MUSEUM OF NEW MEXICO

OFFICE OF ARCHAEOLOGICAL STUDIES

ARCHAIC SEASONAL CAMPS AND PUEBLO FORAGING IN THE PIEDMONT: EXCAVATION OF TWO SMALL SITES, LA 61315 AND LA 61321, ALONG THE NORTHWEST SANTA FE RELIEF ROUTE, STATE ROAD 599 (PHASE 3), 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 LA 61315 and LA 61321. These two archaeological sites were along the right-of-way of the northwest Santa Fe Relief Route (State Road 599) within Santa Fe city limits. Both sites were within the area of the Santa Fe Estates/Tano Road interchange between Centerline Stations 144+00 and 146+00. The parcels containing LA 61315 and LA 61321 had not been acquired by the NMSHTD at the time of the excavation. Permission to enter and excavate was obtained from Santa Fe Estates, Inc., of Santa Fe, New Mexico. Funds provided by the New Mexico State Highway and Transportation Department and the Federal Highway Administration were used for this project.

Excavation of LA 61315 revealed three temporal components from the early Archaic and late Basketmaker II periods and the Coalition period. The early Archaic occupation consisted of a collapsed hearth and a profiled thermal feature. Deeply buried in the ancient colluvium, this small campsite remained from small-scale commensal hunting and gathering. The early Archaic and later Basketmaker II period component included the burned remains of a structure and 10 associated thermal features and pits. Abundant fire-cracked rock, chipped stone, and faunal remains suggested a domestic occupation. Archaeobotanical evidence indicated a probable early summer to winter occupation. The Coalition period occupation occurred at the same geomorphological level as the late Archaic-Basketmaker II component, but was radiocarbon-dated 1,000 years later. This large roasting or processing pit had few associated artifacts. It, along with the large feature from LA 61321, could represent staged ancestral Pueblo foraging.

Excavation of LA 61321 revealed one Coalition period thermal feature. This large rock-filled feature is similar to pits used to roast succulents found in southeastern New Mexico. No archaeobotanical or archaeofaunal remains were associated with this feature. Its size suggests large-scale processing such as might support large village populations participating in repeated seasonal foraging activities.

Two research domains outlined in the initial research design (Wolfman et al. 1989) were addressed with data recovered by excavation. These were the use of chippable stone and the role of small sites in the Santa Fe River Basin resident’s subsistence systems.

During the Archaic period, situating of camps and residences in the piedmont proximate to abundant gravel sources conferred the benefit of convenient access to raw materials for stone tool production as well as for the rock used in food processing and facility construction and manipulation. That all potential lithic raw materials were used during the late Archaic-Basketmaker II component occupation is apparent from the equal proportion of fine- and medium-grained and cortical and noncortical artifacts. During the Coalition period there is strong evidence for testing, initial reduction, and replacement of tool raw materials, which is also true for general site scatter assemblages. Distributions indicate that assemblages accumulated from repeated visits rather than from a few isolated reduction or procurement episodes.

Subsistence strategies, as reflected by feature variability through time, were examined for each component. The features from the three temporal components reflect fundamental changes in settlement and subsistence. The early Archaic period is represented by two thermal features in poor condition that are associated with the most mobile and least sedentary settlement pattern. The late Archaic-Basketmaker II features reflect the variability resulting from a residential occupation established on the piedmont. Larger features with unique structure or content tend to be outdoors, while indoor features are smaller and have less content variability. Finally, the Coalition period features are considerably larger than earlier features, exhibit evidence of reuse, and may reflect the need to increase foraging capacity. Increased foraging capacity could have resulted in an intermediate step of in-field processing or drying before the energy-bearing, nutritive, or useful products are transported to the village for consumption.

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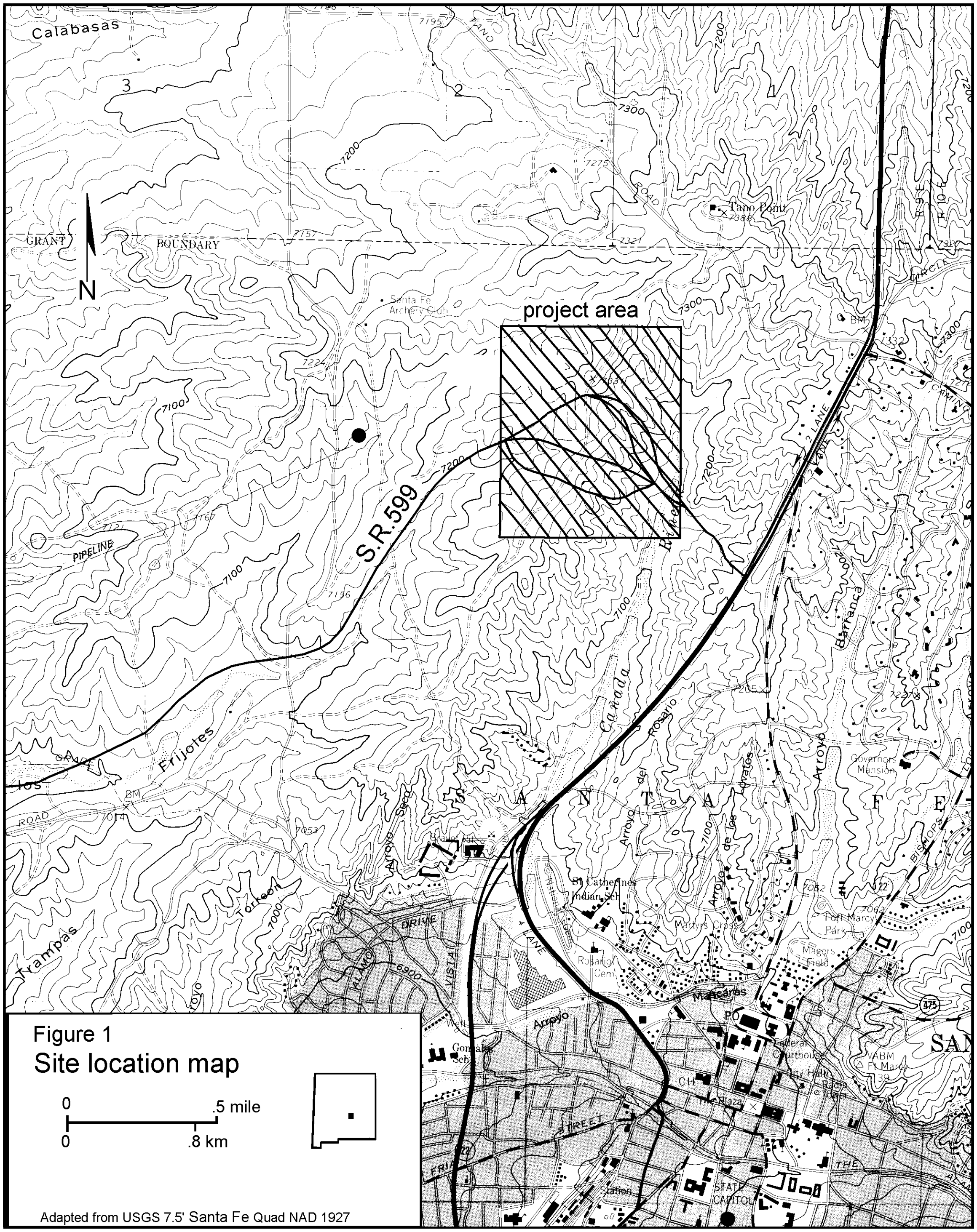
INTRODUCTION

The Office of Archaeological Studies (OAS), Museum of New Mexico, conducted archaeological excavations of LA 61315 and LA 61321. These two archaeological sites were along the right-of-way of the Northwest Santa Fe Relief Route (State Road 599) within Santa Fe city limits. Both sites were within the area of the Santa Fe Estates/Tano Road interchange between Centerline Stations 144+00 and 146+00 (Fig. 1).

LA 61315 is in the south portion of the right-of-way and LA 61321 is in the north portion of the right-of-way. The excavation was conducted according to the data recovery plan outlined in *The Santa Fe Relief Route: Initial Results and Data Recovery Plan, Santa Fe County, New Mexico,* by Daniel Wolfman, Timothy D. Maxwell, David A. Phillips, Jr., Joan Gaunt, and Mollie Toll. Excavation of LA 61315 was conducted between April 25, 1995, and June 15, 1995. Excavation of LA 61321 was conducted between June 2 and June 16, 1995, and November 11 and December 6, 1995.

The parcels containing LA 61315 and LA 61321 had not been acquired by the NMSHTD at the time of the excavation. Permission to enter and excavate was obtained from Santa Fe Estates, Inc., of Santa Fe, New Mexico. Funds provided by the New Mexico State Highway and Transportation Department and the Federal Highway Administration were used for this project.



project area
S.R.599
N
Figure 1
Site location map
0
.5 mile
0
.8 km
Adapted from USGS 7.5' Santa Fe Quad NAD 1927

MODERN AND PALEOENVIRONMENT

Modern Environment

The project area is within a structural subdivision of the Southern Rocky Mountain physiographic zone (Folks 1975:110). The basin is bounded on the west by the Jemez Mountains and to the east by the Sangre de Cristo Mountains. 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 for 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.

Local topography alternates among nearly level piedmont table land, rolling gravel terraces, and steep, rocky slopes. The major drainage is the Santa Fe River with four major tributaries, Cañada Rincon, 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 Pueblo period, although no evidence of fields or field structures has been identified (Post 1996b). 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 site location pattern that is repeatedly evident along the Northwest Santa Fe Relief Route (Post 1997) and in the Las Campanas area (Post 1996b; Lang 1996).

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-thick 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 with greatest depth 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 suggest 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 1996b). Deeply buried cultural deposits may co-occur with later near-surface deposits or they may be visible as a faint, gray-colored 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, 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 B.C. (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 1997).

An important environmental factor that seems to have a strong influence on the structure of the piedmont archaeological record is the relative abundance of lithic raw material suitable for core reduction and tool manufacture. Exposed along the 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 from the middle to the 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 that 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, igneous, and metamorphic materials. There is differential distribution of suitable lithic raw materials throughout the piedmont hills with particularly thick deposits noted along the Arroyo de los Frijoles (Lang 1996). 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 as described by Kelley (1980) are common within the Northwest Santa Fe Relief Route project area: piñon-juniper woodlands and the rabbitbrush community. Other important plant communities include the grassland community that extends to the edge of La Bajada and the riparian environment of the Santa Fe River. Together these plant communities would have provided a diverse array of floral resources for prehistoric populations.

Within the project area, the piñon-juniper woodland is the dominant plant community covering an estimated 80 percent of the land. Piñon-juniper woodlands had 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 context include yucca, prickly pear and pin cushion cacti, *Chenopodium* sp., *Amaranthus* sp., and Indian ricegrass. Wetterstrom (1986) suggests that intensive gathering of these species might off-set 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. Total available economic plant species of the piñon-juniper woodland project high wild resource productivity, but conditions that favor grasses and shrubs might off-set piñon-juniper productivity.

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 run-off, 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). Mammals most abundant on the piedmont would have been cottontail and black-tailed jackrabbit, a variety of squirrels, rats, mice, and gophers, prairie dogs, coyote, and mule deer. Pronghorn would have roamed the shortgrass plains. 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, during the

Pueblo period, Lang and Harris (1984) suggest that 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 that produce severe runoff and reduce usable moisture. The area receives a range of 229 to 254 mm of precipitation per year and a mean snowfall of 356 mm (Kelley 1980:112). The growing season ranges from 130 to 220 days and averages 170 days. The last spring frost usually occurs in the first week of May and the first fall frost occurs around the middle of October. The mean yearly temperature is 10.5 degrees C.

Paleoenvironment

Paleoenvironmental reconstructions for the northern Rio Grande are few. 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 Pueblo period investigations, but the sequence starts at A.D. 985. Therefore, early Developmental period and earlier occupation of the Santa Fe area lack detailed climatic reconstruction allowing more fine-grained examination of relationships among environment and settlement and subsistence patterns. More general paleoclimatic reconstructions are available for the early Archaic to early ancestral Pueblo occupations of the Santa Fe piedmont and northern Rio Grande.

The earliest evidence for occupation in the Santa Fe area dates from 7,000 to 5,000-4,000 B.P., 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 suggested to be warmer and drier than the 4,000 years that followed. However, Mehringer's study of the southern Basin-and-Range pollen record (1967) 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 intrusion of 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 grass lands, 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, making fine-grained reconstructions impossible (Wills 1988:53).

More recent geomorphological study in the Jemez Mountains has shown that from 9,000 B.P. 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 more recent times, but the topography and physical landscape may have been considerably different from what has existed for the last 2,000 years. An additional effect that these prolonged periods of landscape instability may have on the archaeological record is that cultural deposits from 6,200 to 3,500 B.P. may be differentially preserved. This span from the early to middle Archaic may be represented by a site distribution that does not necessarily reflect human settlement patterns as much as the accumulative 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 7,000 B.P., piñon-juniper woodlands were in place in northern latitudes or southern highland settings indicating that 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 Jemez Mountains). Archaeological inventory in the Santa Fe piedmont has identified archaeological deposits in association with deeply buried outcrops of Tesuque sandstone exposed in more recent arroyo cuts or erosion channels (Anschuetz and Viklund 1997). 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 4,000 B.P., the climate was substantially similar to modern climate in the ranges of precipitation and temperature (Antevs 1955). Evidence of this climatic regimen 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 5,000 to 3,500 B.P. (Powers 1939; Cully 1977:97). Palynological evidence from western New Mexico and eastern Arizona suggest that between 4,000 B.P. and 3,000 B.P., light summer rains were more prevalent with a winter-dominant precipitation pattern. From 3,000 to 500 B.P. there was a return to a summer-dominant precipitation pattern typified by heavy rains. Periodicity in precipitation and rainfall is indicated in the pollen record by a span of increased summer rainfall from 3,400 to 2,800 B.P.; decreased annual precipitation with cooler temperatures between 2,800 and 2,500 B.P.; warmer temperatures and more precipitation between 2,500 and 2,300 B.P.; warmer temperatures with less precipitation between 2,300 and 2,100 B.P.; and a return to cool temperatures with more precipitation between 2,100 and 1,600 B.P. (Peterson 1981).

The length of these periods of different temperature and moisture regimens is generalized and the variation within any of the 200 to 500-year spans undoubtedly is comparable to the more recent record provided by Rose et al. (1981) for Arroyo Hondo Pueblo. The importance of the variability within the long-term patterns for late Archaic populations is the effect on the distribution and abundance of food sources. 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 the effect on biotic community range include an extension of shortgrass plains with an increase in summer available seeds and increased or greater distribution of antelope herds. Extension of piñon-juniper woodlands would result in a decrease in local antelope, but an increase in mule deer range and the fall piñon nut harvests.

Late Archaic base camps occur at the edge of the short-grass plains and in the upland piñon-juniper wood lands after 2,500 B.P. (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 B.C. and A.D. 400. His (Lang 1977:328-329) climatic reconstruction identifies the periods from 50 B.C. to A.D. 200 and from A.D. 250 to 400 as the best for a hunting and gathering adaptation. 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 game mammals. These favorable intervals promoted late Archaic-Basketmaker II settlement in the area and may have increased or experienced more frequent reoccupation of base camps.

A climate reconstruction for the last 2,000 years was completed for the El Malpais area in west-central New Mexico (Grissino-Mayer 1995). A recent dissertation by Robert Dello-Russo summarizes the climatic reconstructions for the period from A.D. 81 to 660 (1999:48-54). Three major periods were recognized in the study: A.D. 81-257, A.D. 258-520, and A.D. 521-660. Without going into detail for each period, they can each be briefly summarized. From A.D. 81 to A.D. 257, there was increased variability and rapid shifts in precipitation. This unpredictability was accentuated by severe drought periods and periods of extreme precipitation. The driest years were from A.D. 145 to A.D. 170. A.D. 258 to A.D. 520 was characterized as the most severe drought period over the 2,219-year record. Major drought periods occurred from A.D. 300 to 395 and A.D. 419 to 489. These periods may have stressed the Basketmaker II populations of the middle Rio Grande and Colorado Plateau periphery. In response to decreased biotic resources, subsistence foci may have changed. Stress could have resulted in changing subsistence strategies or seasonal movements extending into wetter and less affected areas, perhaps north into the upper reaches of the Rio Grande Valley and its tributaries. From A.D. 521 to A.D. 660, the drought conditions subsided and were replaced with generally favorable conditions, but high unpredictability and variability occurred during much of the period. A.D. 570 to 660 may have been the best suited to seasonal foraging and potentially 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 A.D. 258; drought, A.D. 258 to 520; and post-drought, A.D. 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 solutions for 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 returned to suitable levels.

Pueblo period occupation of the Santa Fe River is most evident after A.D. 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 and temperature combined with soil type are three environmental factors that influence plant and animal productivity and distribution, and the probability of success for irrigation and dry-farming techniques. Prior to A.D. 1050, low population density permitted mobility as an option when crop and wild resource productivity were low. After A.D. 1050, settlement of the Santa Fe River and other major drainage basins in the northern Rio Grande increased and mobility options may have decreased. Availability and distribution of critical resources as influenced by an unpredictable climate may have strongly affected the timing and rate of community growth and continued settlement viability.

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. Between A.D. 1050 and 1450, periods of greater than average spring precipitation occurred; these were between A.D. 1050 and 1080, A.D. 1195 and 1210, A.D. 1290 and 1340, A.D. 1390 and 1415, and A.D. 1430 and 1435 (Rose et al. 1981:98-99). These would have been periods when agricultural productivity could have surpassed the average, and established villages could have increased population or increased stored 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 A.D. 1250 and 1290 there were more bad years than good, and this is the time that the Coalition settlement was established at Pindi Pueblo (Rose et al. 1981; Ahlstrom 1989).

Throughout the Coalition period (A.D. 1175 to 1350) the piedmont hills would have been used as resource abundance permitted. Consecutive good years may have boosted piñon nut crops resulting in intensive gathering. Poor years might have hampered 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. Timing of environmental effects and the formation of sites may be difficult to correlate, but clearly they were strongly intertwined.

CULTURAL-HISTORICAL BACKGROUND

This cultural-historical background is provided as a context for interpreting the archaeological record found at LA 61315 and LA 61321. It includes discussion of key issues for each period represented by the excavations and a brief description of available archaeological data from the Santa Fe River Basin and nearby areas. It is not intended to be exhaustive, but is a sampling of the state of our current knowledge.

Early Archaic in the Northern Rio Grande

The early Archaic as it is used in the northern Southwest begins at 7,000 to 8,000 B.P. It marks the transition from early Holocene big-game hunting to a more 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, studies by A. E. B. Renaud (1942, 1946) and Kenneth Honea (1971) offered the earliest evidence for assessing 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 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 with a replacement by a more generally adapted hunter-gatherer population initially referred to as the Desert Culture (Irwin-Williams 1979, 1994).

Since support for each side was 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 overlooks the broad Santo Domingo Basin, covering 300,000 sq m, and exhibiting a wide array of tools and manufacture debris suggesting a repeatedly occupied hunting camp, perhaps geared to summer exploitation of large game herds and June maturation of Indian ricegrass (Hicks 1982). Renaud's sites in the San Luis Valley in southern Colorado evidenced a more balanced subsistence and a more northern environmental setting with a wide range of dart points associated with large mammal bones and one-hand manos. Two environmental settings, evidence for technological variability, and evidence of periodic reuse, suggest a long-term occupation history.

A continued reliance on projectile point styles and surface finds biased our interpretation of early Archaic settlement and subsistence patterns. This situation could only be remedied by excavation data and absolute dates. Enter the OLE project conducted by TRC, Inc., from 1991 to 1993 (Acklen 1997) (Fig. 2). This large-scale, cultural resource management-driven, archaeological project examined 33 sites consisting of surface artifact scatters with features along an 87-km-long corridor (Acklen 1997) across the northern Rio Grande from the Abiquiu area to the southern Jemez Mountains. A detailed geomorphological study combined with 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 ranging from 4300 to 6100 B.C. These features and associated dates documented long-term early Archaic use of the northern Jemez Mountains that spanned the Paleoindian-Archaic transition. Unfortunately, these dated features were the earliest components on sites that exhibited occupation for as long as 6,000 years. The resultant occupational palimpsest yielded few artifacts that could be unequivocally associated with these features. In contrast, the Bajada type site has hundreds of pieces of manufacturing debris and tools indicating that large assemblages are possible if not common (though the site has suffered from

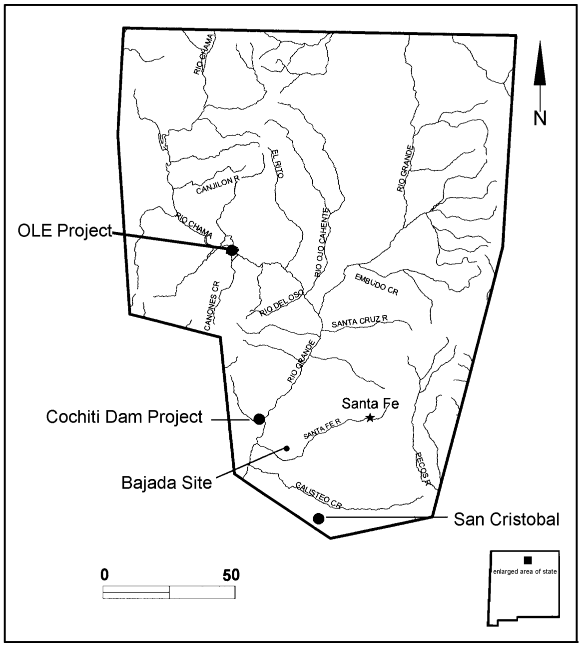


Figure 2. Selected projects in the northern Rio Grande.

mixed deposits as well). The OLE early Archaic hearths were thought to remain from small groups that used higher elevation hunting territories while they maintained access to the lower biomass resources of the piñon-juniper forest (Hudspeth 1997; Acklen 1997). In other words, by 6100 B.C. early hunter-gatherers were in the Jemez Mountains and were returning regularly. Depending on the setting, their hearths were just as likely to be near the surface as buried a meter below it.

