistence pattern. This pattern involved movement of small bands along the Rio Grande with camps (habitation or logistical) established in key resource areas, such as at the edge of La Bajada, which provided access to the upper juniper grasslands and the vast grasslands of the Santo Domingo and Galisteo Basins or the Santa Fe Piedmont, which provided access to a more mixed biotic environment within a relatively restricted area (within a radius of less than 20 km). It is difficult to demonstrate but highly probable that the Rio Grande was the central corridor within a north-south/lower-upper elevation mobility pattern (long ago alluded to by Richard Chapman [1979; 1980]). Movement along the Rio Grande followed plant maturation and game migrations. These two primary sources of calories and energy did not necessarily co-occur, but a flexible logistically organized, residentially mobile settlement pattern (Binford 1979, 1980, 1982; Ebert and Kohler 1988) would have accommodated exploitation of both resources by splitting the band into task groups. Undoubtedly, there are residential or habitation base camps from the Early Archaic nearer to the Rio Grande or another perennial water source. When and if they are ever found and studied, these habitation sites may exhibit greater or more complete congruence of facilities and occupation. It is probable that most of these camps are deeply buried or have been washed away by seasonal flooding. The known sites, therefore, may represent parts of the annual hunter-gatherer mobility cycle whereby multiple commensal units, which formed a band or viable social and economic reproductive unit, may have combined and split into gender-based task groups for intensive foraging and hunting, resulting in the spatial segregation of sites and the deposit of cultural materials (Sassaman 1998). This spatial segregation also results in an archaeological record that reflects technological dichotomies of biface and expedient tool production that may help in the study of gender-specific task organization relative to the landscape. Obviously, in this study the small number of sites precludes following this tactic, but it may be productive should a large sample of sites become available for future study.

Mobile bands comprised of multiple commensal groups may have split into their individual commensal units to exploit certain environments or in response to resource distribution and abundance. Breaking into smaller groups would have occurred where patchy environments made it necessary for small groups to focus on spatially segregated locations. These resource patches may have supported a small group for a short amount of time, but they would not have contributed significantly to the fitness of the larger group. Small-scale, limited-scope resource acquisition and consumption would leave sites similar to LA 61315, consisting of a multipurpose hearth and evidence of both faunal and plant resource procurement and consumption. Potentially, these small-scale camps dot a broad generalized environment such as the piedmont slopes of the Sangre de Cristo Mountains. However, without temporally diagnostic artifacts they would be difficult to distinguish from later small-scale camps or the effects of 7,000 years of geomorphological change.

An important lesson to be learned from the Early Archaic sites is that search methods and interpretations must be adjusted to fit the setting relative to geomorphology and potential biotic and geologic resources. Based on the four radiocarbon-dated components in this area, it is clear that temporally diagnostic dart points are poor indicators and cannot be expected to occur with any regularity on the piedmont sites. Studies based on dart points and interpretations of hunting territories may be appropriate in many locations, but they should detract from the potential of other nonlithic indicators of early occupation. In the piedmont, archaeologists must be watchful for limited buried deposits in colluvial settings associated with Tesuque sandstone outcrops. These limited deposits may be the primary source of information on the Early Archaic period occupations.

Middle Archaic Subsistence and Settlement of the Piedmont

The Northwest Santa Fe Relief Route excavations of LA 61286, LA 61289, LA 61290, and LA 67959 are the most extensive and intensive investigation of Middle Archaic components in the Santa Fe area. To date, only two other Middle Archaic sites, LA 86139 (Las Campanas; Post 1996a) and LA 113958 (College Hills; Anschuetz 1998) have been investigated. The number of components increases minimally from the Early Archaic. However, the scale of the occupations is larger, and the site structure is more complex. These Middle Archaic components exhibit an interesting range of variability relative to facility and occupation congruence, as well as multiple types of technological organization within similar geographic and environmental settings. Assemblage and site structure variability suggest the Middle Archaic populations responded to a dynamic resource structure within the piedmont locale.

Occupation continuity is indicated by the presence of Early and Middle Archaic components at LA 61286 and LA 61289. At LA 61289, the Middle Archaic overlies the Early Archaic deposit and is more extensive, but the occupations are stratigraphically distinct. While reuse of the location might suggest moderate to complete congruence between facilities and occupation of this location, the 1,000-year gap between occupations reduces the likelihood that the occupations were by related groups. Furthermore, the Early Archaic feature type (a shallow basin thermal feature) was very different from the predominant Middle Archaic feature type of cobble-lined ovens.

At LA 61286 the Middle Archaic deposit was 50 m upslope from the Early Archaic features. The occupations were separated by more than 1,500 years, suggesting little actual relationship between the Early and Middle Archaic populations. It is unlikely that the Middle Archaic group was influenced in their choice of the location by the presence of an earlier component. Basically, these two locations show no congruence in occupation and facility use. They do, however, show a strong preference for similar topographic and environmental settings, even with the 1,000- to 1,500-year break in occupation.

LA 67959 has evidence of reoccupation and moderate congruence between location and occupation. Thermal features are separated by 8 to 10 cm of deposit, suggesting that the occupations are not far apart in age. The accumulation of artifacts and debris is low, suggesting small-scale foraging or gathering activities by one commensal group. This pattern is more typical of Early Archaic occupations and is atypical of the Middle Archaic patterns observed at LA 61286 and LA 61289.

One of the main assumptions concerning selection and reuse of locations by hunter-gatherers in a semiarid environment is that water availability exerted a strong influence on site location. As shown in Figure 332, all Middle Archaic components are more than 1 km from the only known modern perennial water source. However, except for LA 86139, all camps are within 200 m of a major tributary arroyo. It can be assumed that Arroyo Gallinas and Arroyo de las Trampas carried water during the Middle Archaic period. The fact that LA 61289, LA 61286, LA 67959, and LA 61290 represent sequential and repeated occupations (see Murrell's chapter) from earliest Middle Archaic (3600 to 3300 BC) to latest Middle Archaic (2000 to 1800 BC) strongly suggests that potable water was available regularly throughout the period.

The Middle Archaic locations occur in a middle or lower slope setting in which low ridges provide limited protection. These sites are nestled into protected settings like the Early Archaic components at LA 61286 and LA 61315. The long, gentle colluvial slopes have a 1- to 3-percent gradient, contributing to feature preservation, but also allowing for a more spatially extensive concentration and intermingling of thermal

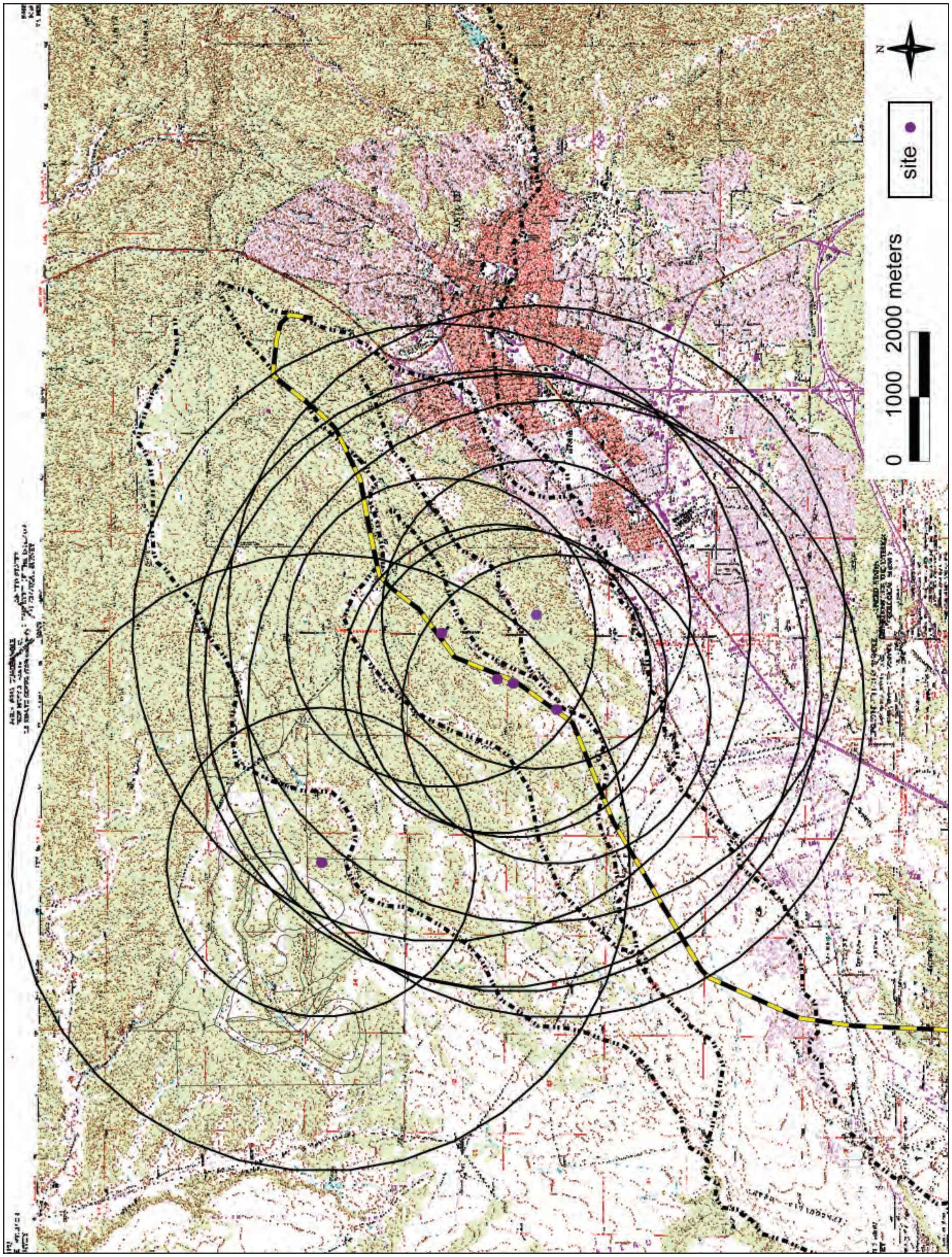


Figure 332. Middle Archaic sites with 2.5 and 5 km foraging radii plotted on four 7.5′ USGS topographic maps (Santa Fe, Seton Village, Turquoise Hill, and Agua Fria).

features, pits, pit-structure foundations, and discard areas. These long, broad, gentle slopes apparently were highly favored by Middle Archaic populations.

Occupation intensity expressed as the number of features exposed within the excavation limits of LA 61286, LA 61289, and LA 61290 ranges from one feature per 6 sq m to one feature per 8 sq m. These averages reflect fairly dense clustering, but not as strongly as the distance between features within components. Without performing a nearest-neighbor analysis, it can be said that feature clustering ranges from tight or close (25 cm apart) to more spread out (1 m apart) to well spaced (at 2.5 to 3 m apart). At LA 61286 four spatially distinct feature distributions represent four to eight multiepisode components. This cumulative spatial pattern is verified by the radiocarbon date clusters, which show three statistically distinct occupations at three-hundred year intervals of 2905 BC, 2675 BC, and 2341 BC.

At LA 61289 three or four occupation episodes may be represented by the linear arrangement of cobble-lined features, the evidence of dismantling features, the reuse of a metate fragment, and the presence of a pit-structure foundation that probably predates the cobble-lined features. This structural evidence of reoccupation is not as strongly supported by the radiocarbon dates as at LA 61286. The radiocarbon dates span 3642 to 2919 BC, but they are from the same statistical population. This suggests multiple occupations within a tighter time frame than at LA 61286. Temporally close occupations are indicated by the similar construction form and technique of the cobble-lined ovens. These features are so alike that they had to be made by the same band or population. The other Middle Archaic locations have similar feature densities, but the features show more morphological and content variability.

At LA 61290 the full extent of the occupations cannot be known because a substantial portion of the buried cultural deposit extended beyond the project corridor. LA 61290 feature variability is less than that of LA 61286, but more than that of LA 61289. Radiocarbon dates form two statistically distinct groups, although all dates fall within a 2500 to 1700 BC span. These dates reflect repeated use of a spatially limited location. The feature distribution, which coincides with artifact clusters, represents at least three spatial components. It is most probable that these represent a sequence of occupations rather than one episode, which is consistent with the radiocarbon date range.

The potential for overlapping occupations is high for 17 possible occupations within a 1,700-year span. However, as shown on the excavation area and site maps, the feature distributions are compelling, and at the least they indicate a regular pattern of site reoccupation.

The feature study (Badner and McBride, this report) showed differences in morphology and construction for the different Middle Archaic components. The earliest component was found at LA 61289, primarily unlined thermal and unburned features in association with a shallow pit-structure foundation. This component may represent a commensal unit occupation that preceded later occupations that were more focused on resource processing. The residential occupation was succeeded by the construction and use of cobble-lined ovens, which may have been used for processing roots, tubers, or fruits, although no conclusive functional evidence was apparent from archaeobotanical and ethnobotanical studies. The co-occurrence of ground stone and a predominantly expedient tool production focus strongly suggests plant processing as a logistically organized activity.

LA 61289 can be contrasted with LA 61286 and LA 61290, where there were no cobble-lined features. LA 61286 and LA 61290 can be contrasted by the difference in the occurrence of fire-cracked rock (Table 190). LA 61286 features had fire-cracked rock in 21 of 34 instances, while 10 of 12 features at LA 61290 lacked fire-cracked rock, as did 20 of 23 features at LA 61289. Fire-cracked rock was used for a variety of purposes in cooking and processing. Therefore, the differences in its occurrence at the sites undoubtedly relates to variability in activities. Analyses of biological

Table 190. Fire-cracked rock distribution, Middle Archaic sites

Site	None	Present	Total
LA 61286	21	13	34
LA 61289	20	3	23
LA 61290	10	2	12
LA 67959	2	1	3
Total	53	19	72

feature contents demonstrated no strong patterning relative to the presence or absence of fire-cracked rock, but the different distribution for the sites certainly suggests different technological organization related to the availability of different foods.

Since LA 61289, LA 61286, LA 61290, and LA 67959 represent a chronological sequence from early to late, the differences in fire-cracked rock occurrence and in feature construction at LA 61289 indicate different environmental conditions for each occupation or combined occupation episodes. These differences suggest that Middle Archaic subsistence strategy and technological organization changed through time, even though similar landscape settings were consistently chosen for occupation. This is consistent with a model of changing site functions within an annual or lifetime territory, where residential base camps may be reused as logistical sites or task-specific processing sites within a foraging territory (Binford 1982; Hudspeth 1997; Sassaman 1998).

Overall, Middle Archaic stone tool assemblages reflect the use of local raw material to produce flakes for immediate or opportunistic use. Variation in this pattern is subtle: only one distinct exception was encountered. Typically, the Middle Archaic components reflect a low or limited reliance on formal or curated tools or the use of nonlocal material in tool manufacture. This heavy reliance on local materials suggests that they were sufficient to produce tools needed on a daily basis. A focus on core reduction and expedient tools is consistent with daily foraging and plant gathering and processing. Relatively low frequencies of tools at all sites suggests they were not regularly depleted or that tasks rarely left visible evidence of wear. Flake edges may have been used for cutting or scraping, but they were largely unmodified. Processed materials were not abrasive or hard enough to damage the flake edge. This is consistent with plant or fiber processing. The low number of whole or fragmentary grinding tools is unexpected given the high number of thermal features that seem to reflect plant processing more than meat roasting, although direct evidence of either is limited.

Debris from lithic production that corresponds with hunting or gearing up for long-distance hunting forays is nonexistent, except at LA 61286, where there was a spatially discrete cluster of obsidian core reduction and biface reduction flakes and bifaces or dart points broken in manufacture. The obsidian is primarily from the Cerro Toledo rhyolite flows in Valle Caldera, suggesting that reduction occurred as one episode. Single-episode or concentrated discard of obsidian has been observed at other sites from later periods (Post 1998; Post 2004). Obsidian tools were not more common than local material tools at LA 61286, suggesting that the obsidian tools were curated and supported logistical hunting. This biface reduction concentration was from one episode at LA 61286, while the other sites had low numbers of biface production flakes or tools. We can conclude that hunting was supported at these sites, but at a minimal level. The lack of formal tool production or evidence of gearing up may reflect the abundant raw material that was available en route to or within prime hunting territories in the Sangre de Cristo and Jemez Mountains.

Middle Archaic occupation focused on gentle colluvial slopes near the major tributary arroyos of the Santa Fe River. Foraging radii as expressed in 2.5 km and 5 km ranges show a strong preference for the piñon-juniper piedmont (Fig. 332). The 2.5 km radius of the Northwest Santa Fe Relief Route and Las Campanas sites are 80 percent or more in the piedmont, and the NWSFRR site radii extend into the floodplain of the Santa Fe River. The 5 km radii extend into juniper grasslands and the major tributary arroyo floodplains. Since these sites are situated in roughly identical and clustered environmental zones with access to the same range of potential biotic and geological resources, it is not surprising that there are similarities. The unexpected feature variability seems to indicate that certain critical resources strongly conditioned site location, while the character of the surrounding biotic environment or locale changed over the 1,500- or 1,600-year span.

Occupations from 3400 to 1700 BC spanned the end of the Altithermal and the beginning of the Medithermal. The Altithermal was characterized by a drier climate that resulted in the expansion of grasslands at the expense of forests. The Medithermal, which was climatically similar to modern times, may have seen an expansion of the woodland in the upper elevations with a retraction of grassland environments to lower elevations. Since the Middle Archaic sites are within a 5 km foraging radius that varies from 6,400 to 7,200 ft in elevation, it is likely that both grassland and woodland plant communities were exploited. Apparently neither community was rich in large game, but the plant community may have been seasonally diverse, and depending on temperature and precipitation, sometimes rich and abundant.

Hudspeth (1997) suggested that in the OLE project area, the piñon-juniper woodlands may have been the most suitable environments for daily foraging and the collection of low-yield relative to effort-expended plant resources. He surmised that for all Archaic periods, the lower-elevation plant communities supported the densest distribution of residential and special-purpose sites (Hudspeth 1977:178). Residential sites should reflect "men's and women's activities." Women's activities included plant gathering and processing and small-game hunting, resulting in accumulations of expedient tools, groundstone, structures, and processing and cooking facilities. Hunting (a male-dominated activity) and special-activity sites should also occur in abundance, but they will reflect small-scale occupations and may not be archaeologically visible or distinguishable from later special-activity sites. Occupations in the piñon-juniper habitat would occur during fall, summer, and winter (Hudspeth 1997:178). Naturally, the occupation duration depended on the abundance and nutritional balance of available resources. However, residential movement within a piñon-juniper woodland zone might provide access to a wide range of resources with the potential for carrying a population through the cold months into the spring.

There are obvious parallels between the Santa Fe Piedmont locale and the OLE project area, except for immediate proximity to prime montane hunting grounds in the Santa Fe Piedmont. The Santa Fe Middle Archaic sites are in what may have been an intermittently prime foraging territory. That this environment changed through time and was different from today is very likely. However, over the course of 1,600 years, different settlement and subsistence strategies resulted in the clustered archaeological record observed at the Northwest Santa Fe Relief Route and College Hills sites. It is very interesting that the Middle Archaic components are clustered within a 2.1 km diameter, where Arroyo Gallinas and Arroyo de las Trampas meet. Four sites—LA 61286, LA 61289, LA 61290, and LA 113958—have small enclosed shelters that were surrounded and overlain by later thermal features and occupation debris. It is as if moderate congruence in occupation and facilities grew from a seasonal residential occupation with a limited focus on plant gathering and processing into a highly clustered, moderate to complete congruence between the occupation and facilities. Unlike the spatial association between the Early and Middle Archaic components, there is a continuity that suggests a formal settlement pattern of which the piedmont locale was an important seasonal component. It is difficult to argue in favor of complete congruence in occupation and facilities because intensive reoccupation has obscured differences that would separate facility reuse from sequential occupation. Moderate to complete congruence is certainly feasible for the cobble-lined oven component of LA 61289. This is further supported by the lack of variability in the lithic technological organization across the component. It is also strongly supported by the likelihood that the cobble-lined ovens were visible and accessible to each successive group. The repeated occupations at LA 61289 may have been of shorter duration and targeted a narrower range of resources than is reflected in the feature and assemblage variability at LA 61286, LA 61290, and LA 113958. These three sites have a broader range of facilities and artifacts, potentially reflecting a more generalized use of the piedmont locale. This level of moderate congruence in occupation and facilities is more the norm for the Middle Archaic, and the more complete congruence suggested by the later Middle Archaic component at LA 61289 is unusual.

In terms of the settlement model of the Early Archaic period, there seems to be continuity in the size of highly mobile bands or groups, with some variation in composition. However, rather than lightly or briefly occupying the piedmont locale, the occupations are more intensive and extensive. These occupations include residential and potentially some special-activity or task group-related activity sites or components. Investment in a range of thermal and processing features and the construction of small shelters indicate that one or more commensal units regularly occupied and exploited the piedmont locale. Except for the concentration of obsidian reduction debris at LA 61286 and the small amount of obsidian recovered from LA 113958, the focus is on locally available resources, primarily those available within 2.5 to 5 km of the camps or locations.

Late Archaic Expansion in the Piedmont and Grassland Locales

The Late Archaic period in the Santa Fe area was better known than the Early and Middle Archaic periods thanks to the excavations in the Tierra Contenta area (Schmader 1994a; Dilley et al. 1998), the Northwest Santa Fe Relief Route Phase One excavations at the intersection of Airport Road and NM 599 (Post 2004), the North Ridgetop Road excavation north of NM 599 (Lakatos et al. 2001), and the Las Campanas excavations (Lang 1997; Post 1996a). The importance of the Northwest Santa Fe Relief Route Phase Two excavations is that they bridge the geographic gap between the low-elevation juniper grasslands to the upper elevations of the piñon-juniper piedmont.

In the Northwest Santa Fe Relief Route excavations, three sites—LA 61286, LA 61290, and LA 61293—had components dated by radiocarbon assays or projectile point data to the Late Archaic period. The radiocarbon-dated components span the full range from 1700 BC to AD 1. The latest date from a thermal-feature cluster at LA 61286, Area 2, overlaps the Latest Archaic, emphasizing the potentially arbitrary nature of these beginning and ending dates. The same can be said for the earliest end of the date range, which overlaps with the terminal Middle Archaic occupation dates for LA 61290 and LA 67959.

All three sites have occupations that reflect repeated use of the same location with varying degrees of congruence between the occupation and facilities. The most intensive occupation was at LA 61293, where a shallow, informal pit-structure foundation with two intramural and overlapping floor hearths was associated with a series of extramural fire-cracked rock filled roasting pits and small thermal features. From feature evidence, foraging and plant processing were the primary activities, but debris from subsequent occupations may have masked more subtle evidence of hunting-related tool production and debris. Fire-cracked rock in thermal features occurs at the later Late Archaic sites, indicating some temporal continuity in technology and potentially foraging focus and strategies with Middle Archaic thermal processing at LA 61286. The LA 61293 residential base camp exhibits moderate to complete congruence between facilities and occupation. This is emphasized by temporally close occupations, indicated by the overlapping floor hearths. Reoccupation over a short span also fits well with the accumulation of fire-cracked rock associated with thermal features. These accumulations of raw material combined with feature and activity area maintenance suggest anticipated return or planned future use.

The LA 61293 occupation compares favorably with the other residential occupations in the piedmont and juniper grassland locales. The Tierra Contenta sites are primarily residential occupations that occurred between 1930 and 830 BC. The tightest cluster of dates indicates occupations during the ninth and tenth centuries BC (Schmader 1994a:92). A mixed subsistence regime is indicated by a variety of wild economic plant species and manos and metates within and associated with structures. Like LA 61293, Tierra Contenta thermal features consistently contained fire-cracked rock. Also dating to this period or slightly earlier than the Tierra Contenta sites was the main component at LA 61282, the Airport Road site (Post 2004). No pit structure was identified, although two large irregularly shaped areas may have been structures. However, 20 thermal and pit features were accompanied by the most direct evidence of meat procurement, processing, and consumption and tool production and maintenance found at any Late Archaic site in the area. LA 61282 varies from all the other sites in this intense focus on hunting.

These lower-elevation sites exhibit different site structure and occupation patterns from those of LA 61293. The Tierra Contenta sites show moderate congruence in facilities and occupation with a strong tendency to reoccupy the same location but not reuse the same structures or facilities. Schmader (1994a) suggested that structure clusters could represent small-scale aggregation of commensal units or a microband. Figure 333 shows the 2.5 and 5 km radii for these sites and LA 61293. The Airport Road site exhibits complete and moderate congruence of facilities and occupation with overlapping thermal

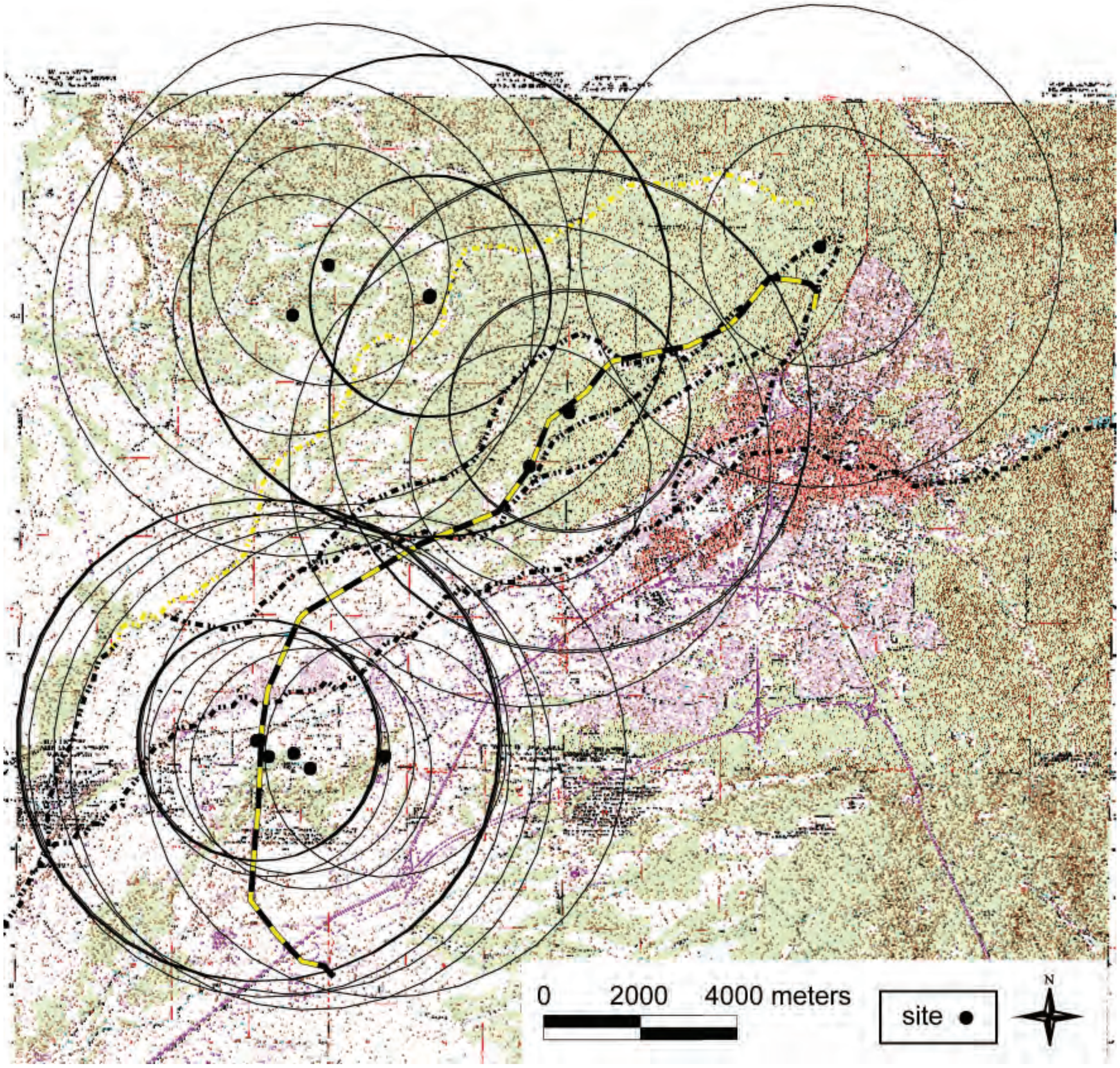


Figure 333. Late Archaic sites with 2.5 and 5 km foraging radii plotted on two 15′ USGS topographic maps.

features, accumulation of midden deposits, and a very tight feature distribution, indicating that this location was favored for occupation.

The Tierra Contenta and Airport Road sites focus on the juniper grasslands and lower reaches of the major Santa Fe River tributaries. With more access to grass seeds and shrub fruits, as well as to broad riparian environments, it seems that these sites are positioned for spring and summer occupations. Abundant antelope remains from LA 61282 indicate that it may not have been a spring or summer encampment, but it may have included a fall component.

Well into the upper elevations of the piedmont overlooking Cañada Rincón was LA 127578 (Lakatos et al. 2001). Remarkable about this site was that it yielded a large, shallow, burned remnant of a pit-structure foundation with five intramural thermal features and one possible storage pit as well as perimeter postholes. The abundant chipped stone focused on local chert used in core reduction with some biface manufacture. One-hand manos and a metate were in the fill above and on the floor of the structure. The structure was partly filled with chipped stone debris and fire-cracked rock and was burned. This seems like unusual behavior in a site dating to cal. 1505–815 BC, two-sigma range. There was an associated activity area 3 m south of the structure and a fire-cracked rock midden south of tThe activity area. This formalized site structure pattern is consistent with a planned, long-lasting occupation with anticipated reoccupation (Kent 1999). This site and the Tierra Contenta structures are evidence that populations planned to stay in or near the piñon-juniper woodlands for an extended time. Prolonged late fall occupation of the piñon-juniper woodlands is seen as a possible precursor of or preexisting condition for the introduction of maize (Wills and Huckell 1994).

Components at LA 61286 and LA 61290 were smaller in scale. The LA 61286 component consisted of single and clustered thermal features with low-frequency expedient core-reduction artifact assemblages. The LA 61290 component lacked thermal features but had higher proportions of nonlocal obsidian and biface flakes in association with a corner-notched projectile point. Both components reflect task-group exploitation of the piedmont. These sites were resource-acquisition and -processing locations from which resources were transported to residential sites within 5 to 10 km. The moderate clustering of the features at LA 61286 suggests moderate congruence between locale and occupation. While not unexpected, it is unusual to find Late Archaic special-activity sites with obvious evidence of reoccupation.

Between the Northwest Santa Fe Relief Route special-activity and residential sites are the Late Archaic sites in the Las Campanas area. LA 84787 and LA 86148 were lithic artifact concentrations with associated dart points and grinding implements. LA 84787 had four spatial components and one multicomponent artifact and feature concentration. LA 86148 had two or three artifact distributions separated into separate but temporally close occupation components. Both sites have strong residential patterns but lack identified structures. Both have moderate to complete congruence between locale and occupation. Adjacent to and above major tributary confluences, they were favored seasonal camps that reflect logistical organization and commensal group residential mobility.

Late Archaic occupation of the Santa Fe River piñon-juniper piedmont was more extensive and elaborate than that of the preceding period. Late Archaic components reflect a full range of subsistence and settlement organization. Residential sites from which logistical and extraction activities were staged were present along the major tributaries of the Santa Fe River. More mobile and less structured residential sites reflect a different seasonal occupation of the area with less focus on residential stability and more emphasis on the staging of logistical activities within a larger territory. Finally, the small-scale sites reflect task-group acquisition and processing of resources. Combined, the sites reflect seasonal and dynamic use of a larger territory over 1,700 years.

The Latest Archaic in the Piedmont

Two major components within the project area were assigned to the Latest Archaic period. LA 61286 and LA 61293 had single pit-structure foundations associated with extramural thermal features, and concentrations of core reduction and stone tool manufacture debris. LA 61286 and LA 61293 Latest Archaic components exhibited formal site structure patterning similar to Late Archaic base camps or residential sites in the project area and other sites within the piñon-juniper piedmont. They were on gentle southwest-facing slopes above major tributary arroyos but below ridge tops, providing shelter and solar gain; and show evidence of reoccupation and reuse of structures and facilities exhibiting complete congruence between location and occupation pattern. The site structure reflects longer-lasting occupations, greater attention to the placement of features, and accumulations of refuse. LA 61286 and LA 61293 also were occupied during the Late Archaic period, suggesting continuity in land use spanning 300 to 500 years. The tendency toward congruence between location and occupation may represent mobility within annual or lifetime territories of a hunter-gatherer band consisting of multiple commensal units.