Roughly concurrent with the distribution of the OLE project report, Kurt Anschuetz, then with Southwest Archaeological Consultants (1998), excavated small buried sites in the piñon-juniper piedmont north of the Santa Fe River (Fig. 2). These sites were located 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 B.C. calibrated, but no associated artifacts. This further reinforced the OLE pattern that early Archaic occupations could be near the surface and ephemeral, and added the twist that to document early Archaic settlement, isolated hearths need to be investigated and not written off as having no data potential.

Hearths without artifacts located near the surface, deeply buried deposits with features, and nonlocal materials and dart points that predate most conventional chronologies define the early Archaic of the northern Rio Grande. Radiocarbon dates indicate that the Jay to San Jose occupation sequence was continuous and there is no apparent evidence to believe that the Rio Grande culture as first described by Renaud did not develop out of a Paleoindian tradition. Evidence for reoccupation of this small sample of locations indicates that early Archaic populations were well aware of the best places to live–a knowledge that could only have accumulated from a long and unbroken history of occupation. Except for large, multicomponent hunting sites, initial indications of early Archaic settlement in the northern Rio Grande are subtle, and can easily be confused with later or even noncultural deposits.

En Medio to Basketmaker II Periods

Between 800 B.C. and A.D. 400-600, during the En Medio to Basketmaker II periods in the northern American Southwest, important changes in settlement patterns and subsistence strategies are recognized in material culture and subsistence data, site structure, and site distributions. 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, technological organization focused more on expedient tool manufacture, and more formal facilities, such as pit structures and storage pits, were constructed (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 that 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).

In defining and distinguishing between the late Archaic and Basketmaker II cultural adaptations on the Colorado Plateau and within and adjacent to the middle Rio Puerco and Rio Grande valleys much interest has focused on the importance of agriculture. To most researchers, the combination of corn or cultigens, material culture evidence for increased occupation duration, and the presence of triangular-bladed, corner-notched dart points represent a transition from Archaic hunter-gatherers to a recognizable antecedent of the ancestral Anasazi and Mogollon cultures. When was corn first incorporated into the Archaic hunter-gatherer diet? How did corn come into the future homeland of the ancestral Pueblo populations long known as the "Anasazi" by Southwestern archaeologists? Why was corn 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-environmental context was early evidence of corn found and what does it mean in terms of seasonal mobility and economy? Hypotheses and theories that offer explanations and answers to these questions rely on combinations of environmental conditions and cultural factors for independent and dependent variables and other conditioning factors.

Often early corn comes from archaeological contexts that are disturbed or are 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 often they are the best source for early corn. Early excavations of cave sites produced assemblages that were used to develop material culture trait lists that may characterize the spatial extent and time depth of a particular aspect of hunter-gatherer economy and organization leading up to and incorporating the adoption of corn (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. More abundant, as cultural resource management archaeological investigations repeatedly have demonstrated, are open-air sites, which comprise an important component of the late Archaic–Basketmaker II archaeological record. This situation is acutely evident in the northern Rio Grande, where excavated and documented cave sites, with a few notable exceptions (Alexander and Reiter 1935; Ford 1975; Hubbell and Traylor 1982), 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 period sometime between 1200 and 500 B.C. In this model, migrating Cochise populations moved north into the western and central Colorado Plateau after 1800 B.C. filling a void left by earlier San Jose or Armijo populations, as they are defined by Irwin-Williams (1979). Matson (1991:184-202), during what he terms the "Latest or Terminal Archaic," cites the paucity of Armijo and En Medio style projectile points as evidence for low population or a population void that was filled by San Pedro or Gypsum Cave projectile point-bearing people 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 B.C.

Irwin-Williams's model of the transition to and adoption of agriculture is based on seminal work in the middle Rio Puerco Valley (1973, 1979; Matson 1991). There, excavations revealed the presence of maize during the late Armijo or early En Medio phases (1200 to 800 B.C.). This early occurrence of maize was followed by an unbroken occupation sequence that exhibited a settlement and subsistence pattern equivalent to the Basketmaker III period defined for the Colorado Plateau. This unbroken sequence was hypothesized as evidence for in situ development of the Anasazi culture in the middle Rio Puerco Valley, which was considered 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 unknown. If maize moved gradually up the Rio Grande from the southern Basin-and-Range region, one would expect to find earlier corn 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 that 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 that, when combined with suitable environmental conditions, produced corn and the evidence for corn use found in the middle Rio Puerco Valley archaeological record. Acquisition of seeds and agricultural technology through trade or marriage would allow for the large distance interval between early dated and later dated maize-bearing sites in 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 slightly different 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 that, "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 co-existed with northward migrating Cochise Basin-and-Range populations. The knowledge and technology needed to grow corn may have been available to northern Rio Grande populations, and in fact 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) considers the Basin-and-Range or "migration model" as having the closest agreement with the archaeological record, supporters of Irwin-Willams's (1973) Anasazi origins or in situ model of the middle Rio Puerco would be less accepting. 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 minimal evidence for the early introduction of corn 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) for the Rio Rancho phase, defined by Reinhart (1968). Matson considers the Rio Rancho phase archaeological evidence as "the furthest afield, off the Colorado Plateau on the outskirts of Albuquerque, New Mexico (fig. 2.22), and in many ways it is the weakest candidate for Basketmaker II (Matson 1991:70)." Matson cites the informal nature of the shallow pit structure, the absence of storage features and an antechamber, and no direct evidence of maize use as "… possessing compelling few similarities to, and a number of significant differences from, other Basketmaker II material" (Matson 1991:71). 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. Though direct evidence of corn was not found, the metates were characterized as the "long-stroke" variety that was commonly associated with corn grinding. Similarities between the Rio Rancho phase materials and the Cochise San Pedro reaffirms how difficult it is to define the latest Archaic and Basketmaker II age materials of the middle and northern Rio Grande in terms of the Basketmaker II-III transition.

In Reinhart's developmental scheme (1967:469), 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, instead. 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 A.D. 700, the Rio Rancho area was 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 hunter-gatherer settlement and subsistence, the transition to maize use, and the establishment of permanent settlements in the northern Rio Grande. If Matson (1991) was 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, 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 B.C. 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 evidenced 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 the span from 380 B.C. to A.D. 400 to the Basketmaker II period, which is 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 (Lang 1977:342). Some sites were reused, a practice that was not evident for earlier or later sites up until A.D. 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 B.C. to A.D. 200 and from A.D. 250 to 400 may have been the best for a hunting and gathering adaptation. 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 would have supported a more abundant and diverse plant community with 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, multi-year 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 in the eastern Galisteo Basin (1977), 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 mini-camps used by a single commensal group. The artifact distributions formed arcs enclosing 3 to 4 m of open space with the hearths at the apex of the arc associated with fire-cracked rock concentrations. 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 having 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 with larger debris forming the discard arc. The unpatterned distribution of tools and manufacture debris indicated that manufacture and processing activities were not spatially segregated. Locations were primarily represented by early stage core reduction debris that was distributed in a circular pattern reflecting a single 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 using a core-flake reduction technique. Obsidian mainly occurred 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 for the late Archaic period at Cochiti Reservoir was summarized as a ". . . picture of 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 for 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 for gearing up or an intense biface manufacturing industry suggests that the group(s) moved to areas where raw material was available. The limited evidence for biface production also suggests that anticipated activities and tool needs between base camps could be supported by flake tools, existing formal tools, or by 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 different spatial-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 sites 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, sheltered, and supported productive, though relatively small-scale resource patches. Thus, more late Archaic to Basketmaker II sites would be expected.

The late Archaic-Basketmaker II site survey data as of 1994 for the Santa Fe area are presented in Post (1996a). These data are not the most current, but they provide a basic background 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 the Cañada de los Alamos to the south of Santa Fe (Lang 1992) and along the Santa Fe River suggest that certain lowland locations were repeatedly occupied for short periods by small groups over a long period of time. Basketmaker II sites are reported in all environmental zones from the Santa Fe River Valley to the foothills of the Sangre de Cristo Mountains. 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 from the Santa Fe area were identified as limited or temporary base camps and limited activity sites. Characteristics typical of these two site types are low numbers of or no processing facilities and equipment, a low density artifact scatter or 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 within the last five years have furnished evidence for longer duration occupation and frequent reuse or reoccupation of desirable locations. Pit structures have been excavated within the Tierra Contenta area (Schmader 1994a:83-88), in the vicinity of the National Cemetery in Santa

Fe (Kennedy 1998), north of the Santa Fe River in the Las Campanas area (Post 1996b). 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 B.C. and A.D. 900 suggesting that seasonal occupation of pit structures may have continued and may have coincided with the earliest Pueblo settlements recorded for the Santa Fe area and the northern Rio Grande region (Kennedy 1998; Post 1996a; Schmader 1994a).

Coalition Period

The Coalition period is marked by three major changes in the archaeological record in the northern Rio Grande: (1) a significant increase in the size and numbers of sites, suggesting an increase in population and an extension of the early village level organization noted in the late Developmental period; (2) pithouses as domiciles were replaced by contiguous arrangements of adobe and masonry surface rooms; and (3) a change in pottery-making technology from mineral paint to organic-based painted pottery. These changes were sufficiently distinct from the late Developmental period to warrant a new period in the Northern Rio Grande cultural sequence that was divided into two phases: Pindi (A.D. 1220-1300) and Galisteo (A.D. 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 during 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 are 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 miles) 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 LA 1 (Pindi Pueblo) and LA 2 (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 recognized two ceramic periods and three building periods (1953:155).

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 A.D. 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 A.D. 1305 and abandonment in 1350 (Ahlstrom 1989:376). It includes Stubbs and Stallings (1953) Building Periods 2 and 3. Building Period 2 occurred between A.D. 1305 and 1340 and it included two periods of growth (Ahlstrom 1989:375).

The early portion of Building Period 2 dated from A.D. 1305 to 1320. It was a period of slow growth with a possible occupation hiatus occurring between A.D. 1316 and 1321 (Ahlstrom 1989:375). During the latter portion of Building Period 2 Pindi Pueblo experienced rapid growth with an estimated 200 rooms constructed between A.D. 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). The third building period is suggested to have occurred late in the A.D. 1340s based on the tree-ring dates.

Pindi grew rapidly from A.D. 1320 to 1339. Building Period 1 rooms were remodeled or razed and numerous roomblocks were added to the village plan. The buildings were estimated to be one to four stories tall (Stubbs and Stallings 1953:31). The enlarged village enclosed two plazas, two surface kivas, and six specialized rooms that 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 then trash or dirt filled, and 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 corn agriculture was a major subsistence pursuit. Turkey pens were excavated showing that animal domestication was practiced. Stubbs and Stallings (1953) observed that there was little evidence of a stone tool industry, though this is in reference to formal tools and not tool manufacture debris. Obsidian and local chert, chalcedony, silicified wood, and quartzite were the most common raw materials. Most of the illustrated tools 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 show that the Pindi Pueblo inhabitants used an array of natural resources typical of the local ecozones. Faunal remains included 9 species of bird and 15 mammal species. The most abundant species was turkey, which was used for food, feathers, and as raw material for bone tools and ornaments. Large game mammals could have been obtained from the Galisteo Basin and the piñon-juniper piedmont. Curiously, no elk or bison bones were identified. This suggests that Pindi hunters had fairly restricted hunting ranges. Yucca was used for sandals, baskets, and mats. Macrobotanical specimens included corn, beans, and squash and wild plants, yucca, cactus, and amaranth.

Reasons for the abandonment of Pindi Pueblo are not offered by Stubbs and Stallings (1953). 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 that affected agricultural productivity. In the middle A.D. 1340s, there was a brief drought period that corresponds to the decline and eventual abandonment of Pindi Pueblo. Poor soil quality, variable precipitation, and perhaps degraded living conditions may have all combined to force the abandonment of Pindi Pueblo.

Limited excavations at the Agua Fria Schoolhouse site (LA 2), which appears to have flourished during the middle to late Coalition and early Classic periods, yielded more information on the prehistoric Santa Fe River community. Similar to LA 1, LA 2 was established sometime between A.D. 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 site size was estimated at 4.3 ha (11 acres) and may have housed between 1,000 and 2,000 people by the late A.D. 1300s (Lang and Scheick 1989:196). How many rooms were built, and by inference how many people occupied the village during the Coalition period, is unknown.

The LA 2 artifact assemblage is similar to LA 1. The temporal change in pottery style from Santa Fe Black-on-white to Wiyo Black-on-white to Galisteo Black-on-white is also similar (Lang and Scheick 1989:192). Trade wares from the Zuni-Acoma areas were the most common. 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).

Excavations at Las Campanas identified 37 Coalition period components, as defined by the presence of Santa Fe Black-on-white pottery (Lang 1996; 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). Numerous sites showed evidence of repeated occupations with multiple clusters of pottery and thermal features. No formal structures were identified, although 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 often were made from obsidian. Typically, the sites were located 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 through 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 that 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, while other locations might be more productive. Plant gathering and processing sites should have been located 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, which are rare in any site assemblage within the northern Rio Grande, were located 6 to 7 km distant from the villages suggesting that numerous activities were embedded in foraging organization (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 duration or daily use of the piedmont hills. Thermal features were mainly shallow, oval-shaped pits with cobble linings or fire-cracked rock moderately abundant to absent. 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 activities. 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.

LA 61315

Site Setting

LA 61315 is in the upland area of the Plains surface piedmont that extends west from the foothills of the Sangre de Cristo Mountains. It is 1.6 km southwest of and 30 m (100 ft) lower in elevation than Tano Point (2,253 m [7,388 ft]). It overlooks the Cañada Rincon on a southeast-facing slope of an elongated and highly dissected ridge. This ridge separates the Cañada Rincon and other drainages to the east from the Arroyo de los Frijoles and Arroyo Calabasas drainage systems. These more eastern drainages have their headwaters in the upper reaches of the Tano Divide, tend to be shorter in length than their western counterparts, and drain due south to southwest into the Santa Fe River.

Exposed on the site surface, especially upslope toward the ridge tops on the north and west, is a dense deposit of Ancha Formation gravel. These eroded gravel and cobble deposits have spread downslope and cover the cultural deposit. Below the cobbles is the deep alluvium of the Pojoaque-Panky Rolling association (Folks 1975:43). The top soil is 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. The cultural deposit within Area 2 is at the same stratigraphic level as the Tesuque Formation outcrop, suggesting that the outcrop was exposed at the time 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 dramatically over the last 6,500 years. It appears that the local physiography included intermittent areas of sandstone breaks that were incorporated into camp locations providing a natural shelter.

Vegetative cover within the immediate site area is sparse grasses, prickly pear, narrowleaf yucca, and a sparse to moderately dense overstory of piñon and juniper. From LA 61315, prehistoric occupants had access to a wide variety of plant communities on the ridge tops and slopes and in the floodplains of the numerous major and minor tributaries that drain the Plains surface piedmont.

The site is in a protected swale that is formed by two low, broad, east-to-west finger ridges and the slope of the main north-to-south ridge. This swale has a deep accumulation of reworked colluvial deposits that originate from Pojoaque-Panky Rolling association. This colluvial bench or swale is roughly 40 m in diameter and extends beyond the right-of-way to the south and east, where it contains deeply buried substantial and unexcavated cultural deposits. Obviously, this setting was chosen for occupation repeatedly over the course of 6,500 years. Currently the swale is bisected and drained by a 1- to 3-m-deep erosion channel that intermittently exposes Tesuque sandstone outcrops.

Pre-Excavation Site Description

LA 61315 site limits were originally defined as extending 18 m north-south by 17 m east-west as indicated by the artifact scatter (Wolfman et al. 1989:82-84). Besides the artifact scatter, a check dam and two ash stains were visible. A third stain was defined by auger tests. Three stains were located along the arroyo bank and ranged from .50 m to 4.0 m in diameter. The smaller stains were indicative of hearths. The large stain was attributed to the remains of multiple features or a structure. Fifty-three artifacts were piece-plotted and collected during the testing phase. These artifacts were primarily core reduction debris of local raw materials, such as chert, chalcedony, and quartzite.

Excavation Methods

LA 61315 was relocated and site limits were redefined by pinflagging the surface artifacts. The surface artifacts were piece-plotted, recorded, and collected from excavated areas.

A baseline for a 1-by-1-m grid system was established and expanded to include the stained feature areas visible along the arroyo cut within Excavation Area 1. The loose top soil and gravel was removed from 33 units further exposing the stain and defining the excavation area limits. Excavation of 103-104N/90E revealed a darkly stained cultural deposit that was divided into Stratum 2 and Stratum 3 based on soil color. These strata were followed as much as possible. Where stratum distinctions could not be made, 5- and 10-cm-deep arbitrary levels were used. In Grid 97N/94E, Stratum 4 was encountered below Stratum 1 (loose sandy-gravelly top soil). This mottled sandy loam was a transitional layer between the dark occupation Stratum 2 and Stratum 3 and the noncultural layer, Stratum 5. Stratum 4 was followed throughout the southeastern portion of the excavation area. It was excavated as a single level if it was less than 10 cm thick; otherwise, it was excavated in 10 cm levels.

Removal of Strata 1, 2, and 4 in Area 1 revealed the partial outline of a subterranean foundation and extramural features and activity space. Strata 1, 2, and 4 were screened through ¼-inch steel mesh. Stratum 3 and feature fill were screened through ⅛-inch steel mesh to capture the small biface reduction flakes and charred bone fragments. Within the subterranean structure foundation, Feature 1, all floor fill was screened through ⅛-inch screen. In addition, large soil samples (greater than 5 liters) were collected from floor fill proveniences for each grid within the structure, from intramural features, and from extramural features. Soil samples were collected from rich, charcoal-stained deposits associated with extramural features. Sample collection emphasized recovering charred economic plant remains, faunal remains, and microflakes that might be used to define activity space within the larger activity areas.

Once the features were defined, they were cross-sectioned to expose stratigraphy that might relate to function and to target additional soil sample collection. Complete excavation of a feature was followed by written description, profile and plan maps, and photographs. Features within the structure were excavated in profile and samples were collected from arbitrary and stratigraphic layers. Radiocarbon samples were collected from feature fill as large charcoal flecks were encountered.

Two other stained areas, Areas 2 and 3, were discovered during the project. These charcoal-infused soil stains were across the arroyo from and to the south of Area 1. Area 2 was a faint, charcoal-stained lens in the north bank of the arroyo below the level of the cultural deposit in Area 1. Area 3 was a surface charcoal stain at a similar elevation to the Area 1 cultural deposit. At the time that they were found in June of 1995, these areas were projected to be within the right-of-way. A later right-of-way survey showed that they were beyond the right-of-way, at which point the investigation was halted.

Area 2 was examined with a 1-by-1-m unit excavated into the toe of the arroyo bank. A 25- to 45-cm-thick layer of natural colluvial sandy loam was removed from above the charcoal-infused stratum without screening. After removing this overburden, the unit was excavated in 20 cm levels exposing stratigraphy that displayed a 20-cm-thick layer of charcoal-infused, but rodent disturbed, sandy loam. The charcoal-infused sandy loam was screened through ⅛-inch mesh and seven pieces of chipped stone debris were recovered. Excavation continued through the charcoal-infused stratum into coarse-grained sandy colluvium that lacked evidence of a cultural deposit. The excavation unit wall profile was mapped and soil samples were taken from the probable cultural deposit.

Since excavation of the initial unit yielded artifacts in association with the charcoal-infused soil level, it was treated as a cultural deposit. To further examine the nature and extent of the deposit, three more contiguous units were excavated. These units exposed a charcoal-stained layer and concentration that may have been the deflated and eroded remains of a shallow hearth. To further expose the level, the arroyo bank was cut back 3 m to the northwest. Up to 1.60 m of the overburden was removed without screening to within 10 cm of the cultural deposit.

Excavation of the expanded area revealed a diffuse charcoal-stained soil layer disturbed by erosion and rodent burrows. This cultural level, which was 1.70 to 1.80 m below the modern ground surface, yielded a cluster of cobbles lying flat that were associated with the stain, microchips of bone and chipped stone, and a corner-notched projectile point. The cobbles, rodent burrows, and in situ artifacts were mapped. The north wall of the excavation was profiled and described, a plan map of Area 2 was drawn, and the area was photographed. Soil samples were collected from stain concentrations.

After excavating approximately 9 sq m and with the prospect of removing a large amount of overburden, the excavation was halted until the right-of-way location could be confirmed. Upon learning that Area 2 was outside the right-of-way, it was covered with plastic, a layer of cobbles, and a layer of soil. No further work was conducted in this area.

Area 3 was a charcoal stain on the surface above and to the northwest of Area 2. Eighteen units were surface stripped to expose the outline of the stain. The stain was visible as three isolated patches of dark soil. At first they were treated as individual features, but definition of individual features proved difficult. Excavation of 10 units combined the three features into a single large roasting pit. The pit interior was excavated in 10 cm levels since the stratigraphy was interrupted by channel intrusions. Soil samples were collected from the darkest stains. The feature was not totally excavated, but the profile and outline were defined and recorded. As with Area 2, excavation was halted until right-of-way location could be determined. This area was also found to be outside the right-of-way. Excavation was halted and the feature was backfilled.