Adding the Latest Archaic site data from previous projects in the piñon-juniper piedmont and juniper grasslands reinforces the settlement and subsistence patterns observed at LA 61286 and LA 61293. Four sites—LA 54744, LA 54752, LA 61315, and LA 108286—had one pit-structure foundation, and LA 65297 had two pit-structure foundations that yielded radiocarbon dates between AD 1 and 900. A sixth site, LA 84758, was not radiocarbon-dated, but the projectile point styles and site structure are consistent with the Latest Archaic period pattern (Post 1996a). At the radiocarbon-dated sites, there is an interesting temporal distribution within the 900-year occupation. Three sites—LA 61315 (Post 2000b), LA 65297, and LA 108286 (Kennedy 1998—dated to AD 1 to 400. None of the sites dated from AD 400 to 800 in the Santa Fe area, which coincidentally corresponds with the date that pit-structure dwelling agriculturalists moved into the Peña Blanca/Cochiti area at the foot of La Bajada near the confluence of the Santa Fe River and the Rio Grande (Akins et al. 2003; Post 2002). The two other Latest Archaic period sites, LA 57544 and LA 57549, dated between AD 800 and 1000 (Schmader 1994a). The early sites were in the upper-elevation piñon-juniper piedmont. The later sites were in the lower-elevation juniper-grassland transition. LA 84758 was 7 km north of the Santa Fe River valley in the Las Campanas area. Seasonal occupation of the piñon-juniper locale is suggested by the combination of well-defined structures; remodeled structure interior, construction, use, and maintenance of features and extramural space; and midden formation. The site structure patterns are consistent with residential stability, anticipated return, and logistical mobility (Dello-Russo 2003; Kent 1991). All sites have tool assemblages indicative of mixed subsistence activities, although artifact frequency varies. The subsistence strategies apparently combined foraging within the locale and logistical exploitation of long-distance and high-altitude game herds. For much of the Southwest, this Latest Archaic settlement and subsistence pattern was the precursor to and often accompanied by small-scale use and cultivation of cultigens. However, not one maize cupule or cob fragment was recovered from any of the seven sites.

Figure 334 shows the Latest Archaic period site distribution. Residential sites are evenly spaced across the piñon-juniper piedmont. Their 5 km foraging radii allow for intensive daily acquisition of resources within the piedmont. The low number of artifacts that reflect logistically organized activities coincides with a central location in the piedmont. Exploitation of montane and grassland resources and animal herds should have resulted in logistical staging sites in those areas. Archaeological evidence of such sites has not been conclusively identified. A small site in the Las Campanas area, LA 84775, may have been a hunting camp. However, the artifact frequency was very low, suggesting hunting and processing in the immediate area, rather than gearing up for longer-distance hunting.

The later sites are of particular interest because they are contemporaneous with the movement of semisedentary agricultural populations up the Rio Grande between AD 600 and 900. Essentially, there is a 1,600-year gap between the introduction of maize and the first agriculturally focused settlement of the Northern Rio Grande in the late ninth century AD, with a 200- to 300-year overlap between agricultural and hunter-gatherer adaptations between AD 600 and 900. On the Colorado Plateau and along the Middle Rio Grande, this period spans the Basketmaker III to Pueblo I transition.

In the Northern Rio Grande, the Archaic settlement and subsistence pattern with only the slightest incorporation of cultigens persisted as late as AD 900; Chama Alcove (Vierra 1998)

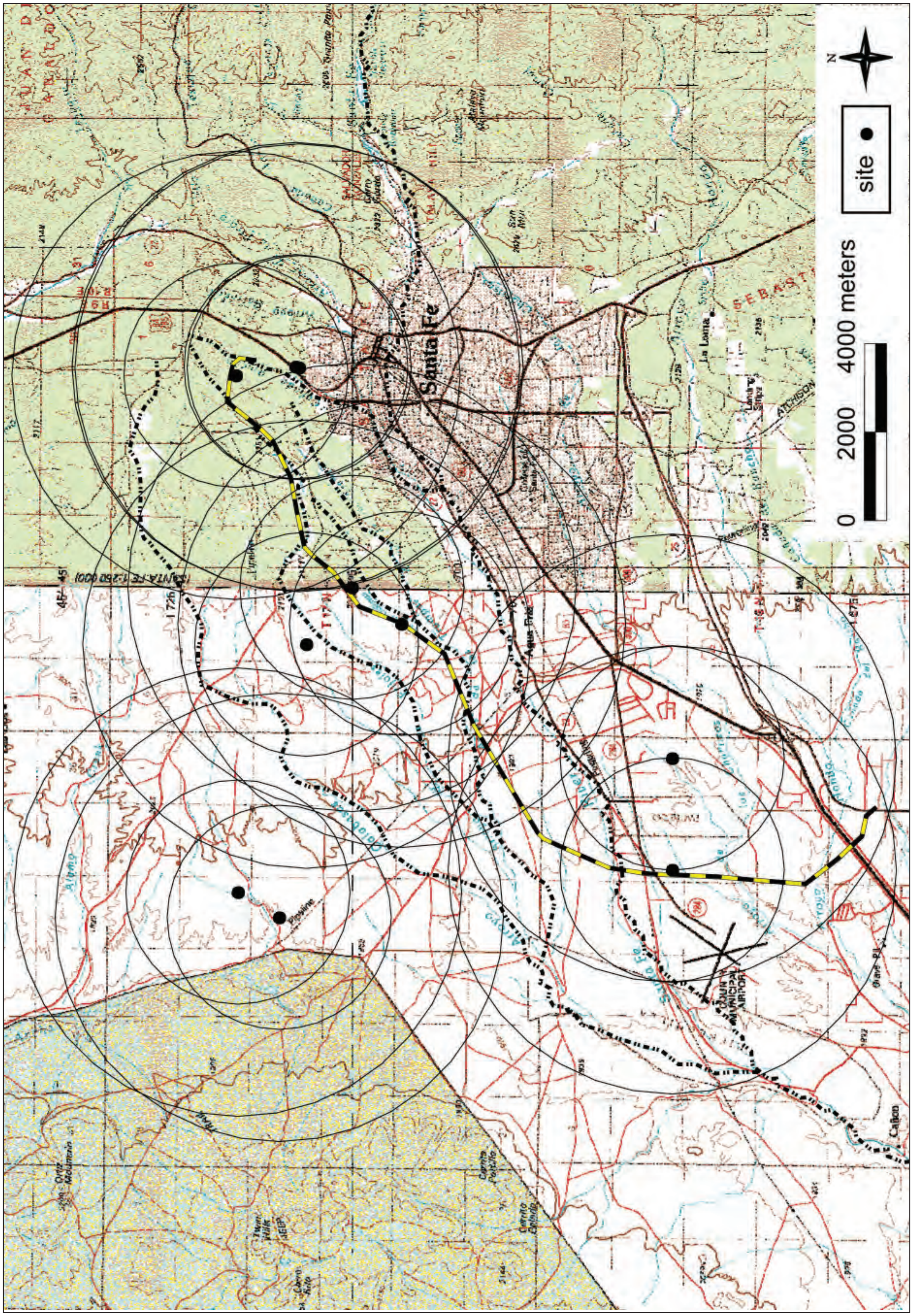


Figure 334. Latest Archaic sites with 2.5 and 5 km foraging radii plotted on two 15' USGS topographic maps.

and a site at the Nambe Reservoir (Skinner et al. 1980) are the exceptions. Prior to the 1980s, the Early Developmental period north of La Bajada (Wendorf and Reed 1955) was portrayed as unoccupied or lacking significant or important populations. This observation was based on the absence of Early or Middle Developmental period pottery types and site architectural traits and patterns that could be correlated with contemporary occupations on the Colorado Plateau. However, excavations in the Rio Chama area identified sites with numerous Trujillo-style and Basketmaker III projectile points, indicating that hunting groups continued to exploit the resources of the area (Lord et al. 1987; Acklen 1997; Turnbow 1997). Dating trends suggested by the projectile point styles were supported by obsidian hydration dates from the Abiquiu Reservoir (Lord et al. 1987; Schelberg 1992). While not completely reliable, the overall temporal distribution of the obsidian hydration dates demonstrated a nearly continuous occupation sequence from AD 200 to 900. Lord (1987:10–36) suggests that the Piedra Lumbre Archaic residents were following a trajectory towards sedentism and agriculture until the Basketmaker III period, when the pattern reverted to a Middle Archaic style of settlement and subsistence. He suggests hunter-gatherers coexisted with Ancestral Pueblo settlers (a condition suggested in Vierra 1994b and Hogan 1994 for the San Juan Basin). This is a likely scenario for the Northern Rio Grande, as well.

Comparisons between Santa Fe area Latest Archaic components and what were termed Earliest Developmental components in the Peña Blanca area provide interesting insight into the transition from a persistent hunter-gatherer adaptation to an Early Formative, agriculturally based adaptation. Before AD 400, the Peña Blanca area was occupied by Latest Archaic seasonal foragers, who left camps containing expedient core-reduction debris, fire-cracked rock concentrations, and thermal features, but no evidence of structures, storage, or maize consumption (Chapman 1980). Excavations near Peña Blanca identified an Earliest Developmental component based on archaeomagnetic dates from AD 435 to 665. These transitional components consisted of 20 features, including a probable house pit foundation and four large, fire-hardened storage and roasting pits with volumes of roughly 1 cu m associated with low numbers of core-reduction debris and ground stone. Some large pits had small subfloor thermal features, indicating multiple uses as temporary shelters and storage/processing features. Evidence of reuse and reoccupation suggests that the Peña Blanca area was favored for seasonal occupations supported by wild-plant gathering and early farming.

When compared, the Peña Blanca Earliest Developmental and Santa Fe Latest Archaic sites exhibit differences in site structure and technological organization. The Santa Fe Latest Archaic site structure emphasized single structures that were often reused, intramural storage, a limited array of extramural processing features, and midden formation. This site structure reflects a longer-duration, broad-based, seasonal subsistence and residential pattern in which locations and facilities were reused within a short time. Large processing/storage features are not present. The small intramural storage pits have volumes of 0.14 to 0.20 cu m. They seem small, but surprisingly, their 125 to 150 kg wild-seed capacity could have provided 25 percent of caloric needs for ten people for six weeks. The Earliest Developmental storage/processing features have almost five times the capacity. They occur with a similar small-scale occupations that may have been shorter and less residentially focused than the Santa Fe Latest Archaic sites. The scale of the Earliest Developmental storage pits seems inconsistent with the associated occupation pattern, since their capacity could have supported a longer occupation. In effect, the Santa Fe sites are in suitable settings for dry farming, yet not one cupule of maize was recovered from hundreds of liters of flotation samples. The Peña Blanca Earliest Developmental component lacks well-defined site structure, reflecting shorter seasonal occupations with maize consumption and storage for a much larger group.

Between AD 650 and 750, there was a fundamental change in the structure and assemblages of the Peña Blanca sites. Shallow, roughly circular or irregularly outlined house pit foundations with intramural features were associated with plain ware pottery and San Marcial–like decorated pottery (Akins et al. 2003). Subsistence is more generalized than in the

Earliest Developmental component, but pollen and macrobotanical analysis indicate continued reliance on wild plants. These house pits were spatially associated with moderate to large, deep, circular pit structures. However, the house pits were one-third to one-fifth the size of the later, deeper structures. One possible interpretation is that these structure types were contemporaneous, and deep pit structures were cold-weather houses, while the shallower structures were for warm-weather cooking or processing.

Similarity between shallow Peña Blanca and Santa Fe Latest Archaic house pits is compelling. Seven Santa Fe area Latest Archaic structures have floor space of 2.36 to 9.42 sq m with two to eight intramural thermal and storage features. The Peña Blanca house pits had floor space of 3.43 to 4.02 sq m with three to ten intramural thermal or storage features with volumes of less than 0.5 cu m. Structure size may be a poor indicator of relatedness, but it does suggest occupation by seasonal task groups in both areas. Clearly, seasonal occupation of the Santa Fe River Basin and Peña Blanca area occurred on a small scale until the late eighth century. Rather than co-occurring with the deep pit structures at Peña Blanca, the shallow house pits may represent the transition from informal structures associated with thermal/storage pits to the large, deep pit structures that accompany increased sedentism after AD 700. This architectural pattern may have developed out of a residentially mobile Latest Archaic settlement pattern typified by the Santa Fe Latest Archaic sites.

A technological link between the Peña Blanca and Santa Fe River populations may be found in the projectile points. Dimensional analysis of whole, notched projectile points from Peña Blanca suggests that 5 of 39 points from Early Developmental contexts could be dart points. Since dart points and shallow structures were not directly associated, the dart points minimally indicate that atlatl technology persisted into the ninth and tenth centuries. A low number of projectile points is common to all Santa Fe Latest Archaic sites. Hafted biface fragments from Northwest Santa Fe Relief Route sites were fragmentary, but a subjective assessment suggests that they were dart points. LA 84758, in the Las Campanas area, yielded three corner-notched projectile points that fall firmly into the arrow class (Post 1996a). This Trujillo-style arrow point type persisted into the AD 1100s in the Santa Fe area (McNutt 1959). Obviously, inferred projectile point function does not inform directly on the relationships between Peña Blanca and Santa Fe River site residents, but the three arrow points from the AD 500 to 800 Santa Fe River site demonstrate that bow-and-arrow users lived above La Bajada during the Peña Blanca Early Developmental occupation.

Pottery was introduced in the Peña Blanca area after AD 700. Assemblages were locally made plain utility ware with San Marcial and a variety of Mogollon red and brown wares (Akins et al. 2003). Similar assemblages occur south to Isleta, representing an extensive technological link along the Rio Grande with pockets to the east and west. Persistence and stability in the ceramic traditions south of La Bajada do not extend to the north. With an estimated 8.5 percent or 78 sq m of northern Santa Fe County inventoried, there are only fifteen possible Early Developmental period sites. Seven have ceramics, and two of those may postdate AD 900. If Peña Blancans hunted and gathered above La Bajada and occupied sites in the Santa Fe area, they did not bring their pottery, but perhaps opted for more flexible and maintainable hide bags and baskets.

Evidence of mobility in the Peña Blanca populations comes from the AD 750 to 900 span (Akins et al. 2003). Human skeletal remains of 20 individuals include 9 children, 1 adolescent, 8 females, and 2 males. A high proportion of women and children is unusual and suggests a flexible residential pattern in which males were absent for long periods. Mobility and robusticity indices for females yielded surprising results. Peña Blanca females femurs were more oval, suggesting high mobility, and more robust, suggesting hard physical activity. These measures were higher than is typically found in females and many males from later, more sedentary and agriculturally reliant populations in the same general area. This physical trait does not result from daily foraging and village activities but is a consequence of regular long-distance travel, such as the annual, seasonal movement between residences or within a large hunting and gathering territory. Early Developmental Peña Blanca people farmed, but their smaller humerus midshaft diameters suggest that they spent less time grinding maize than Late Developmental and Coalition populations. So while some mobility is suggested for all Ancestral Pueblo populations, the Early Developmental Peña Blanca sample suggests increased sedentism was delayed until after AD 900, even though maize was well integrated into annual subsistence.

Between AD 400 and 900, there was an important transition and continuity in the settlement and subsistence pattern as the Northern Rio Grande became more suited to agriculture, and hunter-gatherers may have been forced to accommodate newcomers from the south. Latest Archaic occupants in the Santa Fe area may have continued a seasonal occupation pattern into the early 900s, after agricultural populations had moved into the Peña Blanca area. By AD 750, Peña Blanca residents practiced a mixed subsistence pattern of sedentary farming and highly mobile hunting and gathering. In the Santa Fe area, the absence of pottery makes it difficult to link occupations with the Peña Blanca area. The eventual coalescence of the farming and hunter-gatherer populations established the foundation for cultural developments in the Late Developmental and Coalition periods.

Ancestral Pueblo Foragers on the Piedmont

The majority of the dated components in the Northwest Santa Fe Relief Route project were from the Ancestral Pueblo period (AD 1000 to 1600). Of the 35 temporal components defined for the Phase 2 data recovery effort, 8 dated to the Ancestral Pueblo period. These components were selected for data recovery because they had features and artifact scatters or concentrations with pottery. The typical Ancestral Pueblo components identified during the testing phase, but not included in data recovery efforts, consisted of sherd and lithic scatters, some of which had deflated features. In addition to the Phase 2 Ancestral Pueblo components, the Phase 1, Airport Road site excavation at LA 61282 examined a Coalition and Classic period limited-activity site that was probably related to subsistence activities staged from the Cieneguilla, Pindi, and Agua Fria Schoolhouse sites (Post 2004). The Phase 3 excavations encountered two Ancestral Pueblo period components. The LA 61321 excavation examined a large fire-cracked rock and cobble concentration that was associated with Coalition period pottery types. The unusual size of the feature suggested accumulation from multiple-use episodes and use by a foraging task group rather than individual foragers. The LA 61315 excavation exposed part of a large multiuse thermal pit feature associated with Coalition period pottery types (Post 2000b). In all, eleven Ancestral Pueblo components were investigated during the three excavation phases of the Northwest Santa Fe Relief Route project.