Excavation revealed three spatially and temporally discrete components. These components were designated originally as Areas A, B, and C, and have been renamed Areas 1, 2, and 3. Originally, Area 1 was the focus of data recovery, but closer examination of the site revealed Areas 2 and 3 (Fig. 3). Part of Areas 2 and 3 were excavated before they were determined to be outside the right-of-way. During a pause in excavation from June to November, radiocarbon dates were obtained for Areas 1, 2, and 3 indicating occupations during the early and late Archaic and Coalition periods. Excavation results will be described in chronological order by occupation.

Area 2

Area 2 was identified as a charcoal lens in the cut bank of the entrenched arroyo that divides the site. Excavation revealed an occupation surface 1.60 to 1.70 m below the modern ground surface at 2.90 to 3.00 m below datum (mbd). A 1.50-m-thick layer of colluvial overburden was removed to within 10 to 20 cm of the occupation surface. Part or all of 19 units were excavated to the occupation surface revealing a cobble cluster that may be the deflated remains of a hearth and a corner-notched basalt projectile point (Fig. 4).

Stratigraphy

Stratigraphic descriptions of Area 2 are derived from the north wall profile of the excavation area. This 1.72-m-thick exposure shows four soil levels that could be distinguished by color, texture, gravel and calcium carbonate content, and the charcoal-infused soil lens associated with the cultural materials and features. Cultural deposits to the west, east, and south suggest that this swale was up to five times larger than is currently visible. Figures 5 and 6 show a sketched side view of the arroyo bank and a stratigraphic profile of the north wall of the excavation area.

Figure 6 shows the four stratigraphic levels. These layers reflect combined eolian and colluvial deposition. Strata 1 through 3 lack evidence of a cultural deposit. Stratum 4 is the cultural material-bearing layer.

Stratum 1 was a 52-cm-thick layer of loose to slightly consolidated brown sandy loam, with low plasticity when wet, and a 5 percent content of uniformly distributed pea gravel. The homogeneity of the soil layer suggested a single extended period of deposition. Mechanical analysis suggested that up to 54 percent of this layer was due to eolian deposition. Stratum 1 has been heavily churned by tree roots, rodent burrowing, and sheet erosion. No cultural materials were observed in this stratum.

Stratum 2 was similar in color and content to Stratum 1, except that it had less loam, a higher clay content, and was more plastic. This 92-cm-thick layer had 5 percent pea gravel that was very calcareous and occurred in lenses. This suggested gradual, colluvial deposition. Mechanical analysis of this layer indicated that up to 65 percent of the very fine, fine, and medium sand were eolian deposits. Rodent and root disturbance were present, but not as heavy as in Stratum 2.

Stratum 3 was a 16-cm-thick lens of calcareous pea gravel and coarse sand. This layer may remain from a shallow erosion channel that cut through the occupation area soon after it was abandoned. Occupation may have defoliated the area resulting in destabilization of the soil.

Stratum 4 was a cultural deposit consisting of charcoal-infused gray brown sandy loam mixed with less than 5 percent pea gravel and an occasional cobble. Stratum 4 is a stained version of Stratum 2 suggesting that the occupation occurred during the Stratum 2 deposition episode. A radiocarbon date (Beta-84814) obtained from charcoal recovered from Stratum 4 dated 5260 to 5040

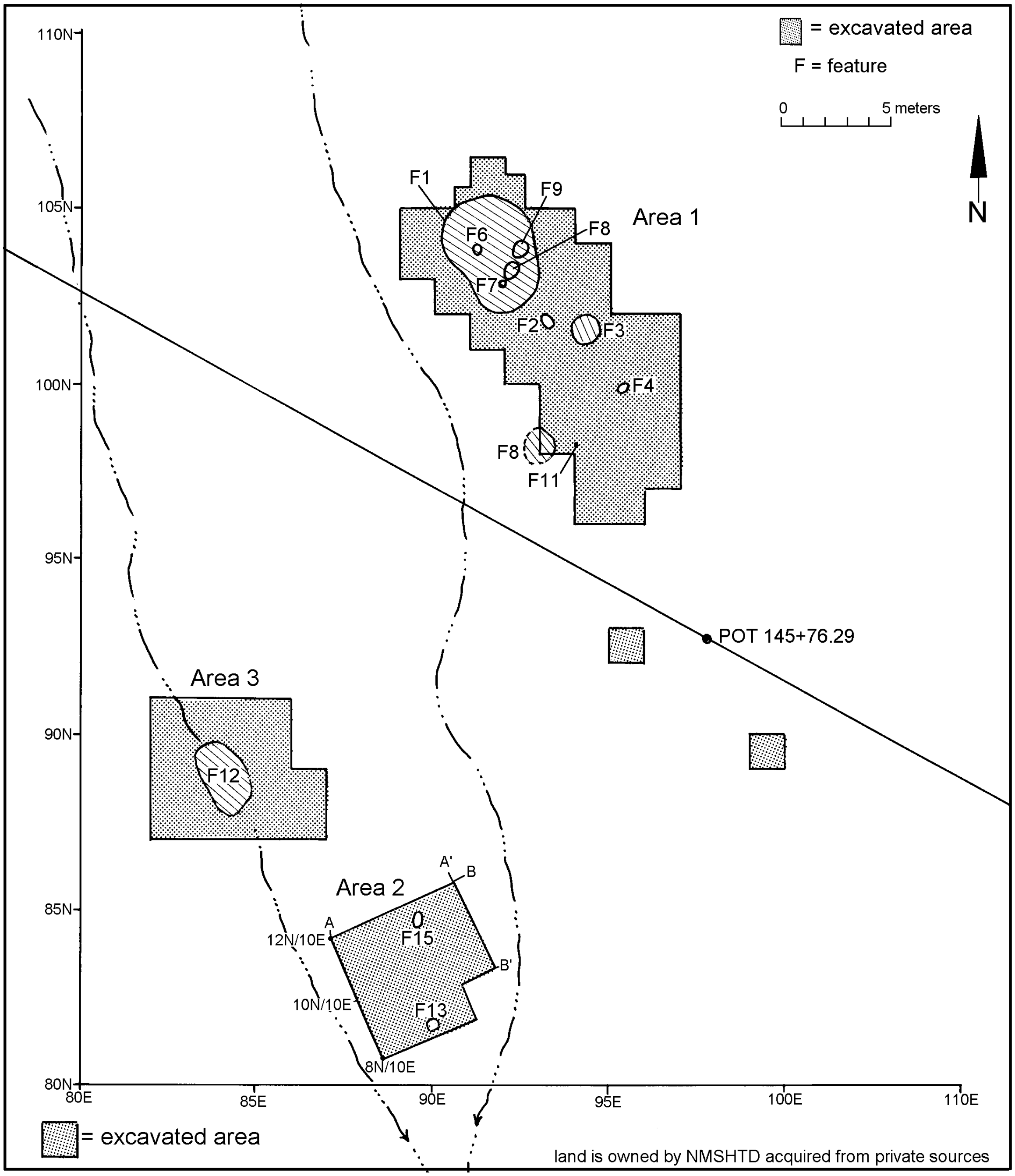


Figure 3. LA 61315, site map.

B.C. (2-sigma, 95 percent probability).

The stratigraphy reveals a depositional history dominated by gradual colluviation and eolian sand accumulation. Strata 1 and 2 are virtually identical, although geomorphological characterization suggests Stratum 2 was stable for a longer period. Both strata exhibit very limited pedogenetic evidence, which was retarded by the soil qualities and steepness of the slopes. Occupation occurred during a period of gradual deposition that continued for 5,000 to 6,000 years following abandonment. The fact that the cultural deposit extends well beyond the excavated area strongly indicates that abandonment was temporary. Clearly, this setting was deemed suitable for repeated hunter-gatherer camps between 5000 B.C. and the 100 B.C. to A.D. 200 occupation of Area 1.

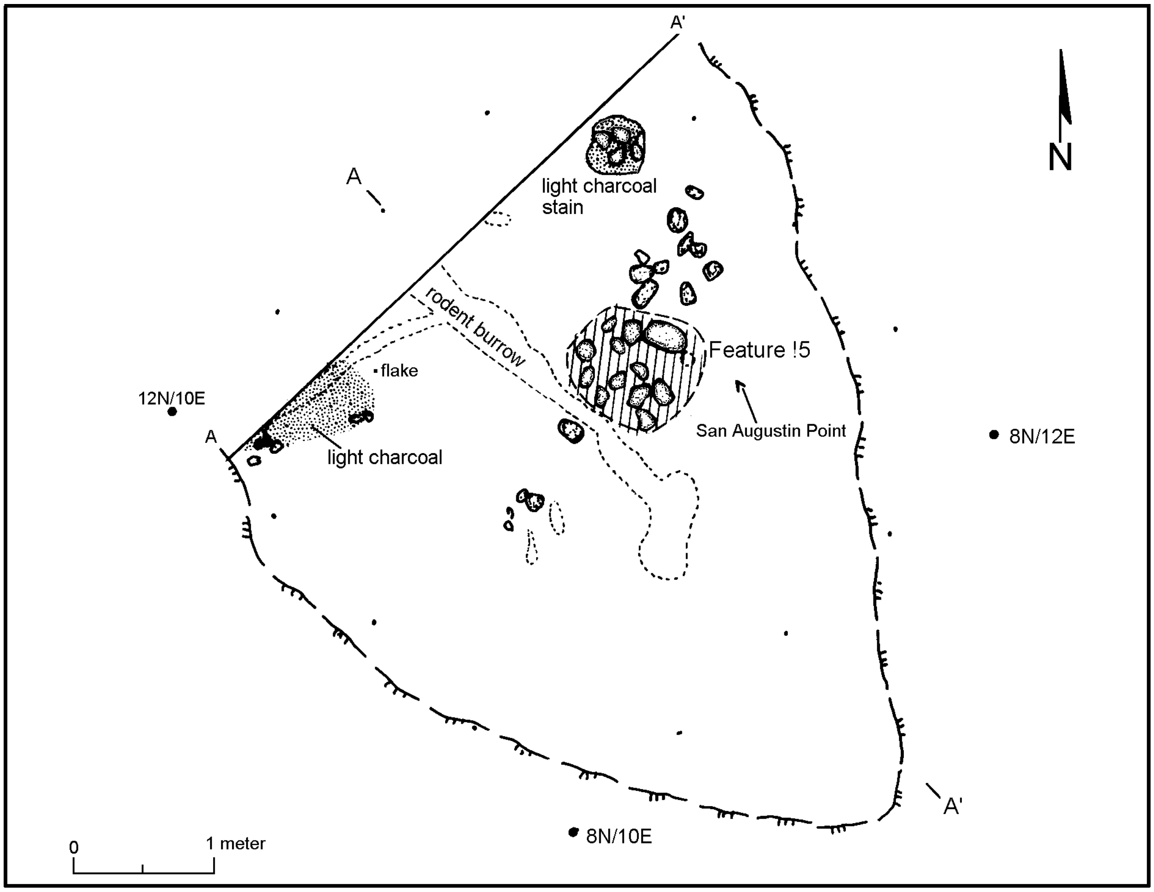


Figure 4. LA 61315, plan view of Excavation Area 2.

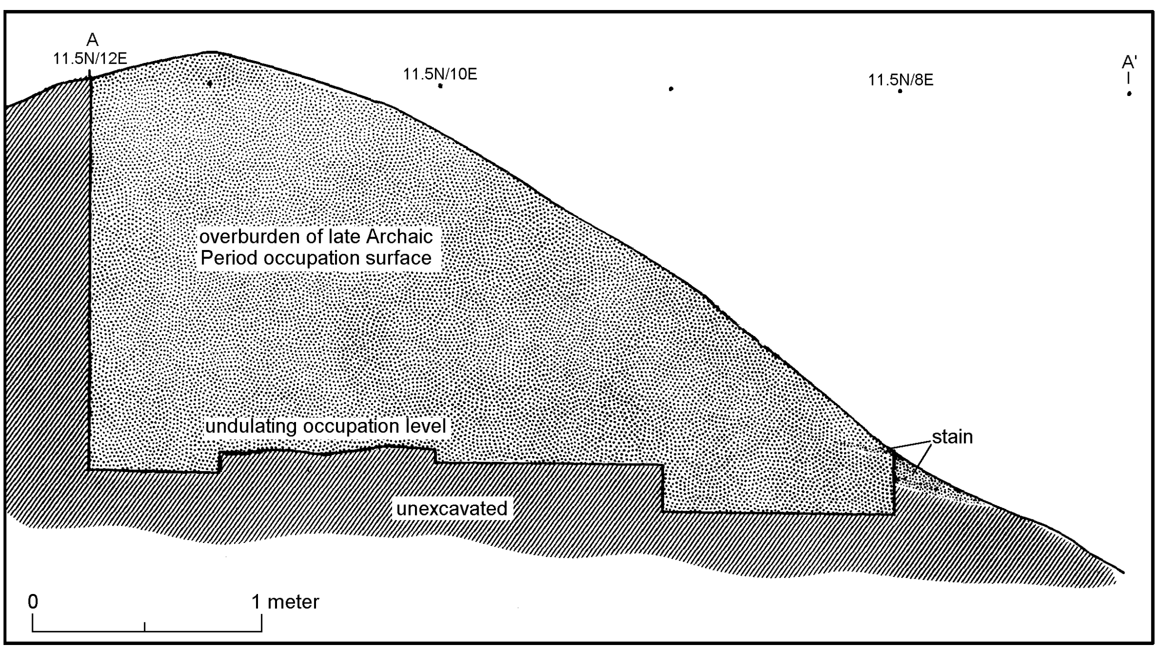


Figure 5. LA 61315, schematic profile of Excavation Area 2, east wall.

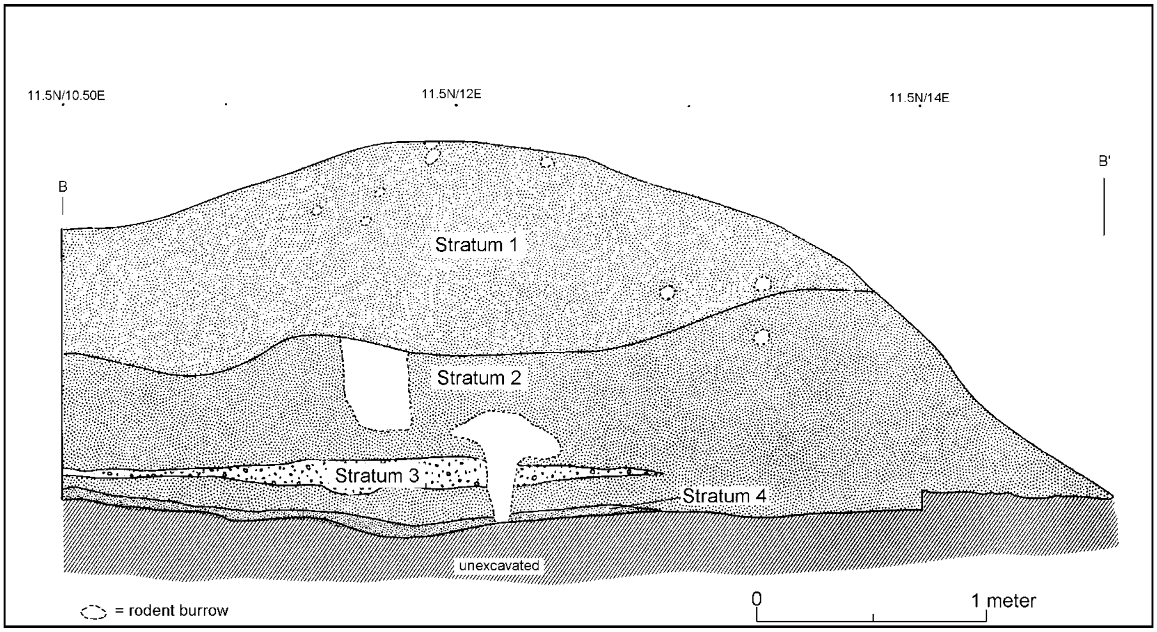


Figure 6. LA 61315, stratigraphic profile of Excavation Area 2, north wall.

Features 13 and 15

Two features were recognized by darker charcoal-infused soil or a cobble cluster. Feature 13 was exposed in the initial grid excavation and Feature 15 was fully exposed by Area 2 excavation.

Feature 13 was a basin-shaped charcoal-infused soil layer exposed in 8N/11E at the southern limit of the arroyo bank. The feature had moderately steep sides and a regular bottom. The stained layer was 18 cm thick and at least 28 cm in diameter. The feature fill was very dark gray (10YR 3/1) Stratum 4 with pea gravel and 15 pieces of fire-cracked rock. One piece of chipped stone was recovered.

Feature 15 was a cluster of cobbles with stained soil that may have been deflated remains of a hearth (Figs. 4 and 7). The cluster measured .75 m in diameter. The cobbles were lying flat in a roughly circular configuration and were lightly burned and cracked. They ranged in maximum dimension from 12 to 18 cm. A San Augustin or Gypsum Cave-style projectile point was recovered southeast of the feature. Rock and stained soil continued under the excavation area wall to the north, suggesting the presence of multiple features. No artifacts were recovered from within the feature. Flotation yielded no macrobotanical evidence of the feature function.

Area 2 Chipped Stone Artifacts

Fifty-seven chipped stone artifacts were recovered from the excavated levels of Area 2. Table 1 provides the artifact type by material type distribution for Area 2. The raw materials are predominantly of local origin. Except for obsidian, and probably nonvesicular basalt, the remaining materials could have been obtained from the local gravel deposits. Artifact types reflect a narrow range of core reduction and tool production. Biface flakes suggest that tool blanks were reduced on-site. Resharpening flakes indicate that worn edges were rejuvenated near the hearth area. Obsidian appears to have been used for more specialized purposes: five of the seven artifacts result from tool production and maintenance. The single dart point was made from fine-grained basalt and was probably carried to the site rather than made there.

Figure 7. LA 61315, Feature 12, Area 2.

Table 1. LA 61315, Area 2 Chipped Stone Artifact Types by Material Type

Count Row Pct Column Pct	Chert Undifferentiat-ed	Tecolote Chert	Madera Chert	Chalcedony	Obsidian	Nonvesicular Basalt	Quartzite	Total
Angular debris	4 66.7 19.0	1 16.7 100.0					1 16.7 6.3	6 10.5
Core flake	15 39.5 71.4		6 15.8 85.7		2 5.3 28.6	2 5.3 50.0	13 34.2 81.3	38 66.7
Biface flake	2 25.0 9.5		1 12.5 14.3		3 37.5 42.9		2 25.0 12.5	8 14.0
Resharpen-ing flake				1 25.0 100.0	2 50.0 28.6	1 25.0 25.0		4 7.0
Projectile point						1 100.0 25.0		1 1.8
Total	21 36.8	1 1.8	7 12.3	1 1.8	7 12.3	4 7.0	16 28.1	57

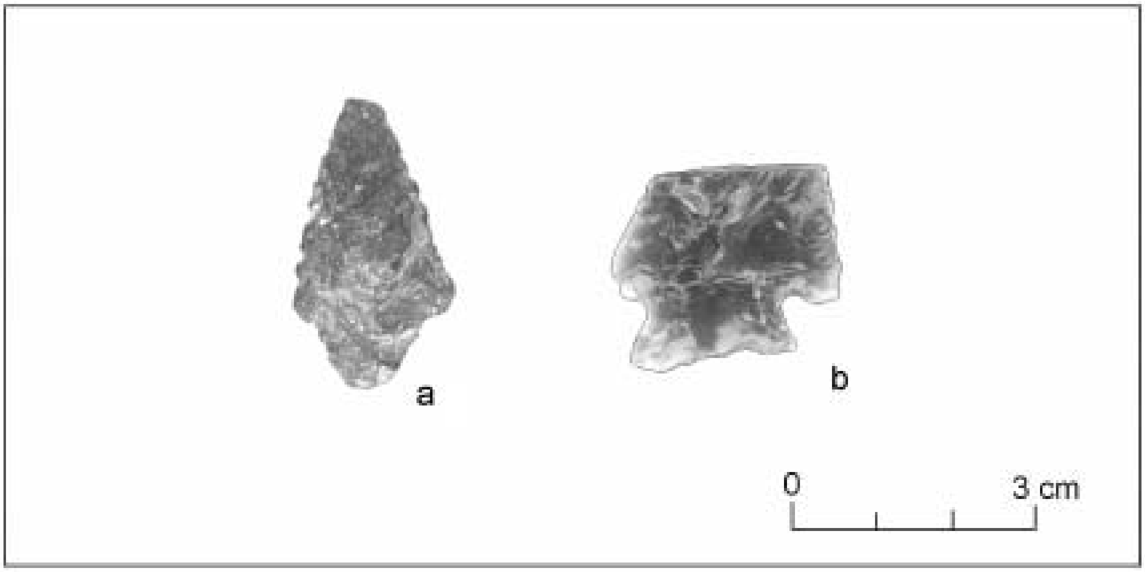


Figure 8. Projectile points: (a) San Augustin-Gypsum Cave style point, Excavation Area 2; (b) En Medio style projectile point associated with Excavation Area 1, Feature 1.