The Ancestral Pueblo components from the Phase 3 data recovery have been described in the preceding site description and analysis sections of this report. The following discussion integrates all of the Northwest Santa Fe Relief Route Ancestral Pueblo data with excavation data from the Las Campanas de Santa Fe project. The Las Campanas project was in the piedmont to the north and west of the Northwest Santa Fe Relief Route. Combined, these projects provide site structure and assemblage structure distribution data for 93 Ancestral Pueblo period components. During both projects, any site or discrete spatial component within a site that yielded pottery was assigned to the Ancestral Pueblo period. Multicomponent sites or sites with pottery types from more than one period were not easily separated into single components. Therefore, temporal components of the Northwest Santa Fe Relief Route and Las Campanas de Santa Fe excavations by Southwest Archaeological Consultants (Lang 1997) were combined, providing a synchronic perspective on technological organization, subsistence strategies, and land use. A primary advantage of using data from these areas is the ability to apply a distance or zonation approach in examining Ancestral Puebloan foraging patterns.

From a site function perspective, Ancestral Pueblo period sites have typically been divided into five or six functional categories based on artifact assemblages, the presence or absence of features and their morphology, and the presence or absence of architecture and its size and construction. These site types include habitation, fieldhouse, gathering site, hunting site, religious site, and other. There is much internal variability within these classes that is conditioned by group size, occupation length, and occupation history.

There is also a potential for considerable overlap between similar classes, such as habitation and fieldhouse or fieldhouse and gathering site. Distinguishing between site types may be further complicated by their reuse for different functions. Fieldhouses may be reused as gathering camps, and vice versa. Internal class variability, overlapping characteristics, and potential reuse underscore the obvious complexity of Puebloan subsistence and settlement strategies and resulting archaeological patterns.

No Pueblo period habitation sites were recorded in the Northwest Santa Fe Relief Route and Las Campanas project areas, which has led to the assumption that most of the Pueblo period subsistence activities and land use took place daily or overnight. In the Las Campanas studies (Post 1996a, 1996b; Lang 1997), there was a small possibility that some of the sherd and lithic artifact scatters could have been associated with farming. However, the overwhelming evidence was that the sites comprised a robust remnant of an Ancestral Pueblo foraging landscape formed by the completion of activities focused on the extraction, processing, and transportation of a wide range of biotic and geological resources.

Foraging may have been secondary to agricultural production, but it was necessary to provide raw materials for the production of household goods and supplemental wild foods (Wetterstrom 1986). As an adjunct to farming, foraging occurred when agricultural activities were at an ebb or in transition (Sebastian 1983; Wetterstrom 1986). Depending on the season and the targeted resource, foraging would have been by small groups or individuals when farming requirements were low, because foraging strategies probably combined multiple tasks into a daily round or trip. The necessary tools may have been part of a personal toolkit that was produced and discarded at the residence and expedient or opportunistic tools that were produced from immediately available raw materials and discarded in the field after they were used (Binford 1982). Pottery vessels may have been cached in the field for repeated use. Partial vessels may have been included as part of personal gear, and discarded chipped stone tools and debris and pottery may have been recycled in the field (Camilli and Ebert 1992). The archaeological record of such an Ancestral Pueblo subsistence pattern would consist of many locations concentrated near the most productive resource areas in which gathering and processing resulted in a concentration of artifacts or features and gathering resulted in low-density artifact scatters and isolated occurrences. Since lithic raw materials were available along Arroyo Calabasas, Arroyo de los Frijoles, Arroyo Gallinas, and Arroyo de las Trampas, material procurement, core reduction, and tool production would have been closely linked. Lightly used expedient tools would be difficult to segregate from unutilized lithic reduction debris. Formal tools would rarely be present, and the use of nonlocal materials would be almost nonexistent since suitable material was available.

Cultural-historical and settlement studies indicate that the most intensive residential occupation of the Santa Fe River occurred between AD 1200 and 1400, with smaller-scale occupations before and after this temporal range. These sites along the Santa Fe River and its southern tributaries form three site clusters. North of the Santa Fe River, the Northwest Santa Fe Relief Route and Las Campanas sites represent material remains of a diurnal foraging strategy and extensive land-use pattern that incorporated a large portion of the piñon-juniper piedmont that is contemporaneous with the residential site clusters.

The foraging sites can be divided into two spatial groups that correspond to the Northwest Santa Fe Relief Route and Las Campanas project areas. The null hypothesis regarding diurnal foraging and extensive land use is that sites have similar artifact and feature distributions and associations regardless of their distance from the village sites. This view maintains that natural factors that might have conditioned site location and the activities carried out at sites were constant across the piedmont area. Differences in feature and artifact frequencies would be proportional to the intensity or repetition of occupation and use. One null hypothesis holds that there are observable and possibly statistically significant differences in the distribution, frequency, and association of feature and artifact classes. These differences may reflect accommodations for increased distance between the resources and residences and for the spatially and temporally variable and discontinuous distribution of biotic and geological resources.

Empirical observations about site distribution and assemblage composition are provided as a basis for the comparative analysis. The analysis will focus on site size, artifact assemblage size, lithic assemblage variability, pottery frequencies, and feature frequencies, function, and artifact associations.

Figure 335 shows the location of the Santa Fe River sites and the 95 Northwest Santa Fe Relief Route and Las Campanas sites or components. Distances between Northwest Santa Fe Relief Route sites and Santa Fe River residential sites range from 1.1 to 3.7 km. Distances between Las Campanas and Santa Fe River sites are 4 to 8 km. Within the Las Campanas sample, the sites fall into two distinct distance groups: 4 to 5 km and 6 to 8 km. The effect that distance had on the organization of diurnal foraging can be examined through the relationships and associations between sites and artifact assemblages and features.

Tables 191 and 192 provide summary data and central tendency statistics for the Northwest Santa Fe Relief Route and Las Campanas sites. Site or component size shows some of the greatest differences: mean site or component size is 2.5 times greater at the Northwest Santa Fe Relief Route sites (Table 193). This statistically significant difference is most apparent in the smallest and largest site-size ranges. Small sites, ranging from 36 to 1,499 sq m, make up a significant proportion of the Las Campanas sites and a significantly less than expected proportion of the Northwest Santa Fe Relief Route sites. The opposite is true of sites covering 6,000 to 40,000 sq m. Some difference may be due to a refinement of spatial limits for some Las Campanas sites and components that was not possible for the Northwest Santa Fe Relief Route sites. Identification of smaller components within big sites reduced the number of spatially extensive Las Campanas sites in the sample. However, the number of larger sites would still be

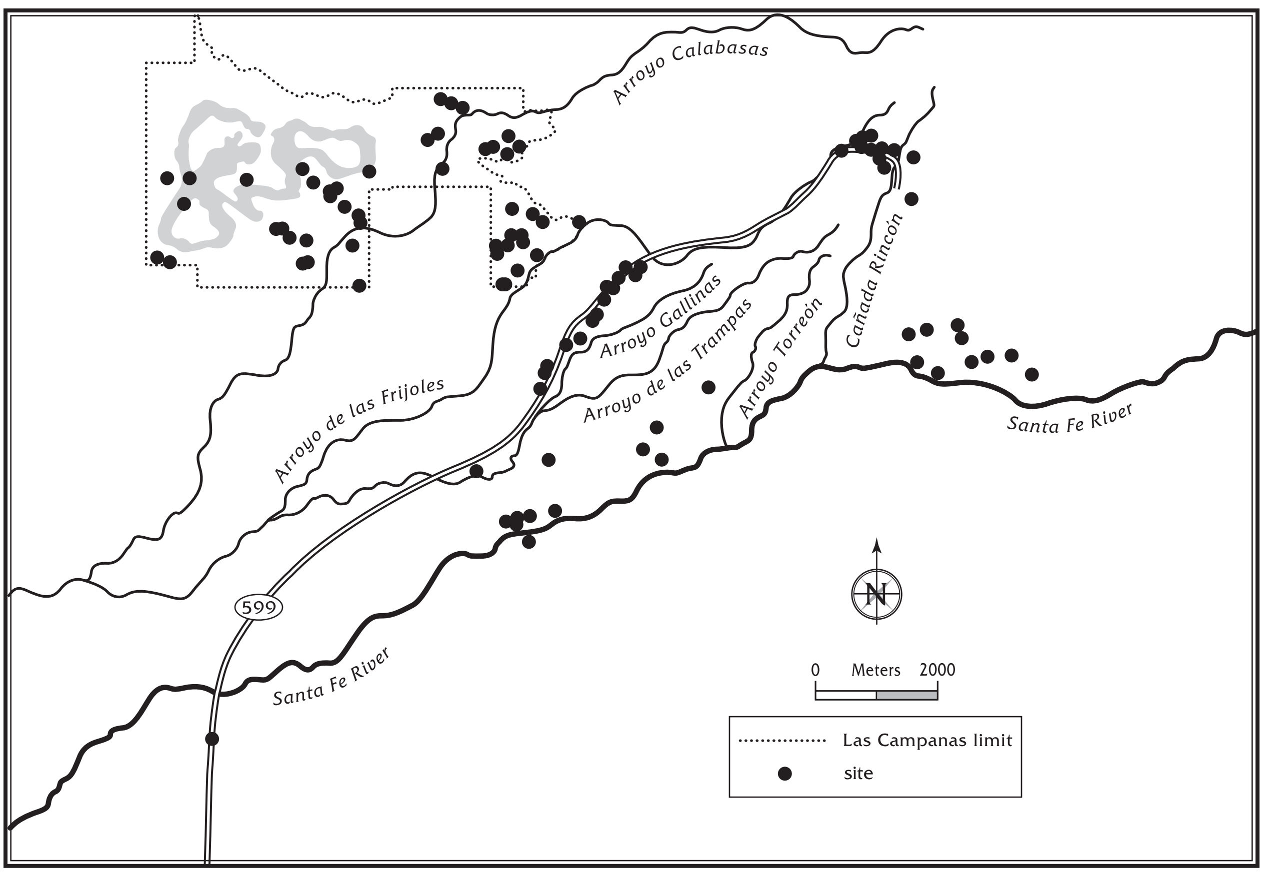


Figure 335. Ancestral Puebloan sites along the Santa Fe River and in the Northwest Santa Fe Relief Route and Las Campanas project areas.

Table 191. Summary data, Northwest Santa Fe Relief Route sites

	Minimum	Maximum	Sum	Mean	SD
Size of sites (sq m)	100	40000	152343	4353	7075
Primary flakes	1	50	604	17	12
Secondary flakes	1	55	460	13	13
Decortication flakes	3	220	868	25	36
Biface thinning flakes	0	46	69	2	9
Angular debris	2	136	843	24	25
Cores	0	14	108	-	4
Ground stone	0	1	4	<1	-
Sherds	1	64	353	-	13
Features	0	11	41	1	2
Tools	0	20	71	-	2
Total artifact count	17	499	3380	97	88

Table 192. Summary data, Las Campanas sites

	Minimum	Maximum	Sum	Mean	SD
Size of sites (sq m)	36	11000	104576	1803	2024
Primary flakes	0	136	747	13	21
Secondary flakes	0	517	1988	34	71
Decortication flakes	0	103	1012	17	24
Biface thinning flakes	0	41	144	2	6
Angular debris	0	259	863	15	35
Cores	0	19	220	4	4
Ground stone	0	4	17	<1	1
Sherds	0	2771	4626	80	370
Features	0	4	30	1	1
Tools	0	72	342	6	12
Total artifact count	10	-	9959	172	500

Table 193. Site size by project area, Ancestral Pueblo sites

No. of Sites Expected Column % Adjusted Residual	NWSFRR	Las Campanas	Total
36-1499 sq m	11	36	47
	17.7	29.3	47
	31.4%	62.1%	50.5%
	-2.9	2.9	
1500-2999 sq m	12	11	23
	8.7	14.3	23
	34.3%	19.0%	24.7%
	1.7	-1.7	
3000-5999 sq m	4	8	12
	4.5	7.5	12
	11.4%	13.8%	12.9%
	-0.3	0.3	
6000-40,000 sq m	8	3	11
	4.1	6.9	11
	22.9%	5.2%	11.8%
	2.6	-2.6	
Total no. of sites	35	58	93

substantially less than the proportion identified for the Northwest Santa Fe Relief Route, even with the finer distinctions.

Figure 336 shows fairly regular and commingled distribution of small and large sites along the Santa Fe River. The majority of the larger sites are more than 6 km from the Santa Fe River in the Las Campanas sample. Large sites with more than one thermal feature are clustered in the Las Campanas area, further suggesting that a targeted resource extraction and processing strategy was employed with increased distance between residence and resources.

Comparison of chipped stone counts, sherd counts, and feature counts showed no significant difference in their frequency distribution between project areas. However, there were patterns that were not statistically significant that may relate to foraging strategy.

Five sites or components have 100 or more sherds within the Las Campanas area. None were found in the Northwest Santa Fe Relief Route project area (Table 194). The sites with 100 or more sherds were 6 to 8 km from the Santa Fe River sites and north of Arroyo de las Calabasas (Fig. 337). The location of these sites strongly suggests different foraging strategies that were in part conditioned by distance between the resources and residences.

Feature distribution suggests that distance from resource to residential site may have influenced foraging strategies. On the Northwest Santa Fe Relief Route sites, 16 of 35 sites had thermal features distributed throughout the 2–4 km distance to residence zone (Table 195 and Fig. 338). The Las Campanas sites showed a marked increase in the proportion of sites with features as distance from the residential sites increased. Of the 19 sites in the 4–5 km zone south of Arroyo de las Calabasas, only 2 had thermal features. Within the 6–8 km zone north of Arroyo de las Calabasas, 15 of 39 sites had one or more thermal features. The proportion of sites with thermal features to those sites without thermal features is similar to that of the Relief Route, suggesting that there may have been foraging zones at different intervals from the Santa Fe River residential sites.

Chipped stone frequency is relatively evenly distributed within and between Santa Fe Relief Route and Las Campanas sites (Table 196). There are slight deviations in frequency from the expected and more than expected sites with 50–99 artifacts. Midrange frequencies within the overall distribution are difficult to interpret. It is possible that this distribution reflects higher raw-material availability within the Relief Route

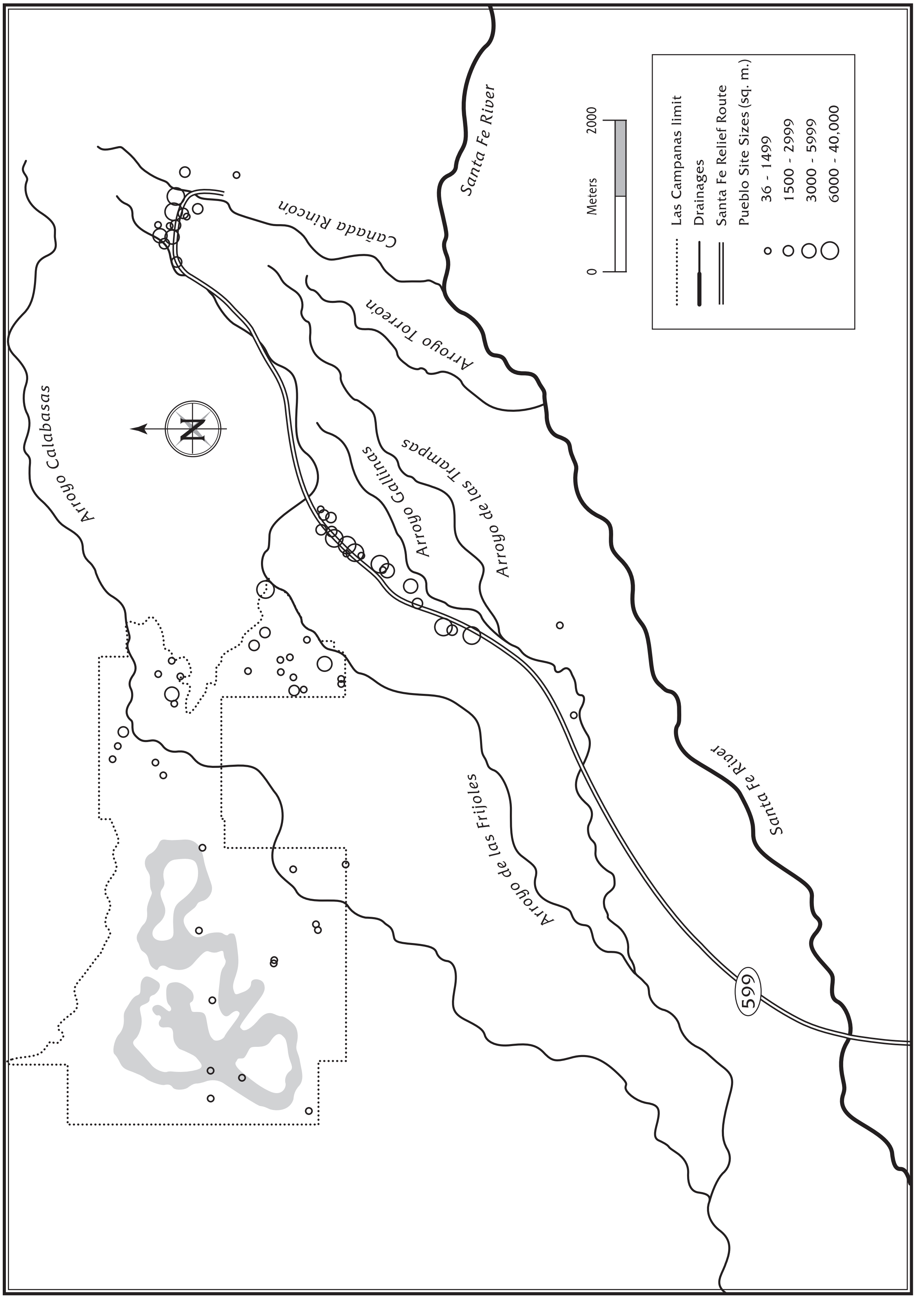


Figure 336. Distribution of Ancestral Puebloan sites in the Northwest Santa Fe Relief Route and Las Campanas areas classed by site size in square meters.