The projectile point is a style not usually associated with northern Rio Grande Archaic assemblages. It is made from fine-grained basalt that is prevalent along the Rio Grande and not a common constituent of the local gravel deposits. The tip is broken from impact, otherwise the dart point is complete (Fig. 8a). Its maximum dimensions are 38.7 mm long by 22 mm wide by 7.4 mm thick. The blade is triangular with one convex edge and one concave edge. The edges exhibit shallow, broad serrations. The tangs are blunt and rounded. The blade length is 31.5 mm. The stem is contracting with a convex and rounded base. The stem length is 7. 2 mm and the neck width is 13.6 mm and tapers to 7.5 mm at the base. The flaking pattern is diagonal and irregular. One surface has a thickly convex cross section caused by numerous hinged or stepped flake terminations. This creates an asymmetrical convex-convex profile.

The shape of this dart point is characteristic of Augustin or Gypsum Cave style points. Augustin points were first described from Bat Cave (Dick 1965:27-28). Based on radiocarbon dates from charcoal from the same stratum, Augustin points were suggested to date between 5,000 and 7,500 B.P. However, investigators have since suggested that this date was too early considering dated contexts for similar point styles from other sites in the Basin-and-Range and from the northern Colorado Plateau (Matson 1991:158). Matson is more comfortable with a 4,000 B.P. date for the Augustin-style point. He also equates this style with the Gypsum Cave style that was more prominent between 3,000 and 4,000 B.P. (Matson 1991:167-168) and was widespread throughout the Colorado Plateau and northern Southwest. Gypsum Cave points are the temporal equivalent of Armijo-style points described for the Oshara tradition (Irwin-Williams 1973). Matson (1991:168) suggests that the Gypsum Cave-Augustin point style had its origin in the Tehuacan Valley of Mexico between 7,000 and 5,000 B.P. He suggests that the point style in the northern Southwest is a late extension that appears about 4,500 B.P.

From the northern Rio Grande, Thoms (1977:114) names this projectile point style as En Medio–Contracting: No. 10. It is distinguished by its lateral-basal notches, shoulders, and contracting stem. It has a maximum length ranging between 30.2 and 42 mm and a maximum width ranging between 14.2 and 23.4 mm for six measurable specimens. The LA 61315 specimen falls within the upper size range and closely fits other morphological characteristics (Fig. 8b). Thoms (1977:114) suggests that this style is an early En Medio phase style and dates after 800 B.C.

This point style occurs in the northern Rio Grande, but it is not common, as indicated by the OLE project (Turnbow 1997). Of the 296 whole and fragmentary projectile points analyzed for the OLE project, only one fits the Augustin-Gypsum Cave style. This suggests that there may be some directionality in its distribution or that it was never abundant in the northern Rio Grande.

The obvious quandary for this project is the lack of congruence between 5260 and 5040 B.C. radiocarbon date range and the suggestion by investigators working with larger collections or those from a wider area that this style predominates between 4,000 and 3,000 B.P. Old wood could decrease the age of the radiocarbon date by 400 years, but that hardly spans the 3,000-year gap between the LA 61315 date and other investigators' chronometric assignments.

Summary

Excavation of Area 2 yielded a deeply buried early Archaic period camp site that potentially dates to the early sixth millennium B.C. Low numbers of chipped stone and animal bone suggest low intensity tool maintenance and core reduction and food processing and consumption. The 5260 to 5040 B.C. date range is one of the earliest reported for the Santa Fe area. The depth of the deposit suggests that the best potential for uncovering evidence of early occupations is in recently eroded upland areas that may have been relatively stable since the third or fourth century A.D.

Area 1

Area 1 was identified as a charcoal-stained soil lens exposed in the east bank of the arroyo that cuts through the site. The stain was visible on the surface along the top of the arroyo cut, but was buried under a layer of overburden that increased in thickness upslope and to the north of the arroyo bank. Chipped and ground stone artifacts were present on the surface. Excavation of 47 units revealed 11 features including 8 thermal features, 1 undifferentiated pit, 1 charcoal-infused soil stain, and the subterranean foundation of a structure (Fig. 9). One hundred and fifty-nine surface artifacts were piece-plotted and 726 pieces of chipped stone, 8 ground stone artifacts, and 141 pieces of splintered animal bone were recovered.

Stratigraphy

Six stratigraphic levels were defined. Two levels were specific to Feature 1, the subterranean foundation, two levels were specific to the activity and discard area south and east of Feature 1.

Stratum 1 was a 1- to 18-cm-thick modern, eolian-colluvial layer of (5YR 4/3) brown sandy loam, gravel, cobbles, and organic duff and roots that covered the cultural deposit. There were pockets of calcareous soil and gravel mostly from the units peripheral to the main feature and activity area. It was thickest in the units immediately north of and upslope from Feature 1. It thinned to the south and southwest reflecting surface deflation and erosion. This layer was mixed with fire-cracked rock and occasional artifacts. Stratum 1 was encountered throughout Area 2

Stratum 2 was defined within Feature 1. Stratum 2 was a 5 to 15 cm thick, gray compact sandy loam mixed with 10 to 50 percent gravel by volume, some large cobbles (maximum dimension greater than 20 cm), and abundant root intrusions. Artifact counts ranged between 1 and 10 and they were usually associated with fire-cracked rock. This layer appears to be a more stable transition soil between the modern colluvium and the loamy deposit that covered the occupation area subsequent to abandonment (Stratum 3 and Stratum 5). The regular occurrence of artifacts and fire-cracked rock within Feature 1 suggests that it was partly trash-filled following abandonment. Unfortunately, there is no concrete evidence for a later occupation other than the Coalition period component in Area 3. Another possibility is that refuse was deposited upslope from the structure and washed into the

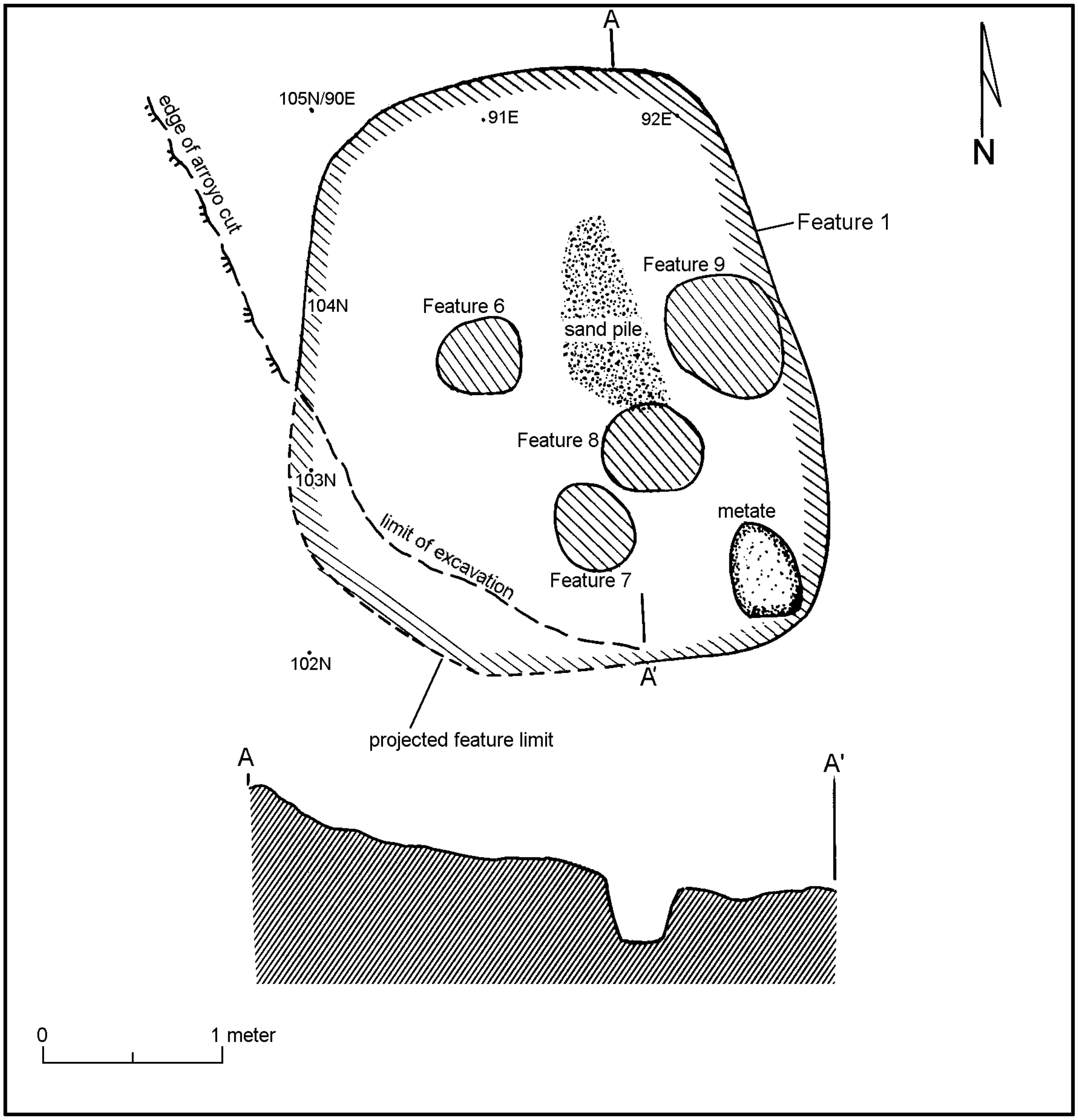


Figure 9. LA 61315, plan and profile of Feature 1, Excavation Area 1.

structure following abandonment. Few artifacts were recovered from the excavation units to the northeast of the structure and the highest densities of refuse were found to the southeast of the structure. This suggests that the primary refuse disposal pattern was downslope. Arroyo formation and entrenchment may have removed a later component that was intermediate to the Area 1 and 3 components.

Stratum 3 was the feature and floor fill of Feature 1. Stratum 3 was a 5- to 15-cm-thick layer of compact, dark gray-brown sandy loam with gravel and fine sand intrusions. This layer contained abundant charcoal from which samples were collected for species identification and radiocarbon dating. The dark stained color and the abundance of charcoal throughout the level strongly suggest that the structure had burned. Patches of low iron-content sand on the floor were slightly oxidized. Artifact counts range from 5 to 30 with a lower frequency of fire-cracked rock than was observed in Stratum 2. All of Stratum 3 was screened through c-inch mesh resulting in the recovery of microflakes and burned bone splinters.

Stratum 4 was a 5- to 14-cm-thick transitional charcoal-stained sandy loam layer between

Stratum 1 and Stratum 5. It contained 10 to 20 percent pea gravel, occasional cobbles, and sparse to abundant fire-cracked rock. This layer was mottled and intermittent depending on the preservation of the upper stratum and the distance from the main activity area. Stratum 4 consistently occurred in the southeast portion of Area 1. It yielded a wide range of chipped and ground stone artifacts, abundant fire-cracked rock, and covered or encased the extramural features. Stratum 4 dissipated along the 96E grid line, suggesting that it was a concentrated deposit before it was spread by erosion and gravity.

Stratum 5 was the cultural layer associated with features and the main part of the activity area. It was dark gray-brown to dark brown sandy loam with abundant pea gravel and small cobbles. Fire-cracked rock was abundant with artifact counts increasing (10 to 30 per unit) near the features. Artifact and fire-cracked rock clustering suggest discrete discard episodes. Features were filled with fire-cracked rock and artifacts suggesting that they were decommissioned and covered with a layer of domestic refuse as new features were established. It is also possible that the densest pockets of fire-cracked rock were deflated shallow hearths that were not recognized during the excavation.

Stratum 6 was the noncultural deposit encountered in Grids 89N/99E, 92N/95E, and 106N/94E. This layer was a brown sandy loam with less than 5 percent gravel and moderate to high caliche content. Thickness of this layer was determined by augering to be 60 to 100 cm.

Features

Eleven features were identified in and around Excavation Area 1. Eight features were hearths or thermal features, one was an undifferentiated pit, one was a soil stain, and Feature 1 was the subterranean foundation of a structure. Feature 1 had four intramural thermal features (Fig. 9). Five contemporaneous features were located south and east of Feature 1, and one feature was from an undefined component was in Grid 111N/96E, north of the main excavation area. Feature data are provided in Table 2.

Feature 1, Burned Structure Foundation. Feature 1 was the remains of a subterranean foundation for a wickiup-like structure. This basin-shaped foundation was 3.2 m long by 2.75 m wide. The southwest foundation limit was removed by arroyo channelization and downcutting leaving a thin to absent cultural deposit. The north and west limits were stable and in good condition and can be used to estimate a former wall height of 8 to 18 cm (Fig. 10).

As described for Strata 2 and 3, the foundation depression was trash-filled. This deposit included charcoal-infused soil, abundant fire-cracked rock, burned bone fragments, and abundant core reduction and tool manufacturing debris. It appears that after abandonment, the structure was burned and later used as a centralized refuse area. The amount and diversity of refuse suggests that it was from domestic activities. However, excavation uncovered no other structures. These structures may be outside the right-of-way or were removed when the arroyo entrenched. This dense trash-laden deposit refutes the hypothesis that Feature 1, the extramural features, and the artifacts represented a single temporal/functional component.

The structure walls were in varied condition. Walls were most evident along the north and west perimeters. The south and west perimeters were reduced or removed by erosion.

The structure floor was in poor condition. It was present as an unprepared, packed surface in a few patches. Mostly it was uneven, pitted, and remained as a thin veneer on top of a coarse sand and pebble stratum. Floor level was best identified by the elevation at which the intramural thermal features could be distinguished from the charcoal-infused Stratum 3.

Within the structure were four thermal features, Features 6, 7, 8, and 9 (Fig. 11). These four features and the metate found on the structure floor dominated the south one-half of the structure interior. Between Features 6 and 9 there was a pile of fine, clean, pink to yellow-orange sand. This

Table 2. Feature Descriptions, LA 61315, Area 1

Feature	Grid	Type	Shape	Dimensions	Matrix	Condition	Artifacts	Samples
1	102N/91-92E, 103N/90-92E, 104N/90-92E, and 105N/90-92E	Structure foundation	Oval or bean-shaped with sloping walls	3.20 m N-S, 2.75 m E-W, 0-50 cm deep	Strata 2 and 3	Burned, slumping walls, cut by the arroyo bank, tree roots throughout the fill.	Lithics, ground stone, and animal bone and, a bead,	flotations, radiocarbon
2	100N/92-93E	Undiff. pit	Circular basin with steep to sloping sides	50 cm N-S, 43 cm E-W, 22 cm deep	Stratum 5, lacking fire-cracked rock	On slope, near steep channel cut, south edge reduce by erosion, fill mixed by slope wash	Chipped stone	2 flotations or about 50 percent feature fill
3	101N/93-94	Shallow thermal feature	Irregular oval with sloping sides	80 cm N-S, 83 cm E-W, 16-20 cm deep	Stratum 5 with abundant chipped stone and fire-cracked rock	Deflated and mixed with colluvial deposit	Chipped stone	2 flotations
4	99N/95E	Shallow thermal feature, possibly rock-lined	Oval-shaped with sloping sides	40 cm N-S, 56 cm E-W, 15 cm deep	Mix of Strata 1 and 5	Deflated and mixed with colluvial deposit	All feature fill collected for water-screening. No results available.	2 flotations
5	97-98N/92-93E	Cobble-lined hearth	Oval with steep to sloping sides and flat cobble bottom	Estimated 140 cm N-S, 120 cm E-W, 30-40 cm deep	Black stained sandy loam mixed with channel slope deposit	Bisected by arroyo cut with W 1/2 and most of upper limits removed.	None	2 flotations
6	103N/91E, within Feature 1	Burned pit	Circular with steep sides and basin bottom	43 cm N-S, 40 cm E-W, 27 cm deep	Stratum 3 with abundant charcoal	Intact with hardened sides and bottom from burning	Lithics and animal bone	3 flotations and radiocarbon

Feature	Grid	Type	Shape	Dimensions	Matrix	Condition	Artifacts	Samples
7	102N/91E, within Feature 1	Burned pit	Oval with steep sides and a basin-shaped bottom	43 cm N-S, 32 cm E-W, 24 cm deep	Dark gray-brown loam with 10-20% pea gravel, abundant charcoal, and artifacts and animal bone	Intact with hardened sides and bottom from burning	Lithics and animal bone	2 flotations and radiocarbon
8	103N/91-92E, within Feature 1	Burned pit	Circular with steeply sloping sides with a basin shaped bottom	48 cm N-S, 44 cm E-W, 44 cm deep	Dark gray-brown loam with 10-20% pea gravel, abundant charcoal, and splintered animal bone	Intact with hardened sides and bottom from burning	Lithics and animal bone	5 flotations and radiocarbon
9	103-104N/81-92E	Rock-lined hearth	Circular with steeply sloping sides with a basin shaped bottom lined with 13 burned cobbles	60 cm N-S, 62 cm E-W, 27 cm deep	Dark gray-brown loam with 10-20% pea gravel, abundant charcoal, and splintered animal bone	Intact with some root intrusion and mixing with colluvial deposit	Lithics, ground stone, bone	2 flotation and radiocarbon
10	110-111N/96E, north of main excavation area	Possible hearth	Shallow, circular pit with sloping sides and basin shaped bottom	80 cm N-S, 74 cm E-W, 18 cm deep	Dark gray sandy loam with pea gravel and a few charcoal flecks	Deflated and eroded	None	2 flotations
11	98N/94E	Soil stain	Roughly circular	13 cm N-S 13 cm E-W 9 cm deep	Fine dark sandy loam	Deflated, may actually be redeposited fill from upslope	None	1 flotation

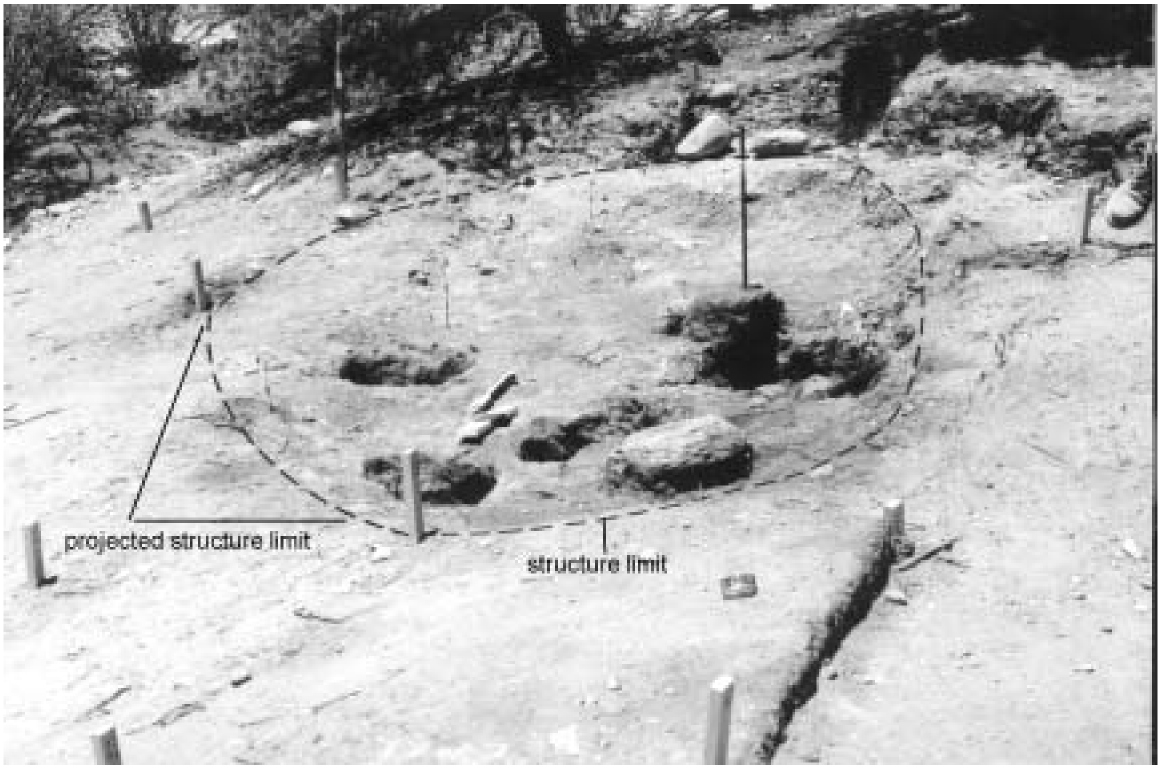


Figure 10. LA 61315, Area 1, Feature 1.

sand may have been used to plug or fill features when they were not in use. The whole metate was lying grinding surface down on the floor. It had a worn out grinding trough, but had still been turned upside down at abandonment.

The intramural features are concentrated in the southern one-half of the structure. Features 7, 8, and 9 form a line across the structure, and the expended metate was in the open space along the southeast wall. They are closely spaced with no more than 20 cm distance between them. Feature 6 is more isolated, but is only 60 cm from its nearest neighbor. The three feature alignment suggests that they are contemporaneous and are functionally related. Features 1, 7, and 8 have radiocarbon date ranges that are close enough to suggest they are contemporaneous. Feature 6 is off-set from the other features and it has a radiocarbon date that is as much as 800 years earlier. Morphological and contextual similarity among Features 6, 7, and 8 provided evidence in support of their contemporaneity. However, the disparity in the radiocarbon dates and the spatial isolation of Feature 6 suggests that it may represent an earlier component that was incidental to the Feature 1 construction and occupation.

Features 6, 7, and 8 have steep walls and basin-shaped floors. They were lightly burned with hardened sides. All contained darkly stained charcoal-infused soil as evidence of burning from other than structure burn. Steep-sided deep thermal features would effectively contain fire, but would not be practical for regular and convenient access to cooked foods or processed goods. These would be better suited for cooking or processing of foods that need to be roasted, but not handled during thermal processing. The heavy staining of the feature fill results from a large quantity of charcoal remaining in the feature after use. Incomplete burning and the lack of ash suggest that partly combusted wood was smothered. Smothering of charcoal would occur during slow roasting or baking. The pits are relatively small and could not have held a large volume of foodstuffs. However, their small size would have been more manageable and predictable for indoor fire use. The shallower and more open Feature 9 could have been the fuel source. Coals could have been transferred from

Figure 11. LA 61315 intramural features within Feature 1, Area 1; (a) Feature 6, (b) Feature 8, (c) Feature 9.

it to Features 7 and 8. If these features had been unburned, then they would be strong candidates for storage features.

Feature 9 had morphological and content attributes that are consistent with an actively used thermal feature. It was the largest and shallowest of the interior features. It showed evidence of intense burning. The fill contained burned and splintered bone fragments, which would have been tossed into an active fire. It had a concentration of 13 cobbles on the interior bottom. These were lying flat and formed a platform. The cobbles segregated the interior feature space into open fire and roasting or cooking platform. This internal division suggests multipurpose functions, such as would

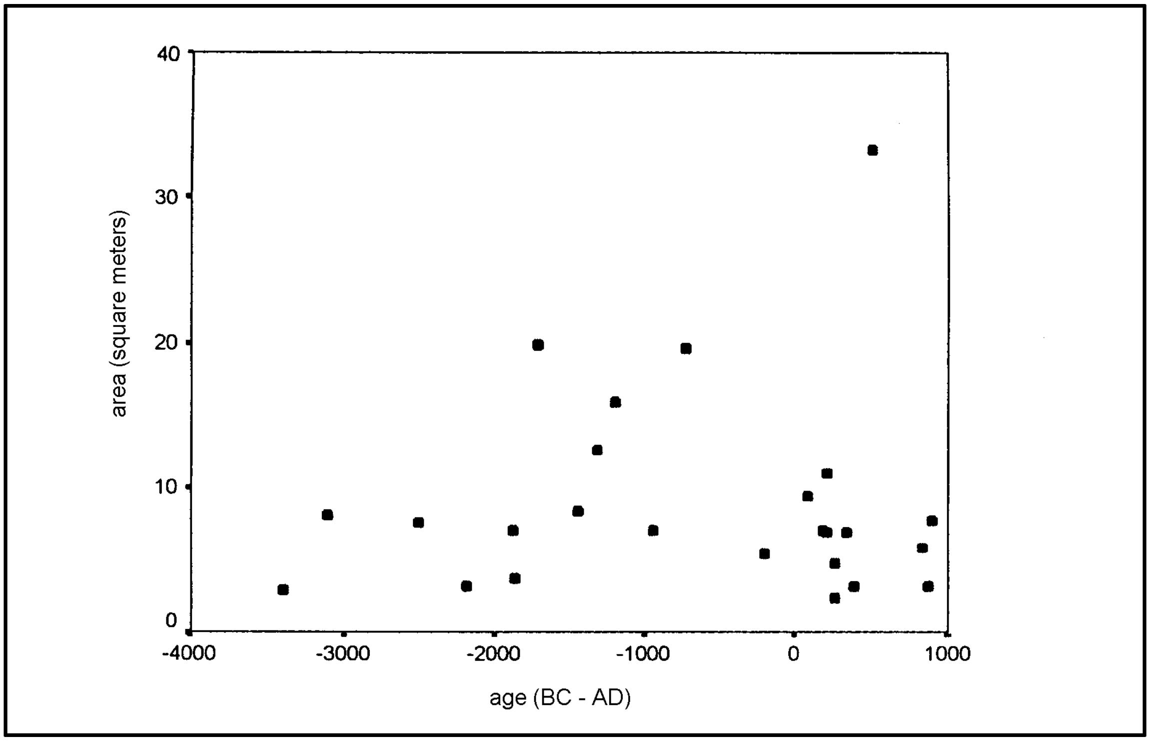


Figure 12. Area by time, northern Rio Grande Archaic pit structures.

be expected of a frequently used domestic feature.

Until the last 10 years, Archaic or Basketmaker II-III age structure remains were poorly represented in the northern Rio Grande archaeological record. Mostly through salvage archaeology investigations there is an increasing awareness of likely settings for early structures and a better understanding of their characteristics, so that they are recognized more frequently. A sample of 28 structures was culled from the existing literature for projects in the northern Rio Grande. Their ages range from 2200 B.C. to A.D. 895. This 3,000-year span attests to the long-term adherence to a low construction and maintenance architectural style that is usually associated with seasonally mobile populations. This 28 structure sample, which includes LA 61315, Feature 1, can be used for comparative purposes.

For this sample, structure floor area as measured in square meters has a mean of 8.4 with a standard deviation of 6.72 (Fig. 12). Twenty-two of 28 structures have floor area less than 10 sq m. Feature 1 is slightly smaller than average with a floor area of 6.91 sq m. Floor area does not covary with time in that pit structure floor area does not increase or decrease from early to late in the temporal sequence. There is some clustering after 200 B.C.; the majority of the pit structures have a floor area of less than 10 sq m. Smaller pit structures occur prior to 1800 B.C. as well. Between 1600 B.C. and 200 B.C. there is a wider range of floor areas with a tendency for there to be more floor space than before or after this date range. These differences may reflect occupation duration, group size, or a combination of the two. LA 61315, Feature 1, was occupied during the late period when structure floor areas remained small, until the more formal pit structures of the middle and late Developmental period that accompanied a more sedentary settlement pattern occurred.

Structure condition refers to abandonment or post-abandonment processes that may be cultural or natural and may affect archaeologists' ability to identify structure remains. Structure condition was coded as burned, unburned, deflated, or cut by drainage. Burned structures were expected to be the most frequent because they are the easiest to identify by their heavily charcoal-infused internal strata. Unburned structures may exhibit charcoal-infused soil, but the staining is more diffuse and reflects deflated intramural features rather than burning. Deflated structures were unburned, but appeared to be heavily reduced by erosion. Structures that were cut by drainages were estimated for size, subjected to erosion and deflation, and had a limited amount of internal integrity. Within the 28 structure sample, 2 could not be assigned a condition, 13 were burned, 5 each were deflated or unburned, and 3 were cut by a drainage. The burned to unburned ratio was 1:1 indicating that other factors than burning allow buried structures to be recognized. Through time, burned and unburned or deflated structures occur equally. What is interesting is that 50 percent of the structures *are* burned.

Besides domestic purposes and as shelter, there may be other kinds of information that structures may have conveyed. Structures may provide a way for seasonally mobile groups to mark their traditional foraging territories and communicate the current status of territorial use. In later times, Anasazi fieldhouses and other outlying, less formal structures have been suggested as a way to mark agricultural lands and establish tenure claims (Adler 1990; Kohler 1992; Schlanger 1992). Seasonally occupied structures of nonagricultural hunter-gatherers may have served a similar purpose. Standing structures that were well maintained would have been a strong signal that the immediate territory was claimed or regularly used. This also implies that the area was still productive and could support the occupying group. Though this information probably was annually communicated at seasonal aggregations, the structures would have served as reminders and they would precisely mark the focal point of the territory.

What other information might by communicated by structures? Certainly, structures that had not been occupied for a number of years would deteriorate. Deteriorated structures would signal that an area was not currently in use, but that a group might return in the near future. So a new group could occupy the territory at their own risk. Potentially, a structure and adjacent extramural space might have cached tools, raw materials, or even food. These caches would serve as notice that the occupants expected to return and had intentionally provisioned their camp in anticipation of their return.

A dilapidated or collapsed structure with no evidence of caching or maintained activity spaces might be left by a group that was not expected to return, soon or ever again. Reasons for abandonment could be cultural or environmental. Death would be a strong conditioner of reoccupation and might have been signaled in a way that others would understand, allowing all related groups to avoid the place. Environmental factors would have been discerned by the natural savvy of the foragers. Erosion, stripped trees, a lack of dead wood, and obviously unproductive areas would signal unsuitability and might accompany an unmaintained or dilapidated camp.

Finally, burned structures are very interesting. The 50 percent occurrence of burned structures in this sample suggests a number of possibilities. Since we have burned and unburned structures, it means that recognition is not solely dependent on and biased by the heavily stained and charcoal-infused deposits that mark burned houses. Therefore, we know that our distribution is not an artifact of archaeological method, and instead may reflect patterned human behavior. Because we find unburned structures, it means that hunter-gatherers did not always burn their structures on abandonment. There may have been a number of factors that would result in a burned structure. Furthermore, a 50 percent burned rate seems high for a people who would have been pyrotechnic experts. In other words, how could people who are so intimately acquainted with fire be so careless as to let 50 percent of their houses burn down? I would suggest that if structures served as territorial markers or tenure identifiers, then to burn one down would signal a release or end to a claim. This relinquishing of the claim could be caused by severe environmental degradation, indications that the following years would be unproductive, death in the group, or that the group was expecting to move away and not come back. For the immediate future following the burning, a burned structure would convey information in the same way as an intact structure. Those groups that pass through the area would see the burned remains and know that something catastrophic, taboo, or life-threatening had occurred. Along with the burned structure would be a landscape exhibiting environmental degradation. In the final analysis, these structures were intentionally burned. Burning may have been a cleansing or release for the occupants and it served as a warning to those that followed. The fact that burned structures occur during all periods within a 3,600-year span indicates that this form of communication was well-established, sanctioned, and effective.

Extramural Features. Extramural features have small to medium diameters and can be classed as roasting pits or hearths and small undifferentiated pits. These pits are associated with abundant fire-cracked rock and chipped stone debris suggesting a wide range of processing activities. Initially, these extramural features were expected to constitute a suite of processing facilities related to the residential occupation. However, overlapping artifact and fire-cracked rock distributions and 1000 B.C. and 200 B.C. to A.D. 200 radiocarbon dates strongly suggest that Area 1 had more than one late Archaic occupation. The fire-cracked rock and artifact halo that surrounded the feature may reflect the filling of abandoned features. The refuse filling of the structure suggests that reoccupation occurred soon after burning, when the structure foundation depression was visible and could be used as a container. Morphological variability in Features 2, 3, 4, 5, and 11 may reflect functional differences. Features 2, 3, and 4 are shallow to moderately deep basin-shaped pits. They are associated with or contain abundant fire-cracked rock. Their shallow depth allowed frequent access and would have allowed rapid combustion of wood into a coal bed that could have been used for light meat roasting or fruit and seed parching. Open, basin-shaped pits are the most versatile and are the most commonly reported in the ethnographic literature (Opler 1941; Smith 1974; Steward 1938). Slight differences in size may reflect the volume of processed goods or the size of the cut of meat to be roasted. These features may be typical of the suite of extramural processing features that would accompany a habitation, but they cannot be unequivocally associated with this structure.

Feature 5 was larger and deeper than the other thermal features, had a cobble lining, and was located away from the main activity area suggesting a more specific function such as a roasting pit for medium or large game mammals. Such a large pit, filled with fire and coals, would be hazardous and would generate tremendous heat, making its more remote placement necessary in terms of traffic and extramural space management. Unfortunately, most of Feature 5 and its adjacent occupation surface were removed by arroyo channeling, so that other associations that may relate to function are missing.

Feature 10 was a shallow, burned pit located north of the structure and isolated from the primary activity space. It had no associated artifacts or fire-cracked rock. It was lightly burned with charcoal-infused soil defining its limits. It appeared to be a surface hearth remaining from a single occupation that was not temporally related to the main late Archaic component. Surface hearths on the periphery of occupation areas reflect the highly fluid nature of landscape formation. Suitable settings are returned to repeatedly over long periods. These repeated occupations are a strong indicator that nearby were resources that were consistently exploited regardless of time or primary subsistence adaptation.

Overall, the 10 thermal features and 1 structure foundation reflect a long-term occupation pattern that incorporated a sheltered, higher elevation setting. While these features appear to form a single, seasonal domestic component, artifact and debris distribution and radiocarbon dates support a multi-occupation interpretation.

Area 1 Chipped and Ground Stone Artifacts and Pottery

Chipped Stone Artifacts

A total of 726 chipped stone artifacts were recovered from excavated contexts in Area 1. These totals do not include the piece-plotted surface artifacts, which are presented separately. The different artifact assemblages are presented by class. Within each class, distributions are examined by excavation level or stratum and feature. This section is primarily descriptive; more detailed analysis and interpretation used to address the research questions appears later in the report.

Material selection relates to the range of lithic material types and qualities that make up the assemblage. Table 3 shows the material types for the combined Area 1 proveniences.

Undifferentiated chert, Madera chert, and quartzite are 93.4 percent of the assemblage. Minor frequencies of other materials reflect the mixed composition of the Plains surface alluvium. The Madera chert sources in the Sangre de Cristo Mountain foothills exhibit considerable color and texture variability that may not have been consistently recognized during the analysis, accounting for the relatively high percentages of undifferentiated chert. Undifferentiated chert was a common occurrence in the Santa Fe Relief Route and the Las Campanas sites. This suggests that there is considerable mixing of Rio Grande lag gravel with the redeposited gravel of the Sangre de Cristo Mountain Pennsylvanian limestone.

Material texture frequencies are roughly divided between fine and medium-grained materials for the three main raw material types. The 47 to 59 percent range of medium-grained materials reflects the uneven quality of the local material and that limited testing of raw material occurred off-site. These percentages also reflect regular on-site culling and reduction of locally obtained cobbles.

Comparisons between Madera chert from LA 61315 and veined source deposits in the Sangre de Cristo Mountains can be made using color and texture variability. From LA 102934, chert debris representing all stages of quarrying and reduction were observed (Ambler and Viklund 1995:51). Three subclasses of Madera chert were recognized by color: red, gray, and white. Material texture for these classes ranged from 55 to 69 percent fine grained and 31 to 36 percent medium grained. The proportion of fine-grained to medium-grained chert is slightly higher at the source than occurred at LA 61315. This difference could result from analysis definitions and differentiation between the two texture classes. Different analysts may classify grain size more or less stringently. There may be better selectivity on the part of the prehistoric raw material procurer at the source, assuming that fine-grained materials were preferred over medium-grained materials. Prehistoric flinknappers may have encountered some difficulty in recognizing texture differences in secondary cobble deposits that were not tested before they were brought to the site. This could contribute to the higher percentages of medium-grained material present within the assemblage. A natural factor may be the differential distribution of fine-grained and medium-grained materials in the deep and mixed Plains surface alluvium. Undoubtedly, a combination of these factors may result in differences between redeposited and original source material texture and availability.

Of particular interest is the almost total reliance on local raw material for all aspects of tool manufacture. Obsidian occurs as a single biface flake, even in the features where c-inch screens were used. This absence of obsidian or basalt from the Jemez and Rio Grande sources undoubtedly reflects the occupation length, where site occupants were before their seasonal occupation at LA 61315, and the projected tool requirements for the season's activities.

Debitage. The artifact type distribution is common for Santa Fe Relief Route sites regardless of period or apparent site function. The three major material types are dominated by core flakes, followed by angular debris, and then by biface flakes. Predominance of core flakes is expected where domestic activities and abundant local materials co-occur. The wide range of domestic activities could readily be supported by flakes produced from local raw materials with minimal planned reduction. In this expedient-focused scenario of tool production and use, tool maintenance is rare, because tools with edges that break or dull could be discarded. Immediate replacement with a fresh edge was facilitated by abundant and suitable raw material.

Another indicator of heavy reliance on expedient tool production is the higher frequency of cores to formal tools or blanks. Twelve cores and seven formal tools or fragments were identified. Basically, it was more common to exhaust a core than to break or exhaust a biface tool or blank. In

Table 3. LA 61315, Area 1 Chipped Stone Artifact Type by Material Type

Count Row Pct Column Pct	Chert Undifferentiated	Pedernal Chert	Madera Chert	Chalcedony	Silicified Wood	Obsidian	IIgneous	Sandstone	Quartzite	Quartzitic Sandstone	Quartz	TOTAL
Angular debris	58 45.7 20.1		57 44.9 21.7						8 6.3 6.3	3 2.4 8.1	1 .8 33.3	127 17.5
Core flake	193 37.8 66.8	1 .2 100.0	173 33.9 65.8	1 1.2 50.0	1 .2 50.0		1 .2 50.0	1 .2 100.0	108 21.1 85.7	32 6.3 86.5	1 .2 33.3	511 70.4
Biface flake	29 46.8 10.0		22 35.5 8.4	1 1.6 50.0		1 1.6 50.0	1 1.6 50.0		5 8.1 4.0	2 3.2 5.4	1 1.6 33.3	62 8.5
Hammerstone flake			1 100.0 .4									1 .1
Undifferentiated core	1 100.0 .3											1 .1
Unidirectional core			1 33.3 .4						2 66.7 1.6			3 .4
Bidirectional core			2 66.7 .8		1 33.3 100.0							3 .4
Multidirectional core	1 20.0 .3		3 60 1.1						1 20.0 .8			5 .7
Cobble tool	4 80.0 1.4								1 20.0 .8			5 .7
Cobble tool, unidirectional	1 100.0 .3											1 .1
Uniface, early stage	1 100.0 .3											1 .1

Count Row Pct Column Pct	Chert Undifferentiated	Pedernal Chert	Madera Chert	Chalcedony	Silicified Wood	Obsidian	IIgneous	Sandstone	Quartzite	Quartzitic Sandstone	Quartz	TOTAL
Biface, early stage	1 20.0 .3		3 60.0 1.1						1 20.0 .8			5 100.0 .7
Biface, middle stage			1 100.0 .4									1 100.0 .1
Total	289 39.8	1 .1	263 36.2	2 .3	1 .1	1 .1	2 .3	1 .1	126 17.4	37 5.1	3 .4	726

a situation where raw material was scarce, cores would be rare and evidence for formal tool manufacture and maintenance would be more common.

Biface manufacture did occur during the Area 1 occupation. This is evidenced by the 8.5 percent biface flakes that were recorded. Biface flakes were predominantly undifferentiated chert and Madera chert, which follows the pattern of local raw material dependence. Furthermore, material selection is not exclusive to fine-grained material as might be expected for biface manufacture. The majority of the undifferentiated chert biface flakes are fine-grained, but the Madera chert biface flakes are 50 percent fine-grained and 50 percent medium-grained. This suggests that material texture was not an important consideration in formal tool production. This may reflect the general nature of tasks that were conducted on-site and that limited gearing up for logistical hunting forays occurred.

Cores. Four core types were identified. Multidirectional, unidirectional, and bidirectional core types occur in roughly equal frequencies. However, Madera chert and quartzite cores are the most common. This may reflect the available size and form of Madera chert and quartzite cobbles. These materials are predominantly from Sangre de Cristo Mountain sources. Their mechanical transport distance is shorter than the Rio Grande gravel, leaving them larger and in cobble and tabular form. Informal inspection of the local gravel deposits reveals a wide variety of fine-grained or crypto-crystalline materials. These varied materials are common, but they occur as small nodules, pebbles, or cobbles. Limited reduction of these materials would leave no remnant core or the exhausted parent material might not be recognized as a core in the analysis. One test of this assumption would entail artifact size. If undifferentiated chert was available in smaller forms, it should occur as smaller debitage on archaeological sites. An independent sample Student's T-test at the .05 significance level examined the null hypothesis that there is no significant difference in the size of core flakes and angular debris for undifferentiated chert and Madera chert. A p-value of .41 was obtained, resulting in a failure to reject the null hypothesis. There was no statistically significant difference in debitage length for the two material types. Hence, raw material size cannot be invoked to explain the difference in core frequencies. Therefore, other cultural factors must have conditioned core/raw material distribution.

The four core types are most commonly associated with expedient core reduction and the production of flake tools. Their discarded form reflects the removal of flakes as needed or to cull raw material for the most suitable pieces. Different platform attributes probably are conditioned by raw material shape and size with tabular cores more suited to unidirectional and bidirectional flake removal. Multidirectional platforms are suited to symmetrical raw materials, where platforms can be created through systematic rejuvenation and clearing old flake scars or exhausted platforms (OAS Staff 1994). This preponderance of expedient core types fits well with the high core flake to biface flake ratio in the debitage assemblage.

Hand Tools. Six cobble tools or flakes detached from cobble tools by use or sharpening were identified. Two cobble tools exhibited battering and are classified as hammerstones. The other four cobble tools are flakes or angular debris detached as a result of maintenance or use, but they are recognized as hammerstone flakes by the battering on at least one dorsal ridge.

One hammerstone (FS 28-6) was recovered from Stratum 4 within Grid 97N/94E south of the structure in the extramural feature/discard area. The dark gray quartzite cobble has been flaked into a hand-sized (90 mm long by 52 mm side by 45 mm thick) oval-shaped tool. The battered wear pattern is at one end, but is partly obscured by the surface crazing that was caused by exposure to intense heat. Rather than heat-treated, the hammerstone was put into an active fire. Perhaps it was exhausted and reused for stone-boiling.

The second hammerstone (FS 49-34) was recovered from Grid 103N/92E from Stratum 2 at the south perimeter of the structure. It was made from a medium-grained chert cobble that was split in half and is heavily crazed. Similar to FS 28, the crazing has resulted from contact with an active fire as part of stone-boiling. Three dorsal ridges exhibit heavy battering indicating that the tool's utility for pecking or battering was exhausted. The hammerstone fragment measures 78 mm long by 64 mm wide by 54 mm thick.

The four hammerstone flakes were recovered from the refuse deposit associated with the structure. These battered flakes are primarily fine-grained chert, exhibit 0 to 40 percent dorsal cortex, and range in size between 27 and 53 mm long by 17 to 27 mm wide by 8 to 20 mm thick. They remain from ground stone production and maintenance and fibrous plant processing.