Table 194. Sherd count by project area, Ancestral Pueblo sites

No. of Sites Expected Column % Adjusted Residual	NWSFRR	Las Campanas	Total
0-29 sherds	32	46	78
	29.4	48.6	78
	91.4%	79.3%	83.9%
	1.5	-1.5	
30-99 sherds	3	7	10
	3.8	6.2	10
	8.6%	12.1%	10.8%
	-0.5	0.5	
100-2771 sherds	0	5	5
	1.9	3.1	5
	0.0%	8.6%	5.4%
	-1.8%	1.8%	
Total no. of sites	35	58	93

Table 195. Feature count by project area, Ancestral Pueblo sites

No. of Sites Expected Column % Adjusted Residual	NWSFRR	Las Campanas	Total
No features	19	41	60
	22.6	37.4	60
	54.3%	70.7%	64.5%
	-1.6	1.6	
1-2 features	11	14	25
	9.4	15.6	25
	31.3%	24.1%	26.9%
	0.8	-0.8	
3-6 features	4	3	7
	2.6	4.4	7.0
	11.4%	5.2%	7.5%
	1.1	-1.1	
7 or more features	1	0	1
	0.4	0.6	1.0
	2.9%	0.0%	1.1%
	1.3	-1.3	
Total no. of sites	35	58	93

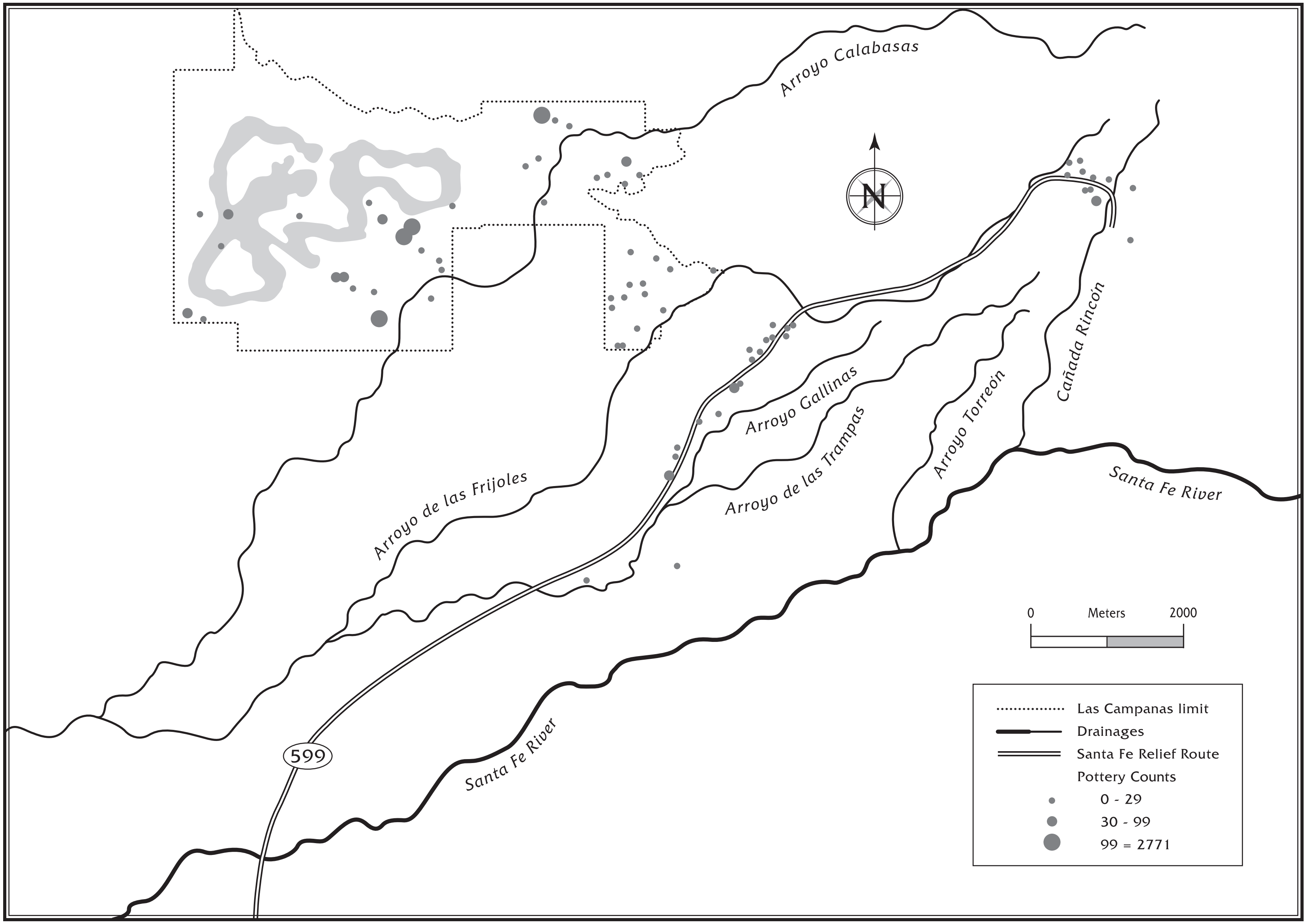


Figure 337. Distribution of Ancestral Puebloan sites in the Northwest Santa Fe Relief Route and Las Campanas areas classed by sherd counts.

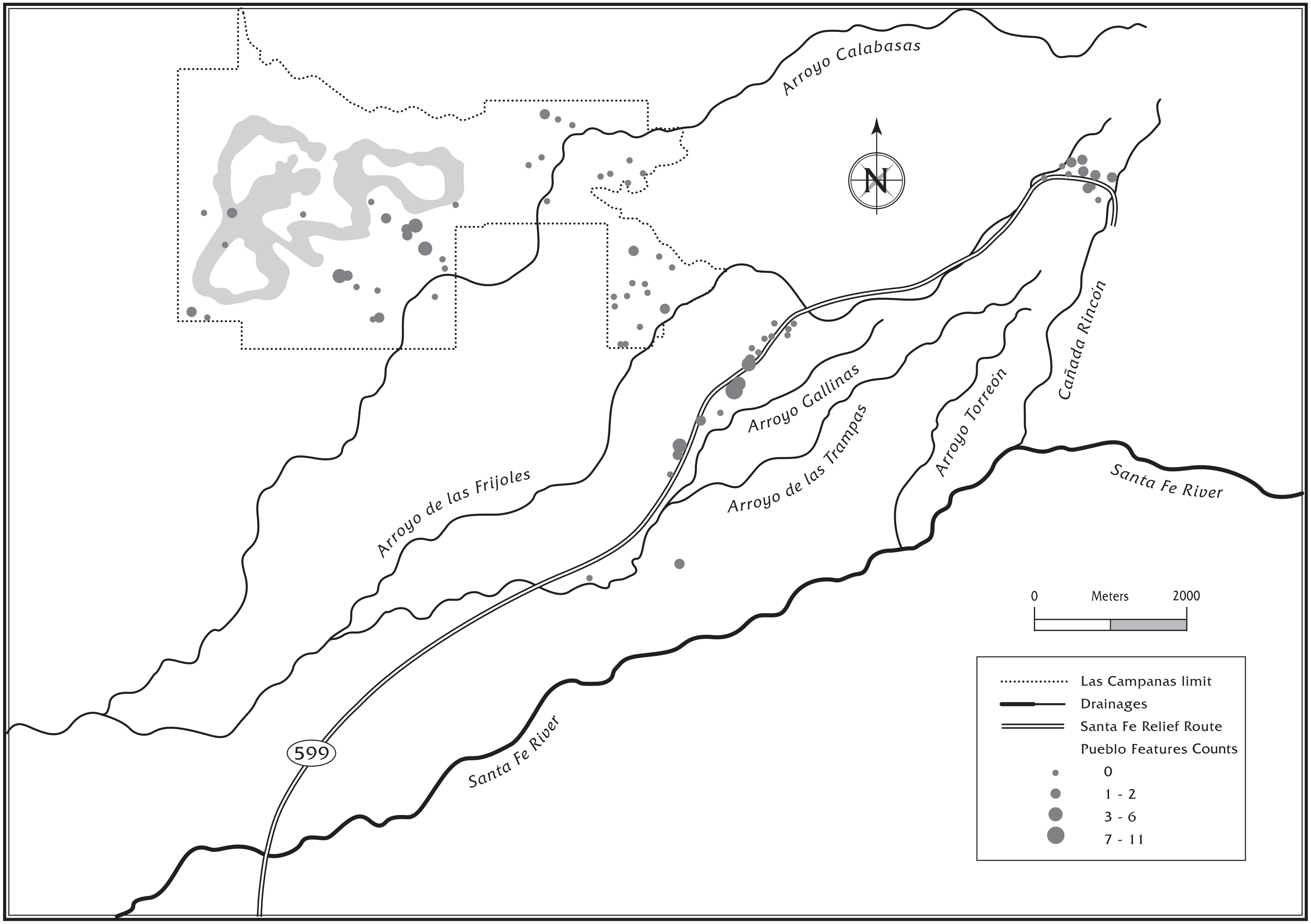


Figure 338. Distribution of Ancestral Puebloan sites in the Northwest Santa Fe Relief Route and Las Campanas areas classed by feature counts.

Table 196. Chipped stone artifact count by project area, Ancestral Pueblo sites

No. of Artifacts Expected Column % Adjusted Residual	NWSFRR	Las Campanas	Total
1-49 artifacts	13	31	44
	16.6	27.4	44.0
	37.1%	53.4%	47.3%
	-1.5	1.5	
50-99 artifacts	14	10	24
	9.0	15.0	24.0
	40.0%	17.2%	25.8%
	2.4	-2.4	
100-299 artifacts	7	14	21
	7.9	13.1	21.0
	20.0%	24.1%	22.6%
	-0.5	0.5	
300-1200 artifacts	1	3	4
	1.5	2.5	4.0
	2.9%	5.2%	4.3%
	-0.5	0.5	
Total no. of sites	35	58	93

project area. Three sites with the highest chipped stone frequencies occur in the Las Campanas area and one in the Relief Route area (Fig. 339). There is no spatial patterning in the site distribution, suggesting these may have been foraging and hunting staging areas focused on specific resource acquisition or extraction. Accumulated chipped stone debris may have attracted subsequent site occupants as a source of raw material.

This comparative analysis has shown that Ancestral Puebloan foraging strategies were not completely redundant or significantly patterned relative to distance from residential site artifact and feature frequencies. While evidence suggests substantial homogeneity in the distribution of artifacts and features, there are some patterned differences, suggesting that foraging strategies were adjusted for increased distance from the residential sites. Observed tendencies suggest that processing or staging locations became more centralized as distance from the Santa Fe River village sites increased, a pattern first observed in the Las Campanas study (Post 1996a, 1996b). The area north of Arroyo de las Calabasas, which was 6–8 km from the Santa Fe River sites, had most of the sites with 100 or more sherds and sites that were larger than 6,000 sq m, and appeared to have secondary staging areas. The foraging and processing staging sites defined as containing one or more thermal features occurred within the Relief Route area at 2–4 km from the Santa Fe River sites and within the Las Campanas area at 6–8 km from the Santa Fe River sites. An expansion of this pattern may be indicated by sites LA 129670 and LA 129674, which are 12 km north of the Santa Fe River sites. The sites overlook the Cañada Ancha drainages and are unlike the majority of sites found in the Santa Fe Ranch lease area (Post 2001:59–60). With assemblages consisting of 200–500 pieces of core-reduction and tool-manufacture debris, they are most similar to the multiple occupation sites in the Las Campanas area. The site lithic assemblages consist of local raw material, and the accumulated lithic reduction debris and features result from multiple occupations, as might be expected for intermediate-distance staging of foraging and hunting. These sites may represent the greatest extent of a staged or zoned Ancestral Puebloan foraging strategy practiced by the residents of the Santa Fe River sites.

Distributional analysis of the Las Campanas and Santa Fe River sites shows tendencies, but not statistically significant patterns in the spatial association of artifact and feature classes and site

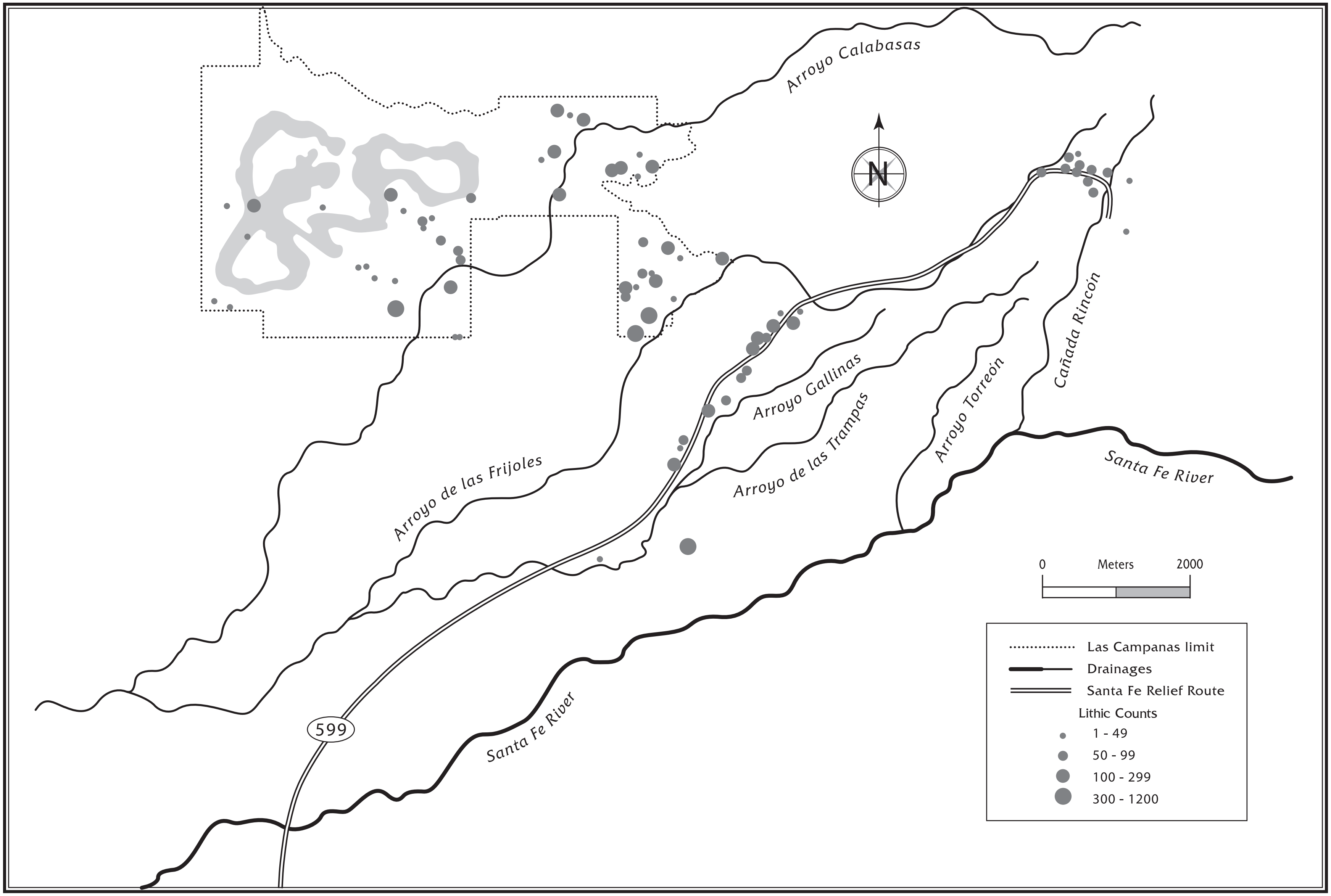


Figure 339. Distribution of Ancestral Puebloan sites in the Northwest Santa Fe Relief Route and Las Campanas areas classed by chipped stone counts.

size and location. The common pattern is of low frequencies of formal or informal tools associated with lithic raw-material procurement and core-reduction debris, low to moderate frequencies of ceramic vessels, and shallow thermal features that usually contained no direct evidence of the processed foods or materials. However, the analysis did show tendencies that suggest that Ancestral Puebloan foraging activities were more than randomly distributed and, therefore, opportunistically distributed across the piedmont landscape.