Formal Tools. Formal tools occur as a uniface/scraper, five early stage bifaces, and one middle stage biface. Descriptive data for these artifacts are presented in Table 4. Each of these classes is briefly discussed.

The early stage bifaces make up the majority of the formal tools. Four are broken and one is complete. Two of the broken artifacts (FS 49 and FS 51) exhibit transverse fractures suggesting that they broke in manufacture. FS 51 also has impurities in the Madera chert that may have contributed to manufacture problems that resulted in the breakage. FS 49 is made of relatively homogeneous material, but was produced from a small nodule. Artifact thinness may have contributed to early breakage. Two fragments FS 74-7 and FS-8 are from the same poorly finished tool. This heavily crazed and burned artifact has numerous dorsal flake scars that terminate in hinge or step fractures suggesting difficulty in working the material. The biface is curved and asymmetrical suggesting that it may not have been intended for hafting or further reduction into a smaller, more refined blade or projectile point. The only complete early stage biface (FS 89) is asymmetrical, shows no evidence of hafting, and no evidence of use wear. The lack of use wear may relate to material texture, since the artifact is made from medium-grained quartzite, which does not display use wear well.

The middle stage biface was collected from the surface in the vicinity of the structure. It is good quality Madera chert and is complete. It is oval shaped and symmetrical. Only one ridge on each face was incompletely thinned. The lateral edges exhibit crushing that may remain from cutting or slicing a hard or rough material. This tool is unhafted and could have been used by hand.

FS 63 is a unifacially retouched scraper fragment. The chalcedony tool fragment is the edge of a 70 to 80 degree edge angle scraper. The edge may have been detached from the parent tool by use or it may have been removed in an attempt to rejuvenate a worn edge. The worked edge does show step fracturing that may remain from use as a scraper. This tool fragment was recovered from the floor fill of the structure.

Utilized Debitage. Eight pieces of debitage exhibited edge wear or modification. Table 5 presents the basic morphological information. The utilized flake material types reflect the overall assemblage with Madera chert, undifferentiated chert, and chalcedony predominating. The tools are almost equally divided between angular debris and core flakes, which is a strong indicator that debris with sharp edges were selected as tools, regardless of form or size. Only one of the artifacts is complete with a roughly equally divided flake portion distribution. Artifact size ranged between 15 and 70 mm long by 14 and 63 mm wide by 2 and 28 mm thick by .5 and 79 g in weight.

Eight pieces of utilized debitage have a total of 10 worn or modified edges. Six tools have a single use edge and two tools have two used edges. Table 6 shows the utilized debitage edge data. Missing is FS 0-52, which was recorded in the field, but the recorder neglected to record the edge data. As might be expected, lateral edges were most commonly used; only two examples of distal edge use were noted. Lateral edges should be used more frequently because they are usually the longest and inherently sharpest. Edge outlines are more widely spread between different categories, though concave and convex edges predominate. Edge outline may reflect original form, but it may also reflect edge attrition through repeated use on hard materials. In this small sample, heavy edge attrition is not readily evident. Of the nine edges, four display edge modification in the form of retouch. Retouching can change the edge angle and blunt the edge, which is acceptable for scraping, but may decrease cutting efficiency. In this assemblage, the difference between retouched and unmodified edges is minimal, suggesting that edges were rarely modified for tasks that could not also be accomplished with unmodified edges. Edge wear is predominantly unidirectional with step

Table 4. Formal Tools, LA 61315, Area 1

FS	Artifact #	Provenience	Material Type	Material Texture	Artifact Type	Dorsal Cortex (%)	Dorsal Scar Count	Thermal Alteration	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
4	5.00	100N/95E, SS, St. 1	Madera chert	Fine grained	Biface, middle stage	0	15	None	56	34	13	25.3
49	32.00	103N/92E, F. 1, St. 2	Chert undifferentiated	Fine grained	Biface, early stage	10	18	None	32	31	9	11.6
51	8.00	102N/93E, F. 1, St. 1, Level 1	Madera chert	Medium grained	Biface, early stage	10	15	Waxy patina	56	44	21	44.0
63	9.00	102N/92E, F. 1, St. 3	Chert undifferentiated	Fine grained	Uniface, early stage	0	10	None	47	22	20	14.7
74	7.00	103N/92E, F. 1, Floor fill	Madera chert	Medium grained	Biface, early stage	0	10	Burned/discard	39	28	15	15.7
74	8.00	103N/92E, F. 1, Floor fill	Madera chert	Medium grained	Biface, early stage	0	5	Burned/discard	35	26	15	6.1
89	5.00	F. 8, fill	Quartzite	Medium grained	Biface, early stage	10	14	None	70	38	20	52.7

Table 5. Utilized Debitage, LA 61315, Area 1

FS	Artifact Number	Provenience	Material Type	Material Texture	Artifact Type	Tool Type	Dorsal Cortex (%)	Portion	Platform	Dorsal Scar Counts	Length x Width x Thickness (mm) x Weight (g)
0	52.00	92/101E, Surface	Chalcedony	Fine grained	Angular debris	Flake tool	0	Indeterminate	NA	7	42 x 32 x 16 x .0
39	1.00	99N/94E, St. 4	Chert undifferentiated	Fine grained	Core flake	Utilized flake	50	Lateral	Crushed	4	62 x 47 x 18 x 41.6
41	1.00	104N/91E, F. 1, St. 2	Quartzite	Fine grained	Core flake	Retouched flake	20	Distal	Missing/ manu	6	60 x 63 x 21 x 75.2
46	11.00	101N/94E, St. 5	Chert undifferentiated	Fine grained	Biface flake	Utilized flake	0	Proximal	Single/ abraded	7	15 x 14 x 2 x .5
52	4.00	104N/93E, F. 1, St. 1	Chalcedony	Fine grained	Core flake	Utilized flake	0	Lateral	Missing/ manu	3	40 x 32 x 16 x 8.9
58	14.00	105N/91E, F. 1, St. 1	Madera chert	Fine grained	Core flake	Utilized flake	40	Whole	Cortical	9	58 x 32 x 15 x 26.8
75	3.00	105N/90E, F. 1, St. 3	Madera chert	Fine grained	Angular debris	Utilized flake	60	Indeterminate	NA	5	70 x 53 x 28 x 72.8
89	4.00	F. 8, Fill	Madera chert	Medium grained	Core flake	Utilized flake	10	Distal	Missing/ manu	10	54 x 59 x 27 x 79.1

Table 6. Utilized Debitage Edge Data, LA 61315, Area 1

FS	Edge 1					Edge 2				
	Location	Outline	Modification	Wear	Angle	Location	Outline	Modification	Wear	Angle
39	Lateral	Convex	None	Unidirectional/ scraping	40					
41	Lateral	Convex	Unimarginal	None	60					
46	Lateral	Concave	None	Unidirectional/ scraping	20	Lateral	Concave	None	Unidirectional	25
52	Distal	Concave	Unimarginal	Bidirectional/ rounding/cutting	40	Lateral	Straight	Bimarginal	Bidirectional/r ounding/cutti ng	55
58	Distal	Convex	None	Unidirectional/ scraping	80					
75	Lateral	Sinuous	Unimarginal	Unidirectional/ scraping	70					
89	Lateral	Convex	None	Unidirectional/ scraping	55					

fractures and scalar flake scars reflecting scraping. Edge wear may form from use on durable or coarse materials or from heavy use on softer materials. This assemblage is too small to investigate which action may have been more prevalent. Edge angles range from 20 to 80 degrees. Experimentation has demonstrated that acute angles are more suited to cutting, slicing, and light scraping and steeper angles more suited to heavier duty scraping (Schutt 1982). This functional dichotomy is oversimplified, but is logical. This assemblage shows acute angles of 20 and 25 degrees on a biface flake (FS 46) that exhibits unidirectional wear. In the same vein, FS 52 has two edges that have 40 and 55 degree edge angles and bidirectional wear. These angles are more in line with multipurpose or general use, which is a characterization that fits better with the overall concept of expedient tool use. The wide range of edge angles within this small assemblage strongly suggests that multiple purposes were supported and suitable edges were employed in the varied tasks that accompanied a domestic occupation. Spatial distribution shows no specific association with the extramural features or structure. They were used and discarded as part of daily activity and were not generated by a specific task or used in a particular area for a task-specific purpose.

Summary. The chipped stone from Area 1 is abundant and reflects a general set of activities that would be expected for a domestic occupation. The chipped stone raw materials occur almost exclusively locally. The debitage is dominated by core reduction debris; there was only a minor contribution of biface manufacturing flakes and maintenance debris. Formal tools are rather crude and were only finished into early and middle stages of production. Utilized debitage occurs in very low frequency and reflects a wide range of activities with little evidence for intensive or extended duration processing. Perhaps the greatest value of this assemblage is its relatively large size, which will serve well as a comparative database for intrasite and intersite studies.

Ground Stone Artifacts

Eight pieces of ground stone were recovered. Ground stone artifact descriptive data are presented in Table 7.

Three artifacts recovered from Area 1 were classified as one-hand manos. These three artifacts were made from locally available quartzite or indurated sandstone cobbles. The two complete manos were ground on both faces and exhibited pecking and light to heavy grinding wear. All manos had been resharpened or roughened. FS 20 is interesting because one face exhibits almost fresh pecking and light wear, suggesting that it was just being put into use at the time of abandonment. FS 95 was fire-cracked and recovered from the bottom of the cobble-lined hearth (Feature 9) within Feature 1. Its use in the hearth indicates that even though cobbles were abundant on the slopes, the nearest source, probably the midden, was exploited for construction materials for the feature.

The length and width of the two whole manos were plotted with a sample of 25 one-hand manos from other Santa Fe area late Archaic-early Developmental period sites (Fig. 13). LA 61315 manos cluster with LA 84758, an early Developmental residential site. The manos from LA 84758 tend to be larger than the other sites, which are base or foraging camps that lack a residential structure. One mano from each of the other three sites also occurs in this large-size cluster, but the majority are in a smaller dimension class. While realizing that available local cobble size may condition mano dimensions, there does seem to be a pattern of larger manos occurring on residential sites. This increase in size may equate with the need to process greater quantities of seeds or nuts or it may relate to changing subsistence focus. Tentative as any hypothesis may be based on mano size, it appears that there may be some correlation between occupation duration, activity range and intensity, and mano size.

Four metates or metate fragments were identified. Three were internal fragments or edges from basin metates. They appeared to originate from large tabular cobbles, which is similar to the metates recovered from LA 84758 at Las Campanas (Post 1996a). One complete metate (FS 111) was lying upside down on the structure floor. This artifact was made from friable sandstone and had been worn

Table 7. LA 61315, Manos and Metates

FS	Provenience	Mano or Metate Type and Present Form	Material	Texture	Portion	Plan View	Wear Location	Wear Type	Length cm	Width cm	Thick cm	Weight kg
Manos												
17	104N/90E, SS, P.P. 200	One-hand, cobble	Quartzite	Medium	Complete	Biconvex	Both faces	Heavily pecked and ground	11.8	10.3	6.0	1.194
20	104N/91E, SS, P.P. 201	One-hand, cobble	Indurated Sandstone	Fine	Complete	Biconvex	Both faces	Pecked and heavily worn; Pecked and lightly worn	12.1	10.1	4.9	1.033
95	103.65N/92.35E, F.9, P.P. 217	One-hand, cobble	Indurated Sandstone	Fine	2/3 complete	Convex	One face, other face missing	Pecked and moderately worn; Other side fire-cracked and missing	12.6	7.8 (partial)	5.0 (partial)	.65
Metates												
16	99N/93E, SS	Basin, tabular cobble	Quartzite	Coarse	Internal near edge	Concave	Basin and edge perimeter	Moderately worn and fire-cracked	12.8	3.6	6.8	.535
17	104N/90E, SS	Metate fragment	Quartzite	Coarse	Edge	NA	Edge	Moderately worn and fire-cracked	5.2	8.8	3.9	.177
39	99N/94E, St. 4, .68 BD, P.P. 207	Metate fragment	Quartzite	Coarse	Internal	Concave	Basin	Moderately worn and fire-cracked	7.8	5.5	5.1	.309
111	On the floor of F. 1	Basin	Sandstone	Medium	Complete except for center of basin	Concave	Basin	Moderately worn, but bottom of basin is broken through	47.0	30.0	5.0	9.2

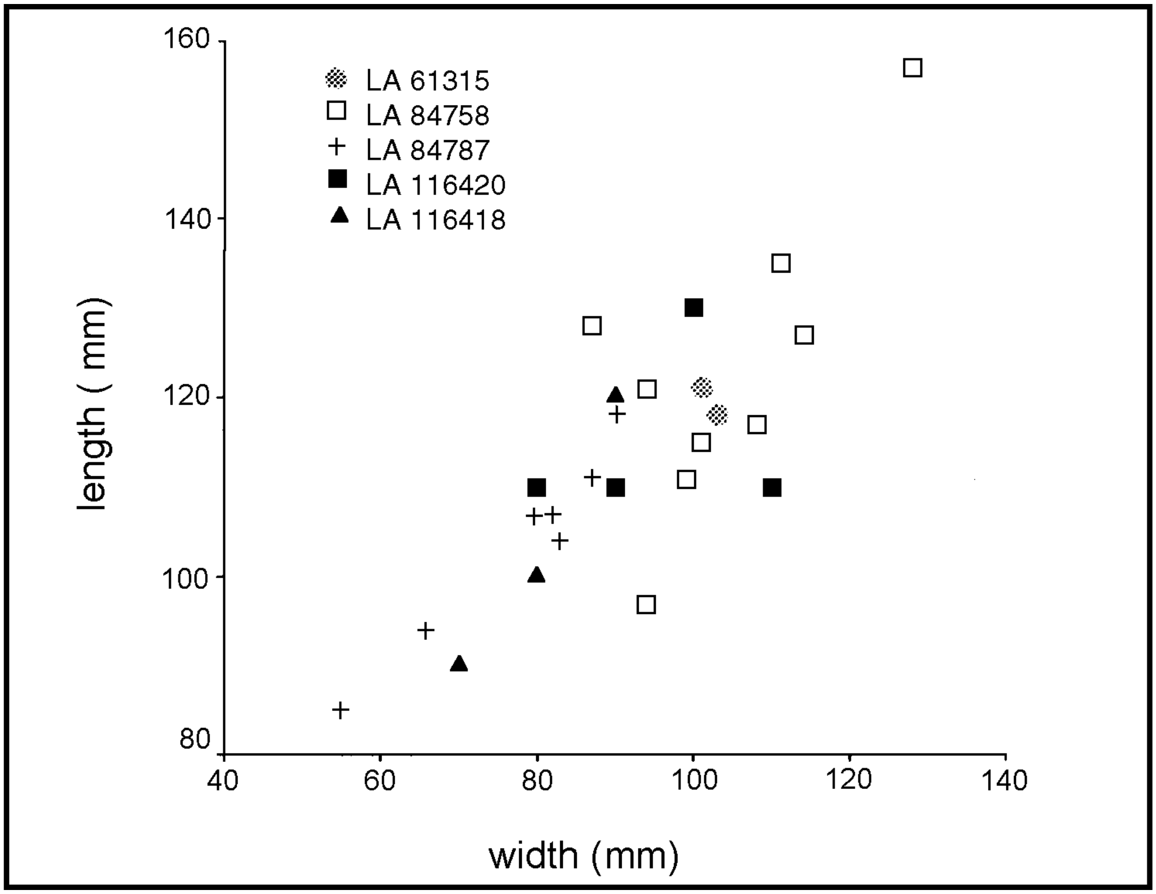


Figure 13. Mano length by width from Santa Fe area late Archaic sites.

into a deep basin. The bottom of the basin had broken, leaving the metate unsuitable for grinding. The metate is burned, supporting the observation that it was associated with the structure. The heavily used condition of FS 111 indicates that even though LA 61315, Area 1, was primarily a seasonal occupation, it was of sufficient duration to require a full range of domestic facilities and tools.

Pottery

Two sherds were recovered from Area 1. One jar body sherd of plain gray ware was recovered from Grid 100N/95E in Stratum 1. The sherd is burned or overfired with a blackened and smoothed exterior and a smooth interior. The paste is black, friable alluvial clay mixed with rounded sand and mica. This utility ware pottery was produced between A.D. 900 and 1400 in the northern Rio Grande and is not diagnostic of a particular period.

The second (FS 0-93) is a Santa Fe Black-on-white bowl body sherd. The interior is lightly slipped with a streaky polish. The exterior is smoothed. The design is four parallel framing lines, probably located parallel to the rim. A right-angle broad line motif is pendant from the lowest framing line. The paste is fine-grained, volcanic-origin clay with abundant glassy filaments of tuff. The most likely source for this paste type is the Pajarito Plateau or periphery of the Tewa Basin (Habicht-Mauche 1993). Santa Fe Black-on-white is the most common decorated pottery recovered during the Northwest Santa Fe Relief Route testing project (Wolfman et al. 1989). It is also the main decorated pottery produced within the northern Rio Grande during the thirteenth century (Habicht-Mauche 1993).

Chronometrics

Four wood charcoal samples were submitted for radiocarbon analysis. Table 8 gives the date ranges and provenience for each sample.

The calibrated radiocarbon date ranges indicate that Feature 1 occupation could have occurred over a 1,455-year span from 1015 B.C. to A.D. 440. Three date ranges cluster between the second century B.C. and fifth century A.D. The fourth date is well outside the most probable range even if the "old wood" factor is invoked to explain the difference. It is possible that more than one occupation occurred in the Feature 1 area and that the early date represents a pre-Feature 1 occupation with the structure built on top of Feature 6. The dates do indicate a late Archaic or early Basketmaker II occupation. Absolute dates from these periods are currently rare in the Santa Fe area.

Table 8. Radiocarbon Date Ranges for LA 61315, Area 1

Sample Number	Provenience	Intercept Date	2-Sigma Date Range
Beta-84810	Feature 1, floor, 103N/91E	A.D. 210	cal 35 B.C. to A.D. 420
Beta-84811	Feature 6, burned pit within F. 1	830 B.C.	cal 1015 to 780 B.C.
Beta-84812	Feature 8, burned pit within F. 1	A.D. 260	cal A.D. 90 to 440
Beta-84813	Feature 7, burned pit within F. 1	A.D. 15	cal 175 B.C. to A.D. 145

Summary

Area 1 yielded a complex of features and associated artifacts that represent a late Archaic or early Basketmaker II residential occupation. The structure's foundation with intramural burned pits and a hearth suggest a cold weather occupation. Extramural features combined with abundant chipped stone debris, fire-cracked rock, and exhausted ground stone artifacts are evidence of a long and intensive domestic occupation. The small structure size suggests a small family unit. Splintered animal bone from the hearths and pits remain from meat processing and consumption, although the preponderance of chipped stone debris from core reduction and ground stone artifacts suggest a greater emphasis on plant and other biotic resources.

Area 3

Area 3 was across the arroyo to the southwest of Area 1 and northwest of Area 2 (Fig. 3). The cultural deposit consisted of a low frequency scatter of chipped stone and a charcoal-infused soil stain exposed by a shallow erosion channel. Removal of the sandy gravelly top soil from 18 units yielded 34 lithic artifacts and 1 sherd and exposed the outline of a deflated and eroded thermal feature. Excavation revealed a large, intensely burned roasting pit that was excavated into an old ground surface at 10 to 15 cm below the modern ground surface.

Stratigraphy

Two strata were identified in Area 3. Stratum 1 corresponds to Stratum 1 in Area 1. It was a 1- to 15-cm-thick, modern, colluvial layer of brown sandy loam with gravel, cobbles, and organic duff and roots that covered the cultural deposit. There were pockets of coarse alluvial sand deposited by the modern erosion channel. This coarse sand covers and intrudes into the feature matrix, Stratum 2.

Stratum 2 was a 5- to 20-cm-thick, dark gray brown to dark brown charcoal and ash-stained sandy loam mixed with 50 to 60 percent pea gravel. The feature fill was churned by modern erosion and deflation. Pockets of black-stained soil occurred at the feature center. These stained pockets might have been a second thermal feature that was built into Feature 12. The numerous cobbles found

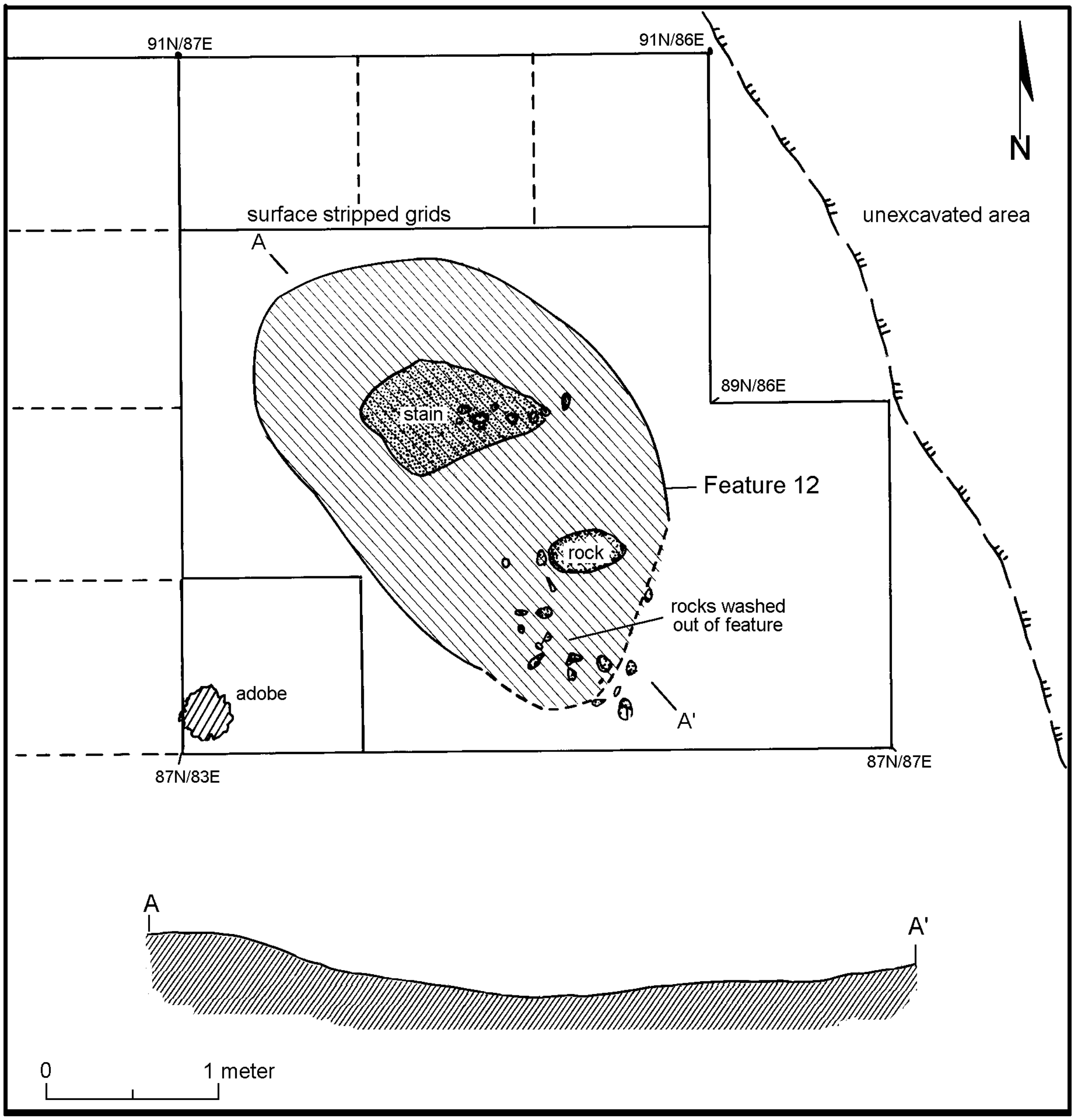


Figure 14. LA 61315, plan view and profile of Excavation Area 3 and Feature 12.

within Feature 12 may once have lined it.

Features

One thermal feature (Feature 12) was completely excavated. A second thermal feature (feature number unassigned) was observed in the floor of Feature 12, but was not excavated and remains buried at the site.

Feature 12 was an intensely burned pit feature that was eroded and partly filled by alluvial sand. Pockets of charcoal-stained soil appeared as three individual features, but excavation connected the pockets into one large thermal feature. Feature 12 was oval-shaped and measured 2.75 m north to south by 1.75 m east to west and 35 cm deep (Fig. 14). It was excavated into native soil and had cobbles lining the feature edge. The walls were moderately to steeply sloped with a sinuous, but relatively level bottom. Only a few pieces of chipped stone or fire-cracked rock were recovered from within the feature. Eleven flotation samples were collected from the darkly stained soil pockets. A radiocarbon date from wood charcoal yielded a two-sigma calibrated date range of A.D. 1030 to 1290 (Beta-84815).

A possible thermal feature was observed as a concentration of heavily charcoal-impregnated soil on the floor of Feature 12. Although it was left unexcavated, the stain's dimensions were estimated as 110 cm east-west by 67 cm north-south. Apparent stratigraphic distinction between the stain and the main body of Feature 12 indicated the potential for multiple episodes of feature use.

Area 3 Chipped Stone Artifacts and Pottery

The Area 3 artifact assemblage included 34 chipped stone artifacts and one sherd of utility gray ware pottery. Each artifact class is briefly described and will be compared with other areas later.

Chipped Stone Artifacts

A total of 34 chipped stone artifacts were recovered from excavated contexts in Area 3. This section focuses on attributes that reflect raw material procurement and reduction patterns.

Raw material selection relates to the range of lithic material types and qualities that make up the assemblage. Table 9 shows the material types for Area 3 proveniences. Undifferentiated chert, Madera chert, and quartzite are 96 percent of the assemblage. One quartzitic sandstone artifact reflects the mixed composition of the Plains surface alluvium. Sources for undifferentiated chert and Madera chert were discussed for the Area 1 assemblage and also apply to this assemblage.

Table 9. LA 61315, Area 3, Chipped Stone Artifact Type by Material Type

Count Row Pct Column Pct	Chert Undifferentiated	Madera Chert	Quartzite	Quarzitic Sandstone	Total
Angular debris	2 40.0 14.3	3 60.0 25.0			5 14.7
Core flake	12 42.9 80.0	9 32.1 75.0	6 21.4 100.0	1 3.6 100.0	28 82.4
Unidirectional core	1 100.0 6.7				1 2.9
Total	15 44.1	12 35.3	6 17.6	1 2.9	34

Material texture frequencies are roughly divided between fine and medium-grained materials for the three main raw material types. Undifferentiated chert and Madera chert have slightly more fine-grained than medium-grained material and quartzite has slightly more medium-grained than fine-grained material. This pattern undoubtedly reflects raw material texture frequencies in the source gravel and a general lack of material selectivity by the prehistoric flintknapper. Raw material texture was discussed in more detail for the Area 1 assemblage.

Debitage. The artifact type distribution is not unusual for Santa Fe Relief Route sites regardless of period or apparent site function. This assemblage is dominated by core flakes with a substantially lower frequency of angular debris compared to Areas 1 and 2. The predominance of core flakes suggests that core reduction focused on initial flake removal and a limited amount of core reduction for the purpose of making tools or paring down cores. This pattern is substantiated by the dorsal cortex ratio–41 percent noncortical to 59 percent cortical debris–which is very different from Areas 1 and 2. Differences between area assemblages will be explored further in the Research Design section.

Core. One unidirectional core was recovered from Area 3. The chert cobble exhibited flake removal from a single striking platform. It had 20 percent dorsal cortex and exhibited 8 dorsal scars. It is a small core measuring 57 mm long by 45 mm wide by 43 mm thick and weighing 118 g. Its presence is consistent with expedient core reduction and initial flake removal.

Pottery

One sherd of utility gray ware was recovered from Grid 88N/85E within Feature 12. The sherd is a Tesuque Corrugated jar rim. The coil exteriors are indented and smeared and the vessel interior is smoothed. The rim is rounded and flattened and slightly everted. The paste is a black and blocky Sangre de Cristo source clay with coarse-grained granitic sand and muscovite mica as temper or as natural constituents in the clay deposit. This type is typical of the utility wares made throughout the northern Rio Grande from A.D. 1100 to 1400 (Habicht-Mauche 1993).

Summary

Excavation of Area C yielded a large, intensely burned hearth or roasting pit. Feature 12 was associated with a low frequency of core reduction debris. No faunal remains were recovered from the feature. The pottery and radiocarbon date indicate an occupation during A.D. 1100 to 1300. The large capacity of the feature suggests mass processing of gathered nuts, seeds, or fruits. Ethnobotanical analysis provided no additional evidence of feature function or processed plant resources.

The Surface Artifact Scatter

The surface artifact scatter included chipped and ground stone artifacts. The extent of the surface artifact scatter was used to define the site limit. Pinflagged surface artifacts were field recorded using the same basic attribute list used in the laboratory artifact analysis. The surface artifact data were expected to provide information on raw material procurement, resource acquisition, and processing, and the artifact data are compared with the data from Areas 1-3 for similarities that may indicate temporal or functional association.

One hundred and fifty-three artifacts were piece-plotted within a 40 m north-south by 35 m east-west area covering 1,400 sq m. Surface artifact density within the largest area was 1 artifact per 10 sq m, which is quite low. However, Figure 15 shows two clusters, one within Area 1 and the other 15 m southeast of Area 1. These clusters have relatively equal proportions of noncortical and cortical debris suggesting they are related to the domestic/processing activities focused around Area 1. There is also an elongated linear distribution that extends from the northeastern map limit to the southwest for about 30 m. Within the elongated distribution there are two clusters that may represent individual reduction episodes. Both have high proportions of cortical artifacts within areas measuring less than 5 m in diameter. Overall, the surface distribution reflects the multicomponent nature of the site and a more general land-use pattern of many site visits creating an archaeological record of dispersed artifact scatters that are temporal palimpsests.

Surface Chipped and Ground Stone Artifacts and Pottery

Of the one hundred fifty-three artifacts, 151 were chipped stone, 1 was ground stone, and 1 was pottery. The pottery was a bowl sherd of Santa Fe Black-on-white that was within the Area 1 excavation area described previously. The other artifact types are briefly described below.

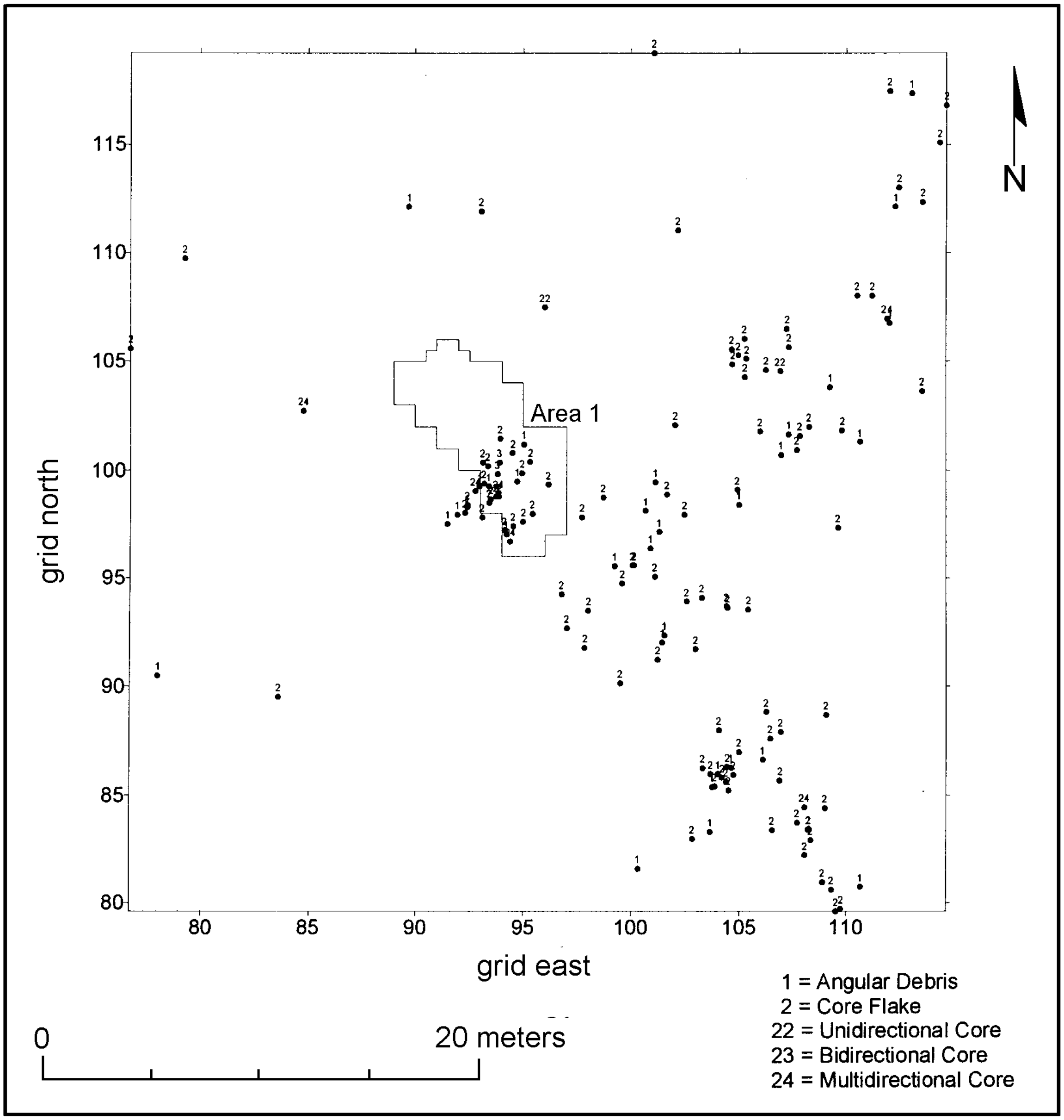


Figure 15. LA 61315, piece-plotted surface artifact types.

Chipped Stone Artifacts

The 151 chipped stone artifacts included core flakes (n=107), angular debris (n=33), multidirectional cores (n=7), unidirectional cores (n=2), and biface flakes (n=2) (Table 10). The raw material distributions show a predominance of undifferentiated chert and quartzite. Madera chert is absent. Undoubtedly it occurred in the scatter, but was not recorded. The common, though not abundant presence of quartzite applies for the three excavation areas and the surface artifacts. The low frequency of other material types also mirrors the pattern observed in the excavation area assemblages. Raw material texture distribution shows 50 percent fine-grained and the remaining 50 percent medium- or coarse-grained chert. All of the quartzite was coded as medium grained. Combined medium- and coarse-grained materials were 55 percent. This pattern strongly confirms the raw material texture distribution found in the excavation area assemblages and supports the observation that almost all raw material was acquired from the local gravel sources.

Table 10. LA 61315, Surface Artifacts by Artifact Type and Material Type

Count Row Pct Column Pct	Chert Undifferentiated	Chalcedony	Silicified Wood	Sandstone	Quartzite	Total
Angular debris	30 90.9 23.4	1 3.0 33.3			2 6.1 10.5	33 21.9
Core flake	88 83.2 69.5	1 .9 33.3	1 .9 100.0	1 .2 100.0	16 15.0 84.2	107 70.9
Biface flake	2 100.0 1.6					2 1.3
Unidirectional core	1 50.0 .8				1 50.0 5.3	2 1.3
Multidirectional core	6 85.7 4.7	1 14.3 33.3				7 4.6
Total	127 84.8	3 2.0	1 .1	1 .7	19 12.6	151

Debitage. Debitage accounts for 94 percent of the surface assemblage. Core flakes are higher in this assemblage than in the others. Debitage dorsal cortex proportions are 32.5 percent cortical and 67.5 noncortical; cortical flakes are split evenly between artifacts with 10 to 50 percent dorsal cortex and those with greater than 50 percent dorsal cortex. These percentages are higher than the excavation area assemblages and the even split within the cortex classes is also unusual for this site. This dichotomy may relate to a different raw material procurement strategy and the use of materials that are available less than 50 m distance from the activity area or habitation.

Cores. Nine cores were field recorded accounting for 6 percent of the assemblage. This core frequency is higher than that observed for the excavation areas. A distribution map shows the cores scattered throughout the site area. This indicates that they accumulated from multiple procurement or reduction episodes rather than as a single lithic raw material acquisition event. The cores are unidirectional and multidirectional forms, which are strongly associated with expedient core flake production and raw material procurement. Core sizes range from 35 to 90 mm long by 21 to 75 mm wide by 21 to 51 mm. Generally speaking, the cores are primarily small to medium in size with no core having a length greater than 100 mm. This no doubt reflects raw material size and should also be reflected in the maximum flake sizes. Core dorsal cortex shows that 67 percent retain at least 10 percent cortex and that 40 percent have more than 50 percent dorsal cortex. Dorsal scars range from 3 to 13 with the 7 of 9 exhibiting more than six dorsal flake scars. The relatively high flake scar count per core suggests that raw material procurement regularly proceeded beyond testing and that core flake size may also reflect the intensity of reduction for each core.

Ground Stone Artifact

The one ground stone artifact is a fine-grained tabular basalt slab metate fragment. It is an outer edge fragment that has been lightly flaked along one edge. The two edges meet at a right angle suggesting that the complete metate had a rectangular or square plan view. The cross section is plano-plano. One face is slightly pitted and is lightly pecked and ground. The facets are very smooth at the interior edge of the fragment. The other side is ground flat and is polished with diagonal striations visible below the polish. This side may not have been useful for grinding, but may have been used as a comal or to roll out thin bread. The fragment is 14.2 cm long by 9.4 cm wide by 2.4 cm thick and it weighs .502 kg.

Surface Artifact Scatter Summary

The surface artifact scatter is an accumulated deposit from on-site activities as well as from material testing and procurement by seasonal foragers. Visual examination of artifact location plots distinguished three or four distinct reduction episodes within a dispersed scatter formed by a low intensity land-use pattern that dominated the area for 7,000 years. The surface artifact database is useful for comparison with Areas 1-3, LA 61321, and other site assemblages from the Northwest Santa Fe Relief Route and Las Campanas projects.

Site Summary

Excavation of LA 61315 revealed three discrete occupation areas from the Bajada and En Medio phases of the Archaic period and the Coalition period of the Rio Grande sequence. Area 1 was an En Medio phase residential camp with architectural remains, extramural features, and an activity area, and a predominance of core reduction debris. Area 2 was the deflated remains of a late Bajada phase camp site with a deflated hearth and microdebitage from tool maintenance and edge sharpening. Area 3 was the deflated and eroded remains of a large roasting pit or thermal feature from the Coalition period. Areas 1 and 3 may have been more deeply buried, but have been exposed by the heavy erosion that occurred during the nineteenth and early twentieth centuries. Deflated feature remains and artifacts were exposed on the surface in Excavation Areas 1 and 3 suggesting limited soil deposition between 175 B.C. and A.D. 1290. A 1.65-m-thick deposit on top of Excavation Area 2 suggests considerable aggradation of the drainage head between 5000 and 200 B.C. The long spans between the occupations indicate conditions that were sporadically suitable for habitation and resource exploitation. A sheltered setting, suitable lithic raw material, and easy access to riparian, woodland, and montane environments are three factors that would have influenced site location, occupation length, and range of activities. Excavation of LA 61315 has recovered more information than the data recovery plan expected. Excavation results will make a valuable contribution to understanding human occupation of the Santa Fe-Tesuque Divide.

LA 61321

Site Setting

LA 61321 is on a long, broad ridge that descends from Tano Ridge on the north to the edge of the Santa Fe River terrace on the south. The gently sloping ridge separates Cañada Rincon from the headwaters of the Arroyo de los Frijoles. The east slope is a moderate to steep grade that drains into Cañada Rincon. Most of the cultural material is found on the east slope. The soil is predominantly sandy silt with moderate to dense concentrations of gravel and cobbles. Most of the general setting characteristics are similar to LA 61315, which is to the south across Camino la Tierra, and on the same elongated ridge slope.

Pre-Excavation Site Description

The site covers 800 sq m. The remains of two thermal features were visible on the surface. Testing indicated that Feature 2 would have data potential. An unknown number of chipped stone artifacts and a single utility gray ware sherd were observed. Excavation was to focus on the remaining thermal feature, field recording, limited surface collection, and piece-plotting the surface artifacts.

Excavation Methods

LA 61321 was relocated and site limits were redefined by pinflagging the surface artifacts. The surface artifacts were piece-plotted and recorded in the field. Surface artifacts were only collected from excavated areas.

A base line for a 1-by-1-m grid system was established and expanded to include the tested feature areas and the charcoal stain found in an arroyo cut in the northwest corner of the site. A 5 m north-south by 7 m east-west area with 145N/116E as the northeast corner encompassed the rock concentration designated Feature 2 (Area 1). An 8-by-8-m area with 187N/80E as the northeast corner encompassed the projected limits of the charcoal stain in the northeast corner of the site (Area 2).

The loose sandy top soil was removed from both areas. All of Area 1 was stripped and part or all of 24 units in Area 2 were surface stripped. Surface stripping revealed the extent of the rock concentration in Area 1 and exposed the most deflated portions of the charcoal stain in Area 2. All deposits were screened through ¼-inch steel mesh.

After defining the rock concentration (Feature 2), three units were excavated to provide a cross section of the feature fill. The resulting profile was mapped and soil samples were collected. Feature 2 was photographed and described. No further excavation was conducted because of the low artifact count recovered from the feature, the lack of a definable cultural deposit, and the low expectation for obtaining new data from more excavation.

Excavation of Area 2 was carried out to determine the nature, extent, and date of the charcoal-stained deposit (Figs. 16, 17). Two units were excavated in 10 cm levels into the charcoal stain. These units did not yield artifacts, but there was moderately abundant charcoal. To further investigate the deposit, a 1-by-7-m trench was excavated into the charcoal deposit in 10 and 20 cm levels. These units did not yield artifacts or reveal evidence that the stain was cultural. Two 1-by-1-m units were excavated on the east side of the arroyo that cut through the area. These units were excavated into and through the charcoal-stained layer in 10 and 20 cm levels. No cultural material was recovered and excavation was halted. The trenches were profiled, the area was transit mapped, and the excavation units were backfilled. It was determined that Area 2 was not a cultural deposit.