By examining the data from the piedmont sites, the analysis has extended the received definition of the Ancestral Puebloan extra-village foraging distance beyond 1–2 km (Wetterstrom 1986). By doing this, new dimensions have been added to a normative and limited perspective on the economic activities that supplemented a maize agriculture-dominated subsistence system. Small sites with ash and charcoal-filled pits associated with pottery spalls were interpreted as pottery-firing features within the Las Campanas project area (Lakatos 1996). A cobble-lined feature with an associated Santa Fe Black-on-white/McElmo Black-on-white design style dipper, found in relative isolation at LA 61299 within the Relief Route project area, was also interpreted as a firing feature. At LA 61290, another pottery-firing feature was inferred from stratigraphy similar to that of the Las Campanas features and the recovery of a few spalled sherds from the feature interior. These pottery-firing features were situated farther from the nearest village than most models for Ancestral Puebloan pottery production have predicted (Lakatos 1996; Post and Lakatos 1995; Purcell 1993). They represent a significant departure from our typical understanding of pottery-production organization. Two thermal processing features associated with piñon nut shells from LA 61286 and LA 61290 indicate, as expected, that nut gathering and processing was an important activity on the piedmont. However, out of the 71 probable Ancestral Puebloan features, only two yielded direct evidence of that activity. Even with the large sample of sites, the mechanics of on-site processing of raw materials and foods are still vague. However, by combining limited direct evidence with the broader and indirect evidence of subsistence organization, the mechanics can be unpacked and interpreted. Through the study of these small Ancestral Puebloan sites, we have come to a more detailed, multidimensional and ultimately informative perspective on a little-investigated aspect of subsistence organization and technological adaptation.

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Appendix 2: Features, Site and Artifact Data, and Site Data by Class

Table A2.1. Features, Northwest Santa Fe Relief Route

LA No.	Feature No.	Date	Period	Feature Type	Length (m)	Width (m)	Depth (m)	Area (sq m)	Shape	Fill Type	Profile Type	Fire-cracked Rock	Condition	Locus	Economic Plants	Wood Charcoal
61286	55	4465 BC	1	2	0.8	0.66	0.16	0.41	2	2	4	50	2	2	1	3
61286	56	-	1	2	1	1	0.16	0.79	1	2	4	0	2	2	1	3
61286	20	-	2	2	0.65	0.55	0.14	0.28	2	2	4	18	9	2	0	0
61286	21	-	2	2	0.6	0.4	0.16	0.19	2	2	2	20	2	2	1	0
61286	25	2605 BC	2	2	0.68	0.68	0.35	0.36	1	2	2	4	2	2	0	6
61286	27	-	2	2	0.4	0.4	0.1	0.13	1	2	4	0	1	2	1	1
61286	28	-	2	2	0.4	0.26	0.1	0.08	2	2	1	30	2	2	0	0
61286	29	-	2	2	1.13	0.77	0.08	0.68	2	2	4	175	2	2	1	6
61286	30	-	2	2	0.68	0.6	0.4	0.32	1	1	2	1	2	2	0	6
61286	34	-	2	2	0.37	0.36	0.22	0.1	1	2	3	0	2	2	0	6
61286	35	-	2	2	0.4	0.4	0.11	0.13	1	8	4	44	2	2	0	6
61286	36	-	2	6	2.48	2	0.08	3.9	3	3	3	100	4	2	-	-
61286	37	-	2	2	1.17	0.85	0.1	0.78	2	2	1	49	2	2	1	0
61286	38	-	2	2	0.76	0.49	0.17	0.29	2	2	2	23	2	2	0	0
61286	39	2605 BC	2	2	0.5	0.5	0.1	0.2	1	2	1	0	2	2	0	6
61286	40	-	2	2	0.65	0.4	0.08	0.2	2	3	6	0	5	2	1	4
61286	41	-	2	2	0.4	0.4	0.12	0.13	0	2	4	0	2	2	1	0
61286	43	-	2	2	0.59	.	0.22	.	0	2	4	0	2	2	1	3
61286	44	2920 BC	2	2	0.67	0.67	0.3	0.35	2	2	2	0	9	2	0	4
61286	45	-	2	2	0.61	0.56	0.29	0.27	1	2	2	0	2	2	1	0
61286	48	-	2	2	0.53	0.32	0.14	0.13	2	1	4	0	2	2	1	6
61286	49	-	2	2	0.43	0.41	0.23	0.14	1	2	2	0	2	2	1	4
61286	50	-	2	2	0.74	0.68	0.1	0.4	2	2	4	2	1	2	0	5
61286	51	-	2	2	0.44	0.26	0.08	0.09	2	2	1	0	2	1	0	2
61286	52	-	2	2	0.25	0.25	0.15	0.05	1	2	2	0	2	2	0	3
61286	57	-	2	2	0.52	0.38	0.26	0.16	2	2	2	0	1	2	0	6
61286	58	-	2	2	0.22	0.21	0.13	0.04	1	2	2	0	2	2	0	4
61286	59	-	2	2	0.28	0.28	0.1	0.06	1	2	4	2	2	1	1	3
61286	60	2500 BC	2	1	3.98	2.4	0.12	7.5	2	7	1	0	1	3	1	6
61286	61	-	2	2	0.44	0.39	0.13	0.13	1	2	4	0	1	2	1	4
61286	62	-	2	2	0.35	0.35	0.12	0.1	1	2	2	0	2	2	1	4
61286	63	-	2	2	0.62	0.42	0.13	0.2	2	2	2	0	2	2	1	3
61286	64	-	2	2	0.46	0.46	0.16	0.17	1	2	2	8	2	2	-	-
61286	65	-	2	7	0.5	0.4	0.26	0.16	2	2	2	0	2	3	1	4
61286	66	-	2	2	0.7	0.6	0.35	0.33	2	2	4	0	1	3	-	-
61286	67	-	2	2	0.55	0.52	0.13	0.23	1	3	4	0	1	2	0	3
61286	17	-	4	2	0.37	0.34	0.1	0.1	1	8	4	18	2	2	0	6

Table A2.1 (continued).

LA No.	Feature No.	Date	Period	Feature Type	Length (m)	Width (m)	Depth (m)	Area (sq m)	Shape	Fill Type	Profile Type	Fire-cracked Rock	Condition	Locus	Economic Plants	Wood Charcoal
61286	18	185 BC	4	13	0.97	0.93	0.13	0.71	2	8	4	121	2	2	1	4
61286	19	AD 30	4	2	1.1	1.1	0.15	0.95	1	5	1	339	2	2	1	2
61286	22	-	4	2	0.48	0.45	0.16	0.17	1	2	1	0	2	2	1	4
61286	23	-	4	2	0.68	0.64	0.2	0.34	1	2	4	0	2	2	1	6
61286	1	-	5	6	4.9	4	0.18	15.39	3	3	.	370	3	2	1	4
61286	2	-	5	13	0.86	0.4	0.16	0.27	2	2	1	0	3	2	0	0
61286	3	-	5	2	0.45	0.4	0.12	0.14	2	3	1	-	4	2	1	6
61286	4	-	5	2	0.53	0.46	0.2	0.19	2	3	3	0	1	2	1	0
61286	5	-	5	2	1.06	0.6	0.76	0.5	2	1	2	0	2	2	0	3
61286	6	-	5	2	0.54	0.52	0.1	0.22	1	3	2	0	1	2	-	-
61286	7	-	5	2	0.4	0.34	0.22	0.11	2	2	1	0	2	2	1	7
61286	8	-	5	2	0.64	0.46	0.14	0.23	2	3	4	1	1	2	0	0
61286	9.11	-	5	7	0.39	0.36	0.16	0.11	1	2	7	0	2	1	1	3
61286	10	-	5	2	0.44	0.44	0.07	0.15	1	3	1	0	1	2	-	-
61286	11	AD 340	5	1	3	2.9	0.55	6.83	2	2	4	0	2	3	1	4
61286	12.9	-	5	2	0.4	0.4	0.15	0.13	1	3	1	0	2	4	1	3
61286	12.91	-	5	2	0.5	0.35	0.06	0.14	2	3	1	0	2	4	1	3
61286	13	-	5	2	0.2	0.2	0.12	0.03	1	2	2	0	2	4	-	-
61286	14	-	5	2	0.4	0.4	0.16	0.13	2	2	2	0	2	4	-	-
61286	15	AD 390	5	2	0.65	0.58	0.15	0.3	2	2	4	35	2	4	1	4
61286	16	-	5	2	0.43	0.42	0.41	0.14	2	3	3	0	1	3	1	0
61287	2	-	6	2	0.78	0.42	0.13	0.26	2	2	1	0	2	2	1	2
61287	1	-	6	6	1	1	0.2	0.79	3	4	3	35	3	2	-	-
61289	3	-	2	4	0.6	0.6	0.27	0.28	1	2	2	0	2	2	1	6
61289	4	-	2	4	0.5	0.5	0.45	0.2	1	2	2	0	2	2	1	6
61289	5	-	2	4	0.5	0.4	0.18	0.16	0	2	2	0	2	2	0	6
61289	6	-	2	4	0.9	0.7	0.4	0.49	2	2	2	0	2	2	0	0
61289	8	-	2	8	0.4	0.4	0.2	0.13	1	2	2	0	2	2	1	0
61289	9	-	2	2	0.7	0.6	0.22	0.37	2	2	5	-	1	2	1	6
61289	10	-	2	2	0.74	0.6	0.18	0.35	2	3	1	0	1	2	1	2
61289	11	-	2	2	0.78	0.6	0.2	0.37	2	3	4	0	1	2	0	4
61289	12	-	2	2	1.5	1.1	0.24	1.3	2	3	4	0	1	2	-	-
61289	14	-	2	2	0.86	0.86	0.28	0.58	1	3	4	0	8	2	-	-
61289	16	-	2	4	0.6	.	0.12	0.28	1	3	2	-	3	2	0	0
61289	17	3345 BC	2	4	0.55	0.53	0.4	0.23	1	1	2	0	2	2	1	5
61289	18	-	2	4	0.6	0.6	0.32	0.28	1	1	2	0	2	2	1	4
61289	19	3400 BC	2	1	2.2	1.7	0.08	2.94	1	2	1	-	3	3	1	5

Table A2.1 (continued).

LA No.	Feature No.	Date	Period	Feature Type	Length (m)	Width (m)	Depth (m)	Area (sq m)	Shape	Fill Type	Profile Type	Fire-cracked Rock	Condition	Locus	Economic Plants	Wood Charcoal
61289	20	-	2	4	0.7	0.4	0.16	0.22	2	2	2	0	2	2	0	4
61289	21	-	2	4	0.54	0.54	0.3	0.23	1	1	2	0	2	2	0	6
61289	22	-	2	4	0.56	0.56	0.46	0.25	1	1	2	0	2	2	1	4
61289	23	-	2	2	0.44	0.31	0.16	0.11	2	2	2	0	2	2	0	6
61289	24	-	2	4	0.44	0.44	0.44	0.15	1	1	2	0	2	2	1	0
61289	25	-	2	2	0.3	0.3	0.04	0.07	1	3	1	0	1	2	0	2
61289	26	3400 BC	2	7	0.44	0.44	0.22	0.15	1	1	2	0	2	1	1	6
61289	27	-	2	6	0.9	0.5	0.05	0.35	3	4	6	28	3	2	-	-
61289	29	-	2	2	0.9	0.9	0.14	0.64	1	2	1	7	2	2	1	4
61289	31	-	2	4	0.4	0.3	0.12	0.09	1	3	2	0	8	2	1	0
61289	1	AD 1405	6	4	1	1	0.4	0.79	1	2	4	100	2	2	1	6
61289	2	-	6	2	0.8	0.78	0.26	0.49	1	2	4	-	1	2	1	6
61289	28	-	9	2	0.65	0.6	0.26	0.31	1	1	2	21	2	2	1	0
61289	30	-	9	2	0.77	0.57	0.1	0.34	1	2	1	0	1	2	0	0
61290	13	2285 BC	2	2	0.64	0.42	0.2	0.21	2	2	2	0	2	2	1	4
61290	14	-	2	2	0.76	0.7	0.12	0.42	1	3	1	0	1	2	0	0
61290	15	-	2	12	0.6	0.6	0.02	0.28	1	4	5	-	3	2	0	0
61290	16	-	2	10	0.74	0.69	0.04	0.4	3	3	7	1	3	2	1	4
61290	17	-	2	2	0.5	0.5	0.16	0.2	3	2	4	0	2	2	0	0
61290	18	1910 BC	2	2	0.8	0.4	0.18	0.25	2	2	4	0	2	2	1	2
61290	19	-	2	2	0.78	0.54	0.07	0.33	2	2	1	0	1	2	1	4
61290	20	2025 BC	2	2	1.1	0.52	0.13	0.45	2	2	1	0	2	2	1	6
61290	22	-	2	2	0.5	0.42	0.09	0.16	2	2	2	0	2	2	1	4
61290	23	-	2	2	0.72	0.52	0.48	0.29	2	2	2	8	2	2	1	4
61290	24	-	2	2	0.6	0.5	0.2	0.24	2	2	4	0	2	2	1	5
61290	26	-	2	2	0.87	0.56	0.12	0.38	2	2	1	0	2	2	1	4
61290	1	AD 1300	6	2	1.23	1.1	0.32	1.06	1	2	4	0	2	2	1	6
61290	6	-	6	2	0.85	0.8	0.1	0.53	2	6	1	23	2	2	1	6
61290	7	-	6	12	0.57	0.4	0.05	0.18	2	4	1	0	3	2	0	0
61290	10	-	6	4	0.62	0.39	0.24	0.19	2	1	2	0	2	2	1	6
61290	11	-	6	2	0.38	0.32	0.06	0.1	2	2	1	0	2	2	1	0
61290	25	-	6	2	0.76	0.6	0.19	0.36	2	2	2	0	2	2	1	6
61290	5	-	8	2	1.44	1	0.12	1.13	2	5	1	108	8	2	1	4
61290	2	-	9	12	0.83	0.65	0.06	0.42	2	3	7	0	3	2	0	0
61290	3	-	9	2	0.17	0.17	0.19	0.26	2	8	1	43	9	2	0	2
61290	8	-	9	2	1.2	1	0.05	0.96	1	4	6	3	3	2	1	0
61290	9	-	9	2	1	1	0.08	0.79	1	8	1	8	9	2	0	0

Table A2.1 (continued).

LA No.	Feature No.	Date	Period	Feature Type	Length (m)	Width (m)	Depth (m)	Area (sq m)	Shape	Fill Type	Profile Type	Fire-cracked Rock	Condition	Locus	Economic Plants	Wood Charcoal
61290	27	-	9	2	0.74	0.72	0.16	0.42	1	2	1	32	2	2	0	0
61293	2	-	3	2	1.14	1	0.16	0.9	2	5	4	82	2	2	0	2
61293	3	-	3	2	0.87	0.87	0.15	0.59	1	5	1	86	2	2	0	0
61293	4	-	3	2	0.69	0.52	0.15	0.28	2	6	4	5	2	2	0	4
61293	7	-	3	2	0.6	0.52	0.1	0.25	2	6	4	7	2	2	1	4
61293	15	-	3	2	0.53	0.5	0.03	0.21	3	2	6	6	2	2	0	0
61293	16	-	3	9	0.45	0.38	0.08	0.13	2	2	1	0	2	2	1	0
61293	17	-	3	2	0.65	0.4	0.08	0.2	2	2	1	0	2	2	0	0
61293	18	-	3	6	1.7	1	0.05	1.34	3	3	6	29	3	2	0	0
61293	28	1445 BC	4	1	3.25	3.25	0.18	8.3	1	3	1	0	7	3	1	0
61293	29	-	4	2	1.13	1.03	0.1	0.91	1	2	1	50	3	2	0	0
61293	13	AD 80	5	1	4	3	0.4	9.42	1	2	1	-	2	3	1	0
61293	14.13	-	5	2	0.61	0.44	0.22	0.21	2	7	4	0	2	1	1	0
61293	20.13	-	5	7	0.35	0.35	0.15	0.1	1	2	2	1	2	1	1	3
61293	21.13	AD 80	5	7	0.43	0.41	0.18	0.14	1	2	2	0	2	1	1	6
61293	22.13	-	5	2	0.42	0.3	0.15	0.1	2	2	2	0	2	1	1	4
61293	24.13	-	5	2	0.3	0.3	0.12	0.07	1	2	4	0	2	1	0	-
61293	26.13	-	5	2	0.4	0.3	0.18	0.09	2	2	3	0	2	1	1	6
61293	27.13	-	5	7	0.49	0.36	0.16	0.14	2	2	3	0	2	1	-	-
61293	6	AD 1205	6	4	1	0.66	0.16	0.52	2	2	1	70	2	2	1	1
61293	8	-	6	4	0.45	0.45	0.2	0.16	1	1	3	0	2	2	1	5
61293	9	-	6	2	0.91	0.5	0.08	0.36	2	6	1	17	2	2	1	0
61293	11	-	6	2	0.9	0.85	0.1	0.6	1	5	1	51	2	2	1	6
61293	1	AD 1800	7	3	0.68	0.3	0.22	0.16	3	2	4	0	2	2	-	-
61293	5	-	9	12	0.54	0.3	0.05	0.13	2	6	7	5	2	2	1	0
61293	10	-	9	13	1	0.7	0.18	0.55	2	5	1	58	2	2	1	0
61293	12	-	9	12	0.75	0.7	0.02	0.41	3	6	6	23	3	2	-	-
61293	19	-	9	2	0.7	0.5	0.08	0.27	3	2	6	0	3	2	0	0
61293	23	-	9	2	0.3	0.26	0.26	0.06	1	2	2	0	2	2	0	0
61293	25	-	9	6	1.05	0.9	0.03	0.74	3	3	6	30	3	2	-	-
61299	2	AD 1300	6	15	1.3	1.05	0.12	1.09	2	5	4	-	2	2	1	0
61299	1	-	9	4	0.86	0.72	0.16	0.5	2	5	4	35	2	2	1	6
61299	3	-	9	2	0.72	0.46	0.08	0.03	3	4	1	-	3	2	1	4
61299	4	-	9	4	0.64	0.64	0.08	0.32	1	1	1	-	3	2	1	3
61302	1	AD 1300	6	2	1.2	0.9	0.08	0.58	2	2	1	90	3	2	1	0
61302	2	-	6	2	1.54	0.84	0.16	1.03	3	2	4	207	3	2	1	2
61302	3	-	6	2	0.4	0.26	0.1	0.08	2	2	2	0	6	2	-	-

Table A2.1 (continued).

LA No.	Feature No.	Date	Period	Feature Type	Length (m)	Width (m)	Depth (m)	Area (sq m)	Shape	Fill Type	Profile Type	Fire-cracked Rock	Condition	Locus	Economic Plants	Wood Charcoal
67959	4	-	2	4	0.6	0.48	0.32	0.23	2	2	2	12	2	2	1	3
67959	5	2280 BC	2	2	0.4	0.32	0.2	0.1	2	2	4	0	2	2	1	4
67959	6	2025 BC	2	2	0.64	0.4	0.16	0.2	2	2	1	0	2	2	0	5
67959	1	-	9	2	0.5	0.31	0.06	0.12	2	4	1	6	3	2	0	0
67959	2	-	9	2	0.85	0.38	0.02	0.26	3	4	5	-	3	2	0	0
108902	1	-	9	2	1.26	0.88	0.32	0.89	2	2	4	-	3	2	1	3
113946	1	-	9	4	0.8	0.76	0.26	0.49	2	1	2	-	5	2	1	0
113946	2	-	9	6	1.1	0.7	.	0.61	2	3	.	47	-	2	-	-
113954	1	-	6	3	1.12	0.84	0.12	0.75	2	2	1	-	2	2	-	-
114071	1	-	9	2	0.26	0.15	0.21	0.03	2	2	2	-	1	2	-	-
114071	2	-	9	2	0.48	0.2	0.2	0.03	3	1	4	5	1	2	-	-

Period: 1 Early Archaic, 2 Middle Archaic, 3 Late Archaic, 4 Late Archaic, 5 Latest Archaic, 6 Pueblo, 7 Historic, 8 Late Historic, 9 Unknown.

Feature Type: 1 pit structure, 2 unlined pit, 3 burned pit, 4 cobble-lined pit, 5 slab-lined pit, 6 fire-cracked rock concentration, 7 central hearth, 8 slab- and cobble-lined pits, 9 thermal feature with basal cobbles, 10 ash and charcoal discard, 11 cobble-ring hearth, 12 surface hearth, 13 bilevel pit, 14 burned log, 15 kiln.

Shape: 1 eroded/disturbed, 2 circular, 3 oval, 4 irregular, 5 subrectangular.

Fill Type: 1 primary, 2 primary/secondary, 3 secondary, 4 deflated, 5 cobble-filled, 6 deflated/fire-cracked rock, 7 primary/secondary/structure, 8 mixed with fire-cracked rock.

Profile Type: 1 gentle basin, 2 steep-walled, 3 vertical, 4 moderately steep/basin, 5 irregular, 6 deflated, 7 surface fire, 8 bell-shaped.

Condition: 1 unburned, 2 burned, 3 deflated, 4 cut by drainage, 5 ash-filled, 6 unknown, 7 unburned/drainage, 8 dismantled, 9 burned/drainage.

Locus: 1 intramural, 2 extramural, 3 structure, 4 within feature, superimposed.

Economic Plants: 0 absent, 1 present.

Wood Charcoal: 0 absent, 1 piñon, 2 juniper, 3 piñon/juniper, 4 juniper/piñon, 5 mixed, 6 mixed coniferous, 7 *Atriplex* juniper/piñon.

Appendix A2.2. Site and artifact data from testing and excavation phases, Northwest Santa Fe Relief Route and Las Campanas projects

LA No.	Area (sq m)	Primary	Secondary	Decorti-cation	Biface	Angular Debris	Cores	Ground Stone	Sherds	Period	Features	Tools	Org	Chipped Stone Total	Total Artifacts	Reduction Index	Size Range	No. of Features
Northwest Santa Fe Relief Route																		
61281	160	1	3	1	0	3	0	1	0	6	0	0	1	8	9	-	1	0
61282	225	27	88	488	1270	190	11	3	0	3	23	13	1	2087	2090	0.48	1	5
61282	200	2	2	12	76	2	0	0	0	3	0	2	1	96	96	0.21	1	0
61282	200	2	0	2	40	3	3	0	0	3	0	3	1	53	53	0.16	1	0
61282	200	2	2	10	0	6	0	0	22	5	0	1	1	21	43	14	1	0
61282	200	0	0	2	40	2	0	0	0	3	2	0	1	44	44	0.05	1	2
61283	24,750	3	0	10	3	7	3	0	0	6	1	11	1	37	37	1.14	4	1
61284	900	4	8	8	0	5	0	0	1	5	0	0	1	25	26	-	2	0
61285	3888	7	5	2	0	5	3	0	0	6	0	1	1	23	23	17	4	0
61286	40,000	50	55	37	3	35	14	1	39	5	0	7	1	201	241	15.6	4	0
61286	20	0	1	1	0	0	0	0	0	1	2	0	1	2	2	-	1	2
61286	600	84	60	131	75	108	4	5	0	2	34	10	1	472	477	3.28	2	5
61286	600	5	7	8	0	5	1	0	0	3	5	3	1	29	29	7	2	5
61286	400	91	79	144	42	114	6	5	0	4	14	32	1	508	513	4.32	1	5
61287	17,250	20	12	13	0	25	4	1	1	5	3	5	1	79	81	9.8	4	3
61288	1650	1	5	5	0	6	3	0	0	6	0	2	1	22	22	7	3	0
61289	25	0	1	0	0	1	0	0	0	1	1	0	1	2	2	-	1	1
61289	1750	5	2	3	1	4	0	0	2	5	2	0	1	15	17	10	3	2
61289	400	45	61	133	3	123	10	11	0	2	24	15	1	390	401	13.83	1	5
61290	18,000	3	3	8	10	24	2	0	0	6	0	0	1	50	50	1.6	4	0
61290	500	9	8	10	2	14	2	4	0	2	12	3	1	48	52	5.8	2	5
61290	150	6	1	20	7	38	0	0	0	3	3	3	1	75	75	2.7	1	3
61290	200	7	6	18	0	22	2	0	64	5	6	1	1	56	120	33	1	5
61291	1200	0	1	3	0	2	0	0	0	6	0	0	1	6	6	-	3	0
61292	4750	14	5	24	2	13	1	0	5	5	0	3	1	62	67	8.8	4	0
61293	900	37	33	50	4	59	13	2	0	3	19	16	1	212	214	6.65	2	5
61293	5000	7	6	13	1	8	1	1	10	5	11	1	1	37	48	13.5	4	5
61294	1224	2	1	2	1	2	0	0	0	6	0	0	1	8	8	5	3	0
61295	1050	16	6	8	0	6	0	0	0	6	0	0	1	36	36	-	3	0
61296	7225	40	29	41	1	67	0	0	13	5	1	0	1	178	191	110	4	1
61297	1200	25	11	32	0	34	2	0	13	5	0	5	1	109	122	14	3	0
61298	6525	28	10	35	0	12	0	0	4	5	0	0	1	85	89	-	4	0
61299	864	18	13	10	0	11	0	0	2	5	4	0	1	52	54	-	2	4
61300	648	14	3	9	0	21	0	0	0	6	0	0	1	47	47	-	2	0
61303	380	11	5	4	0	10	2	0	0	6	0	1	1	33	33	22	1	0
61304	2016	7	1	14	0	20	0	0	4	5	0	0	1	42	46	-	4	0
61305	8096	47	23	63	0	45	0	0	12	5	0	0	1	178	190	-	4	0
61306	1044	12	5	22	0	10	0	0	2	5	0	0	1	49	51	-	3	0

Appendix A2.2 (continued).

LA No.	Area (sq m)	Primary	Secondary	Decorti-cation	Biface	Angular Debris	Cores	Ground Stone	Sherds	Period	Features	Tools	Org	Chipped Stone Total	Total Artifacts	Reduction Index	Size Range	No. of Features
61308	1680	9	4	8	0	2	0	0	8	5	0	0	1	23	31	-	3	0
61309	720	3	2	5	2	2	0	0	0	6	0	0	1	14	14	5	2	0
61310	180	5	4	5	0	3	0	0	0	6	0	1	1	18	18	14	1	0
61312	3248	10	9	12	2	21	2	0	1	5	0	0	1	56	57	16.5	4	0
61313	2400	18	11	16	1	38	4	0	2	5	0	8	1	96	98	5.44	4	0
61314	2912	24	6	5	0	20	9	0	33	5	0	0	1	64	97	.	4	0
61315	20	3	8	27	8	6	0	0	0	1	1	1	1	53	53	4.22	1	1
61315	225	89	120	302	62	127	12	8	0	4	10	21	1	733	741	6.3	1	5
61315	100	6	9	13	0	5	0	0	3	5	2	0	1	33	36	-	1	2
61315	900	39	48	46	2	46	11	1	0	6	1	0	1	192	193	72	2	1
61316	2964	30	20	24	0	18	11	0	14	5	2	2	1	105	119	42.5	4	2
61317	1800	9	3	9	0	22	4	0	0	6	0	0	1	47	47	-	3	0
61318	8450	15	9	25	2	27	4	0	21	5	1	0	1	82	103	26.5	4	1
61319	1634	7	3	6	0	8	2	0	1	5	0	0	1	26	27	-	3	0
61320	6699	15	3	14	0	35	8	0	9	5	1	0	1	75	84	-	4	1
61321	225	16	21	9	2	6	4	0	3	5	1	5	1	63	66	7.14	1	1
61321	6000	45	55	44	0	34	18	0	0	6	0	1	1	197	197	162	4	0
61322	3600	14	7	11	0	43	10	0	6	5	1	0	1	85	91	-	4	1
61323	672	1	4	7	2	9	2	0	4	5	1	1	1	26	30	4.67	2	1
61324	420	19	12	17	2	15	4	0	0	6	0	0	1	69	69	26	1	0
61325	986	9	4	14	1	12	5	0	1	5	0	0	1	45	46	32	3	0
61327	960	8	5	17	4	24	6	1	0	6	1	1	1	65	66	7.2	2	1
61328	1680	7	6	11	0	12	2	0	2	5	0	0	1	38	40	-	3	0
61329	2016	18	6	15	1	49	2	0	1	5	0	1	1	92	93	20.5	4	0
67957	840	16	1	8	0	7	0	0	0	6	0	0	1	32	32	-	2	0
67958	340	2	3	8	0	1	0	0	0	6	0	0	1	14	14	-	1	0
67959	20	5	8	10	0	3	0	0	0	2	3	1	1	27	27	23	1	3
67959	1000	4	5	2	0	0	5	1	0	6	2	2	1	18	19	8	3	2
67960	400	2	1	3	0	2	3	1	0	6	0	2	1	13	14	4.5	1	0
108902	1023	32	31	220	46	136	2	0	12	5	1	20	1	487	499	4.32	3	1
108903	2465	22	20	23	0	8	10	0	0	6	1	0	1	83	83	-	4	1
113946	1728	30	54	172	0	183	6	0	0	6	2	2	1	447	447	131	3	2
113949	990	7	8	7	0	3	4	0	0	6	0	0	1	29	29	-	3	0
113954	2688	25	42	48	2	42	7	0	7	5	1	4	1	170	177	20.33	4	1
114071	1440	16	18	67	0	49	3	0	0	6	2	2	1	155	155	52	3	2
83698	162	2	220	0	132	7	2	0	0	3	0	57	2	420	420	1.19	1	0
84746	832	13	20	16	2	12	8	0	0	6	0	4	2	75	75	9.5	2	0

Appendix A2.2 (continued).

LA No.	Area (sq m)	Primary	Secondary	Decorti-cation	Biface	Angular Debris	Cores	Ground Stone	Sherds	Period	Features	Tools	Org	Chipped Stone Total	Total Artifacts	Reduction Index	Size Range	No. of Features
84753	962	1	45	2	15	25	1	0	5	5	0	72	2	161	166	0.56	3	0
84755	100	4	8	15	0	5	3	0	0	6	0	1	2	36	36	30	1	0
84758	3400	1	8	11	5	3	0	0	0	6	0	0	1	28	28	4	4	0
84758	350	83	611	166	90	165	29	41	0	4	14	14	2	1158	1199	8.55	1	5
84759	696	14	14	9	0	14	4	1	5	5	0	0	1	55	61	-	2	0
84759	625	13	39	23	5	12	7	3	40	5	2	1	1	100	143	13.67	2	2
84761	1200	0	5	4	0	0	5	0	0	6	0	2	2	16	16	7	3	0
84762	600	3	7	8	0	1	2	0	0	6	0	6	2	27	27	3.33	2	0
84764	2800	1	5	4	0	1	0	0	57	5	1	3	2	14	71	3.33	4	1
84765	352	1	12	6	6	7	0	0	0	6	0	2	2	34	34	2.38	1	0
84773	6600	20	55	22	1	29	6	0	5	5	0	2	1	135	140	34.33	4	0
84775	875	2	9	3	6	0	2	0	0	4	0	2	1	24	24	2	2	0
84775	800	8	42	15	2	31	1	0	0	6	0	2	1	101	101	16.5	2	0
84777	150	1	1	0	0	0	2	0	0	6	0	0	1	4	4	-	1	0
84778	491	7	5	11	0	2	8	0	0	6	0	2	2	35	35	15.5	2	0
84779	5100	10	34	20	1	4	8	0	0	6	0	3	2	80	80	18	4	0
84780	962	7	16	9	0	3	3	0	5	5	0	3	2	41	46	11.67	3	0
84783	3300	3	7	3	1	0	0	0	171	5	1	9	2	23	194	1.3	4	1
84784	5400	7	10	25	0	9	2	0	18	5	2	16	2	69	87	2.75	4	2
84785	4500	6	4	13	0	0	1	0	122	5	4	3	2	27	149	8	4	4
84787	132	11	58	36	5	26	6	5	0	3	0	16	1	158	163	5.29	1	0
84787	875	123	817	249	142	304	36	29	0	3	3	134	1	1805	1834	4.44	2	3
84787	288	27	405	113	85	185	13	2	0	3	1	27	1	855	857	4.98	1	1
84787	1400	27	377	113	66	151	14	13	0	3	1	66	1	814	827	4.02	3	1
85007	1058	26	58	37	1	17	14	0	0	6	0	8	2	161	161	15	3	0
85008	3705	38	51	68	1	23	19	0	1	5	0	17	2	217	218	9.78	4	0
85011	442	5	12	2	0	1	4	0	41	5	0	0	2	24	65	-	1	0
85016	1536	26	44	45	3	22	7	0	1	6	0	11	2	158	159	8.71	3	0
85017	1500	23	50	24	3	21	5	0	0	6	0	10	2	136	136	7.85	3	0
85018	720	23	34	24	0	17	4	0	1	5	0	4	2	106	107	21.25	2	0
85019	375	4	7	6	0	10	3	0	0	6	0	1	2	31	31	20	1	0
85022	966	8	15	9	1	9	5	0	0	6	0	3	2	50	50	9.25	3	0
85023	707	4	5	1	0	3	0	0	1	5	0	1	2	14	15	10	2	0
85029	2250	16	38	12	7	45	6	0	4	5	0	5	2	129	133	6	4	0
85031	500	20	22	23	1	5	0	0	0	6	0	0	2	71	71	65	2	0
85032	2000	7	48	17	7	22	0	0	0	6	0	6	2	107	107	5.54	4	0
85033	500	5	9	7	0	0	2	0	1	5	0	1	2	24	25	23	2	0
85035	600	2	1	2	0	1	0	0	0	6	0	0	2	6	6	-	2	0

Appendix A2.2 (continued).

LA No.	Area (sq m)	Primary	Secondary	Decorti-cation	Biface	Angular Debris	Cores	Ground Stone	Sherds	Period	Features	Tools	Org	Chipped Stone Total	Total Artifacts	Reduction Index	Size Range	No. of Features
85551	1360	52	156	97	41	47	14	0	7	5	0	40	2	447	454	3.94	3	0
85552	770	3	8	8	0	5	0	0	1	5	0	4	2	28	29	4.75	2	0
85554	96	2	6	2	0	2	6	0	0	6	0	2	2	20	20	8	1	0
85558	500	4	10	12	0	3	3	0	11	5	0	2	2	34	45	14.5	2	0
85559	384	6	6	7	0	2	4	0	0	6	0	1	2	26	26	23	1	0
85561	1760	41	67	50	7	16	13	0	0	6	0	24	2	218	218	5.52	3	0
85562	1500	12	22	11	1	22	7	0	0	6	0	4	2	79	79	10.4	3	0
85563	1820	37	62	15	7	18	7	0	0	6	0	9	2	155	155	7.56	3	0
85564	540	17	67	20	20	19	4	0	0	6	0	14	2	161	161	3.18	2	0
85566	960	7	4	4	0	8	5	0	1	5	0	8	2	36	37	2.5	2	0
85567	900	10	13	10	2	12	10	0	0	4	0	4	2	61	61	7.17	2	0
85568	2000	22	30	16	11	10	6	0	0	6	0	8	2	103	103	3.89	4	0
85576	1050	12	28	24	2	9	4	0	0	6	0	0	2	79	79	34	3	0
85579	660	25	35	40	3	15	7	0	2	5	0	3	2	128	130	17.83	2	0
85583	20	7	14	12	0	11	2	0	0	6	0	1	2	47	47	35	1	0
85584	616	7	21	17	0	9	5	0	0	6	0	4	2	63	63	12.5	2	0
85585	100	10	21	18	0	8	4	0	0	6	0	3	2	64	64	17.67	1	0
85590	800	9	13	10	0	7	2	0	7	5	2	2	2	43	50	17	2	2
85591	600	9	8	12	1	8	1	0	0	6	1	3	2	42	42	7.5	2	1
85596	1050	18	9	21	1	7	5	0	0	6	0	5	2	66	66	8.83	3	0
85598	1050	5	7	7	1	2	0	0	0	6	0	2	2	24	24	6.33	3	0
85606	11,000	40	67	83	4	21	15	0	27	5	0	12	2	242	269	12.81	4	0
85609	1408	24	22	16	2	17	11	0	0	6	0	2	2	94	94	18.25	3	0
85611	3900	75	85	86	5	35	42	0	0	6	0	17	2	345	345	13.09	4	0
85612	2700	21	27	24	0	21	3	0	0	6	0	8	2	104	104	9.38	4	0
85620	1500	6	13	11	1	4	2	0	1	5	0	4	2	41	42	6.4	3	0
85621	2700	33	112	49	9	24	3	0	0	6	1	8	2	238	238	11.59	4	1
85622	1600	20	75	51	11	15	5	0	0	5	0	14	2	191	191	6.04	3	0
85627	594	7	9	8	0	2	0	0	0	6	0	5	2	31	31	4.8	2	0
85629	1050	6	23	7	0	2	2	0	0	6	0	1	2	41	41	38	3	0
85634	2800	31	91	51	9	32	13	0	0	6	3	25	2	252	252	5.47	4	3
85637	900	8	9	18	0	6	3	0	0	6	0	7	2	51	51	5.43	2	0
85638	36	6	30	24	0	9	1	0	1	5	0	1	2	71	72	61	1	0
85642	540	8	11	21	1	7	7	0	3	5	1	5	2	60	63	7.83	2	1
85646	1400	30	35	71	2	14	11	0	0	6	0	2	2	165	165	36.75	3	0
86130	2000	14	10	20	1	3	8	0	1	5	4	3	2	59	60	13	4	4
86131	6500	10	41	9	1	9	7	0	2	5	0	0	1	77	79	67	4	0
86133	306	1	2	7	0	3	0	0	0	6	0	2	2	15	15	5	1	0

Appendix A2.2 (continued).

LA No.	Area (sq m)	Primary	Secondary	Decorti-cation	Biface	Angular Debris	Cores	Ground Stone	Sherds	Period	Features	Tools	Org	Chipped Stone Total	Total Artifacts	Reduction Index	Size Range	No. of Features
86139	1400	9	41	15	11	16	2	0	0	2	1	4	1	98	98	4.47	3	1
86143	672	10	9	14	0	9	3	0	0	6	0	2	2	47	47	18	2	0
86147	2700	4	14	1	0	2	0	0	14	5	0	2	1	23	37	9.5	4	0
86149	1050	1	44	0	31	1	0	0	0	6	0	0	1	77	77	1.45	3	0
86150	1050	6	6	4	0	5	4	2	54	5	2	3	1	28	84	6.67	3	2
86150	525	3	8	5	1	1	3	4	10	5	3	0	1	21	35	19	2	3
86150	1696	2	7	3	1	5	1	1	5	5	1	2	1	21	27	4.33	3	1
86150	625	2	1	1	0	2	0	0	40	5	1	1	1	7	47	4	2	1
86151	4950	10	10	5	0	5	4	0	2	5	0	1	1	35	37	29	4	0
86152	2200	12	38	14	1	21	3	1	0	6	0	3	1	92	93	16.75	4	0
86155	1050	9	18	4	0	6	1	0	10	5	0	2	1	40	50	16	3	0
86156	1400	10	57	13	4	54	2	0	5	5	0	1	1	141	146	16.4	3	0
86159	120	0	2	0	1	7	0	0	569	5	1	0	1	10	579	2	1	1
86159	400	4	72	17	7	14	3	0	0	5	1	7	1	124	124	6.86	1	1
86160	256	9	14	11	0	4	1	0	28	5	1	0	1	39	67	-	1	1
98678	25	2	6	0	0	2	2	0	0	6	0	0	1	12	12	-	1	0
98679	1050	5	18	2	0	4	1	0	0	6	0	0	1	30	30	-	3	0
98680	250	10	77	13	5	19	3	1	3	5	0	0	1	127	131	20.6	1	0
98681	375	4	9	1	0	10	0	0	0	6	0	0	1	24	24	-	1	0
98682	2100	3	11	2	0	5	1	0	6	5	0	0	1	22	28	-	4	0
98683	520	0	0	1	0	0	0	0	11	5	0	0	1	1	12	-	2	0
98684	600	3	6	0	0	0	1	0	0	6	1	0	1	10	10	-	2	1
98685	759	0	7	0	1	0	0	0	0	6	2	1	1	9	9	3.5	2	2
98686	32	1	10	0	0	2	0	0	0	6	0	0	1	13	13	-	1	0
98687	900	4	7	2	0	7	2	0	11	5	0	0	1	22	33	-	2	0
98688	2250	0	0	2	0	0	0	0	28	5	0	0	1	2	30	-	4	0
98688	810	136	517	103	5	259	14	0	2771	5	2	19	1	1053	3824	32.08	2	2
98688	4800	18	33	8	1	10	5	0	318	5	0	0	1	75	393	64	4	0
98689	180	0	23	2	11	4	0	0	0	6	0	0	1	40	40	2.27	1	0
98690	450	0	6	2	3	2	0	1	49	5	1	0	1	13	63	2.67	1	1
98690	160	0	1	0	0	0	0	1	92	5	0	0	1	1	94	-	1	0
98690	225	2	6	1	1	3	0	0	0	6	1	0	1	13	13	9	1	1
98690	225	0	10	0	4	1	0	3	20	5	0	0	1	15	38	2.5	1	0
98691	465	0	3	1	0	0	0	0	6	5	0	1	1	5	11	4	2	0
98692	2000	1	9	0	3	3	0	0	0	6	0	0	1	16	16	3.33	4	0
98693	880	0	6	1	0	1	0	0	1	5	0	1	1	9	10	7	2	0
98861	2290	1	8	4	0	12	2	0	2	5	0	1	1	28	30	15	4	0

Period: 1 Early Archaic, 2 Middle Archaic, 3 Late Archaic, 4 Late Archaic, 5 Latest Archaic, 6 Pueblo.
Org = Organization: 1 OAS, 2 Southwest Archaeological Cons
Size range (sq m): 1 36–1499, 2 1500–2999, 3 3000–5999, 4 6000–40,000.
No. of features: 5 = 5 or more.

Table A2.3. Site and artifact data by class

LA No.	Size (sq m)	Features	Chipped Stone	Sherds	Cores
61282	36-1499	None	1-49	0-29	0
61284	36-1499	None	1-49	0-29	0
61306	36-1499	None	1-49	0-29	0
61325	36-1499	None	1-49	0-29	1-5
84780	36-1499	None	1-49	0-29	1-5
85023	36-1499	None	1-49	0-29	0
85033	36-1499	None	1-49	0-29	1-5
85552	36-1499	None	1-49	0-29	0
85558	36-1499	None	1-49	0-29	1-5
85566	36-1499	None	1-49	0-29	1-5
86155	36-1499	None	1-49	0-29	1-5
98683	36-1499	None	1-49	0-29	0
98687	36-1499	None	1-49	0-29	1-5
98690	36-1499	None	1-49	0-29	0
98691	36-1499	None	1-49	0-29	0
98693	36-1499	None	1-49	0-29	0
85011	36-1499	None	1-49	30-99	1-5
98690	36-1499	None	1-49	30-99	0
84749	36-1499	None	50-99	0-29	1-5
84759	36-1499	None	50-99	0-29	1-5
85545	36-1499	None	50-99	0-29	1-5
85638	36-1499	None	50-99	0-29	1-5
61297	36-1499	None	100-299	0-29	1-5
84753	36-1499	None	100-299	0-29	1-5
85009	36-1499	None	100-299	0-29	6-10
85018	36-1499	None	100-299	0-29	1-5
85579	36-1499	None	100-299	0-29	6-10
86156	36-1499	None	100-299	0-29	1-5
98680	36-1499	None	100-299	0-29	1-5
85551	36-1499	None	300-1200	0-29	11 or more
61315	36-1499	1-2	1-49	0-29	0
61323	36-1499	1-2	1-49	0-29	1-5
85590	36-1499	1-2	1-49	0-29	1-5
86160	36-1499	1-2	1-49	0-29	1-5
86150	36-1499	1-2	1-49	30-99	1-5
86150	36-1499	1-2	1-49	30-99	0
98690	36-1499	1-2	1-49	30-99	0
86159	36-1499	1-2	1-49	100-2771	0
61321	36-1499	1-2	50-99	0-29	1-5
85642	36-1499	1-2	50-99	0-29	6-10
86159	36-1499	1-2	100-299	0-29	1-5
84759	36-1499	1-2	100-299	30-99	6-10
108902	36-1499	1-2	300-1200	0-29	1-5
98688	36-1499	1-2	300-1200	100-2771	11 or more
86150	36-1499	3-6	1-49	0-29	1-5
61299	36-1499	3-6	50-99	0-29	0
61290	36-1499	3-6	50-99	30-99	1-5
61304	1500-2999	None	1-49	0-29	0
61307	1500-2999	None	1-49	0-29	0
61308	1500-2999	None	1-49	0-29	0
61319	1500-2999	None	1-49	0-29	1-5
61328	1500-2999	None	1-49	0-29	1-5
85620	1500-2999	None	1-49	0-29	1-5
86147	1500-2999	None	1-49	0-29	0
98682	1500-2999	None	1-49	0-29	1-5

Table A2.3 (continued)

LA No.	Size (sq m)	Features	Chipped Stone	Sherds	Cores
98688	1500-2999	None	1-49	0-29	0
98861	1500-2999	None	1-49	0-29	1-5
61313	1500-2999	None	50-99	0-29	1-5
61329	1500-2999	None	50-99	0-29	1-5
61314	1500-2999	None	50-99	30-99	6-10
85029	1500-2999	None	100-299	0-29	6-10
85544	1500-2999	None	100-299	0-29	11 or more
85622	1500-2999	None	100-299	0-29	1-5
111364	1500-2999	None	100-299	0-29	1-5
61289	1500-2999	1-2	1-49	0-29	0
86150	1500-2999	1-2	1-49	0-29	1-5
84764	1500-2999	1-2	1-49	30-99	0
61316	1500-2999	1-2	100-299	0-29	11 or more
113954	1500-2999	1-2	100-299	0-29	6-10
86130	1500-2999	3-6	50-99	0-29	6-10
86151	3000-5999	None	1-49	0-29	1-5
61292	3000-5999	None	50-99	0-29	1-5
61312	3000-5999	None	50-99	0-29	1-5
86134	3000-5999	None	50-99	0-29	1-5
98688	3000-5999	None	50-99	100-2771	1-5
85008	3000-5999	None	100-299	0-29	11 or more
85570	3000-5999	None	300-1200	0-29	11 or more
84783	3000-5999	1-2	1-49	100-2771	0
61322	3000-5999	1-2	50-99	0-29	6-10
84784	3000-5999	1-2	50-99	0-29	1-5
84785	3000-5999	3-6	1-49	100-2771	1-5
61293	3000-5999	7 or more	1-49	0-29	1-5
61298	6000-40,000	None	50-99	0-29	0
86131	6000-40,000	None	50-99	0-29	6-10
61305	6000-40,000	None	100-299	0-29	0
84773	6000-40,000	None	100-299	0-29	6-10
85606	6000-40,000	None	100-299	0-29	11 or more
61286	6000-40,000	None	100-299	30-99	11 or more
61318	6000-40,000	1-2	50-99	0-29	1-5
61320	6000-40,000	1-2	50-99	0-29	6-10
61296	6000-40,000	1-2	100-299	0-29	0
61287	6000-40,000	3-6	50-99	0-29	1-5
61302	6000-40,000	3-6	50-99	0-29	1-5