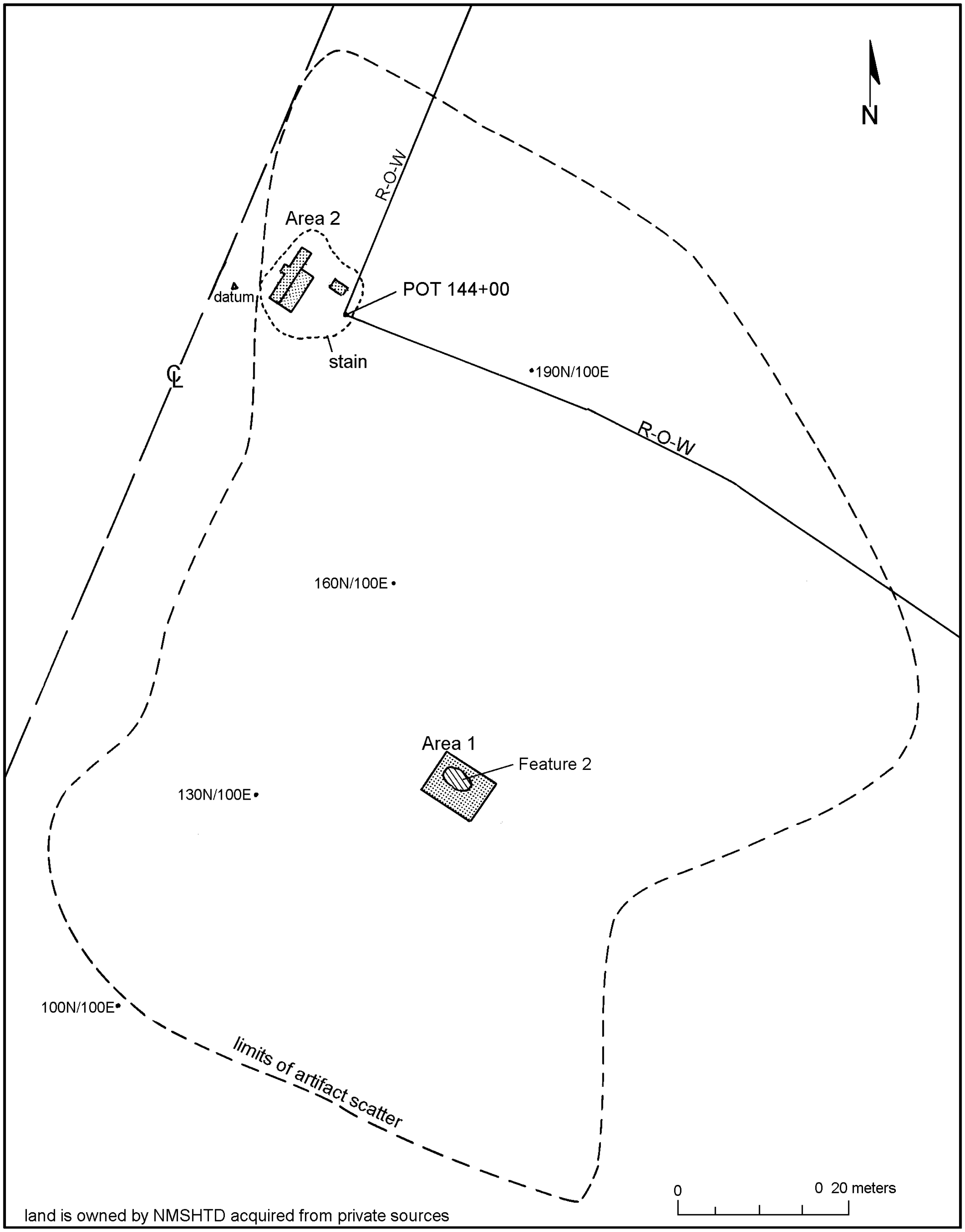


Figure 16. LA 61321, site map.

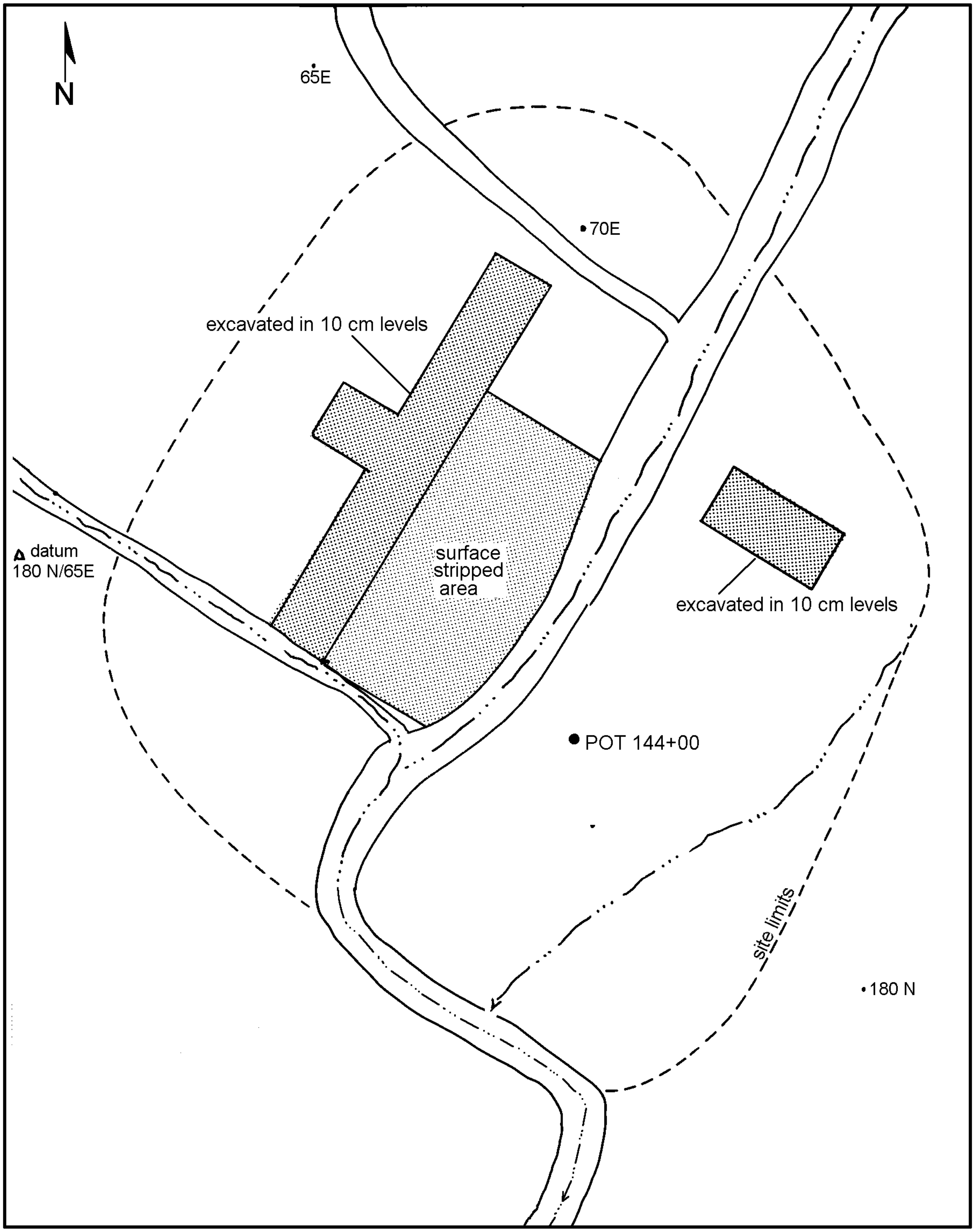


Figure 17. LA 61321, Area 2, site map.

Excavation Results

Redefinition of the site limits expanded its dimensions to 110 m north-south by 90 m east-west covering 9,900 sq m (Fig. 16). Excavation of Area 1 revealed shallow cultural deposits associated with a large and dense concentration of burned and fire-cracked cobbles. Area 2 was determined to be a noncultural charcoal stain. Excavation revealed a dendritic or branch-like distribution to the charcoal, suggesting that the stain was a root or tree burn. The lack of artifacts, fire-cracked rock, or a consistent quality to the stain were used to determine that the stain was not a cultural deposit. The excavation results are described for Areas 1 and 2.

Area 1

Area 1 incorporated the burned and fire-cracked rock concentration designated as Feature 2. The 5-by-7-m area was surface stripped revealing shallow, deflated, and gravelly sandy loam that contained low artifact frequencies and charcoal-infused soil. The combination of charcoal-infused soil associated with the cobble concentration and evidence that the cobbles had been burned strongly suggested that Area 1, Feature 2, was a thermal feature and probably a reused roasting pit. The shallow natural and cultural deposits do not require detailed stratigraphic description. Therefore, Feature 2 will be described and will include soil characterizations.

Feature 2

The Area 2 excavation exposed the limits of the rock concentration designated as Feature 2. Excavation defined an elongated east to west configuration that was roughly oval-shaped. Within the concentration, a 2 m east-west by 1.5 m north-south charcoal stain was defined (Figs. 18, 19). This stain was characterized by mixed eolian and colluvial sandy loamy soil that was loose and shallow. The area around Feature 2 contained a dense cobble deposit that was difficult to distinguish from the feature limit. Definition of the feature limit was aided by the presence of very light gray, charcoal-infused soil that was the deflated remnant of a mixed primary and secondary deposit. The feature-like fill was 10 cm deep near the middle of the feature and only a thin 1- to 2-cm-thick layer existed outside the 2 m by 1.5 m central feature area. Ethnobotanical analysis of flotation samples yielded no charred plant remains that could be attributed to feature function or use. The high density of fire-cracked or heat-altered cobbles and expanded cobble distribution suggest an accumulation through many uses.

Large fire-cracked cobble concentrations have been rarely report in the piñon-juniper piedmont. Analogous features are more commonly reported for southeastern New Mexico, where “ring middens” are common (Carmichael 1985:115-121; O’Laughlin 1980:101-107). Large fire-cracked rock features may cover up to 100 sq m and have 50 cm of charcoal-impregnated fill. These repeatedly used features are commonly interpreted as having been used for processing leaf succulents (O’Laughlin 1980:107). This is based on ethnographic observation and the occurrence of these features in areas where lechuguilla or sotol are or were once abundant. This interpretation has been difficult to substantiate because of the low recovery of charred macrobotanical materials from these features. Obviously, sotol, agave, and lechuguilla are and probably never were a component of the piedmont plant community. Instead, there is the possibility that this feature was used to process cactus tunas, pads, or yucca fruits. Again, this supposition remains unsupported by the lack of charred macrobotanical remains. However, the size of the feature and its apparent reuse indicates that Coalition or early Classic period foragers may have staged gathering and processing activities. Depending on the distance from the nearest village, which in this case is 5 to 7 km, reduction of transport weight may have been accomplished by partially processing water-laden tunas

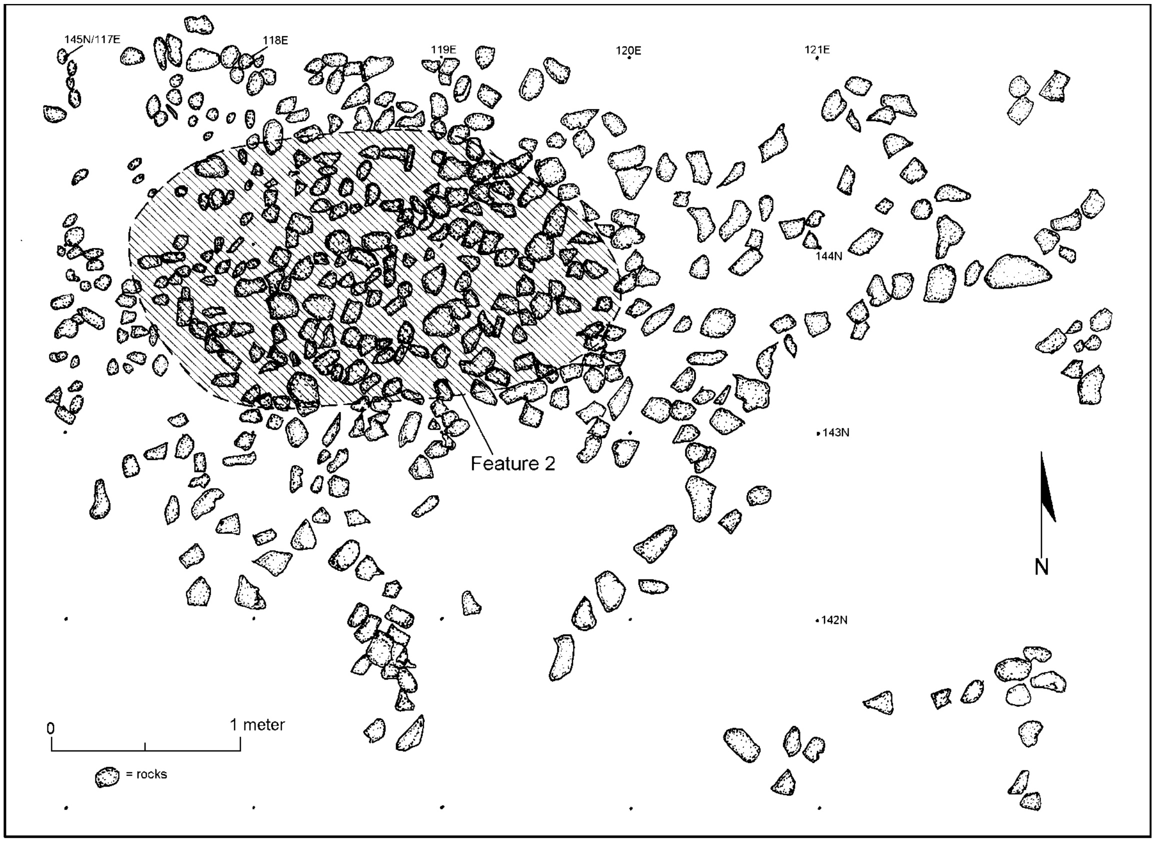


Figure 18. LA 61321, Feature 2, plan view.


Figure 19. LA 61321, Feature 2.

or fruits. A staged-foraging strategy would have allowed ancestral Pueblo foragers to extend their range beyond a 2 to 5 km radius from the village (Post 1996). Expansion of foraging territory may have coincided with local population growth between A.D. 1275 and 1350, when the resources of the piedmont were more intensively exploited (Post 1996b).

The Artifact Assemblage

Examination of LA 61321 and pinflagging of surface artifacts revealed an extensive low density artifact scatter. Field recording of artifacts and the recovery of artifacts by excavation resulted in typological and functional information on 262 chipped stone artifacts and three pottery sherds. The three sherds were recovered from Area 1. Chipped stone artifacts were recovered from surface and excavated contexts. Chipped stone will be described for Area 1 and the general site and then the two assemblages will be compared.

Chipped Stone Artifacts

Data on 262 chipped stone artifacts were recovered through excavation or field recording. Table 11 shows the distribution of chipped stone artifacts by artifact and material type in Area 1 and in the general surface scatter. Detailed description of each spatial component of the site assemblage follow.

Area 1. Sixty-two artifacts were recovered from the Area 1 excavation. Chipped stone was recovered from surface and near-surface contexts. The shallow soil depth in Area 1 indicates that the artifacts may represent a palimpsest distribution. Vertical differentiation within the assemblage is not possible and probably not very meaningful. Therefore, the Area 1 assemblage is discussed as a single analytical unit.

Raw material types for Area 1 chipped stone are dominated by chert. As described for LA 61315, chert is common in the piedmont gravel, although its distribution is patchy. Quartzite is the second most common raw material for the same geological reasons that condition the occurrence of chert on archaeological sites in the piedmont area. Typically for Santa Fe Relief Route sites (Wolfman et al. 1989), chert and quartzite co-occur in the same basic proportions as are found in the Area 1 assemblage. Other raw materials occur in low frequencies reflecting high source variability coupled with low frequency. The range of raw materials is expected in a situation where repeated visits occurred.

Debitage. Debitage accounts for 93.8 percent of the Area 1 assemblage. Core flakes account for 80.6 percent of the total assemblage. Debitage dorsal cortex proportions are 19.4 percent noncortical and 80.6 cortical artifacts. These percentages are unusual for Northwest Santa Fe Relief Route small sites, where cortical debitage is rarely more than 50 percent of the assemblage. This high percentage of cortical debris no doubt reflects the importance of raw material procurement in site activities as well as the small size of available raw materials, which would contribute to a higher proportion of cortical to noncortical debris.

Cores. Two multidirectional cores and one tested cobble were recovered from Area 1. The multidirectional cores are Madera chert and chert. The tested cobble is chert. Multidirectional cores and tested cobbles occur in conjunction with raw material procurement and early stage core reduction. The cores are small with maximum dimensions between 42 and 49 mm. Dorsal cortex was present on both multidirectional cores. Dorsal scar counts were four and five. The relatively high flake scar count per core suggests that raw material procurement proceeded beyond material testing, although the debitage dorsal cortex distribution indicates that early stage reduction was a primary activity.

Cobble Tool. The cobble tool is a split chert cobble that was retouched along one lateral edge. The edge outline is sinuous with a 60 degree edge angle. No use wear is evident on the edge,

Table 11. Artifact Type by Material Type for LA 61321, Area 1, and the General Surface Scatter

Count Row Pct Column Pct	Chert	Pedernal Chert	Madera Chert	Fossiliferous Chert	Chalcedony	Quartzite	Quartzitic Sandstone	Massive Quartz	Total
Area 1									
Angular debris	3 50.0 7.0		1 16.7 25.0		1 16.7 100.0	1 16.7 9.1			6 9.7
Core flake	36 72.0 83.7		2 4.0 50.0	1 2.0 100.0		10 20.0 90.9		1 100.0 9.7	50 80.6
Biface flake	1 50.0 2.3	1 50.0 100.0							2 3.2
Tested cobble	1 100.0 2.3								1 1.6
Multidirectional core	1 100.0 2.3		1 50.0 25.0						2 3.2
Cobble tool	1 100.0 2.3								1 1.6
Total	43 69.4	1 1.6	4 6.5	1 1.6	1 1.6	11 17.7		1 1.6	62
General Surface Scatter									
Angular debris	27 79.4 16.9				1 1.6 100.0	5 14.7 19.2	1 2.9 14.3		34 17.0
Core flake	113 78.5 70.6	1 0.7 100.0			5 3.5 83.3	19 13.2 73.1	6 4.2 85.7		144 72.0
Blade flake	1 100.0 0.6								1 0.5
Tested cobble	1 100.0 0.6								1 0.5
Unidirectional core	1 100.0 0.6								1 0.5
Bidirectional core	1 100.0 0.6								1 0.5
Multidirectional core	13 100.0 8.1								13 6.5
Unidirectional cobble tool						1 100.0 3.8			1 0.5
Bidirectional cobble tool						1 100.0 3.8			1 0.5
Biface	1 100.0 0.6								1 0.5
Total	158 79.8	1 0.5			6 3.0	26 13.0	7 3.5		198

probably partly due to the medium-grain texture of the raw material. The tools resembles a heavy-duty side scraper. It measures 72 mm long by 54 mm wide by 25 mm thick.

Side Scraper. A large side scraper made from medium-grained local chert was recovered from Feature 2. It is made from a cortical core flake with 80 percent dorsal cortex remaining and six dorsal flake scars from the marginal retouching. The side scraper measures 70 mm long by 51 mm wide by 22 mm thick. The retouched lateral edge is sinuous and convex with a 55 degree edge angle created by the marginal retouching. The tool may have been used used to prepare plant parts prior to roasting in Feature 2.

Pottery

Three small sherds of gray utility pottery were recovered from the feature perimeter. Two sherds are smeared indented corrugated jar bodies with smeared interior. Their paste is fine silty, redeposited alluvial clay with fine mica, quartz, and feldspar inclusions. The third sherd is also a smeared indented corrugated jar body, but it lacks the smudged interior. Smeared indented pottery was the typical utility ware manufactured during the A.D. 1200 and 1300s in the northern Rio Grande.

Area 1 Summary

Area 1 excavation revealed a large fire-cracked rock concentration accumulated by repeated thermal feature use. The size of the feature indicates it was used to process large quantities of gathered plant resources or to roast meat. Its large size and distance to the nearest village (3 km) are strong evidence for a staged foraging strategy during the Coalition period. Staged foraging may have been a necessary subsistence strategy as demands for food and natural resources grew in conjunction with the apparent population aggregation and growth along the Santa Fe River. Although few formal tools or a diverse or abundant pottery assemblage were missing, it appears that lithic raw material testing and reduction were incorporated into gathering and processing activities. The pottery recovered from near the feature indicates that it was in use during the A.D. 1200s or 1300s.

Surface Chipped Stone Artifacts

One hundred ninety-eight artifacts were piece-plotted and recorded in the field or collected for laboratory analysis. Distribution by artifact and material type is provided in Table 11. A surface artifact plot shows that the majority of the chipped stone artifacts are scattered and occur in only three minor clusters in the southwest, south-central, and west-central portion of the site (Fig. 20). This dispersed distribution indicates an accumulation through repeated site visits, and it reflects low frequencies of suitable raw material for chipped stone procurement and expedient tool production.

The 198 chipped stone artifacts included core flakes (n=144), angular debris (n=34), cores (n=16), cobble tools (n=2), and a biface. The raw material distributions show undifferentiated chert and quartzite predominate. Madera chert is absent. Undoubtedly it occurred in the scatter, but was not recorded. The common, though not abundant presence of quartzite is repeated in Area 1 and within the three excavation areas and surface artifact scatter at LA 61315. Raw material texture distribution shows 65 percent fine-grained and the remaining 35 percent medium- or coarse-grained chert. All of the quartzite was coded as medium-grained. This pattern conforms to the raw material texture distribution found in the Area 1 assemblage and supports the observation that most raw material was acquired from the local gravel sources.

Debitage. Debitage accounts for 90.5 percent of the surface assemblage. Core flakes occur at a slightly lower percentage than Area 1 (Table 11). Debitage dorsal cortex proportions are 71 percent cortical and 29 percent noncortical artifacts. Cortical debitage with less than 60 percent coverage

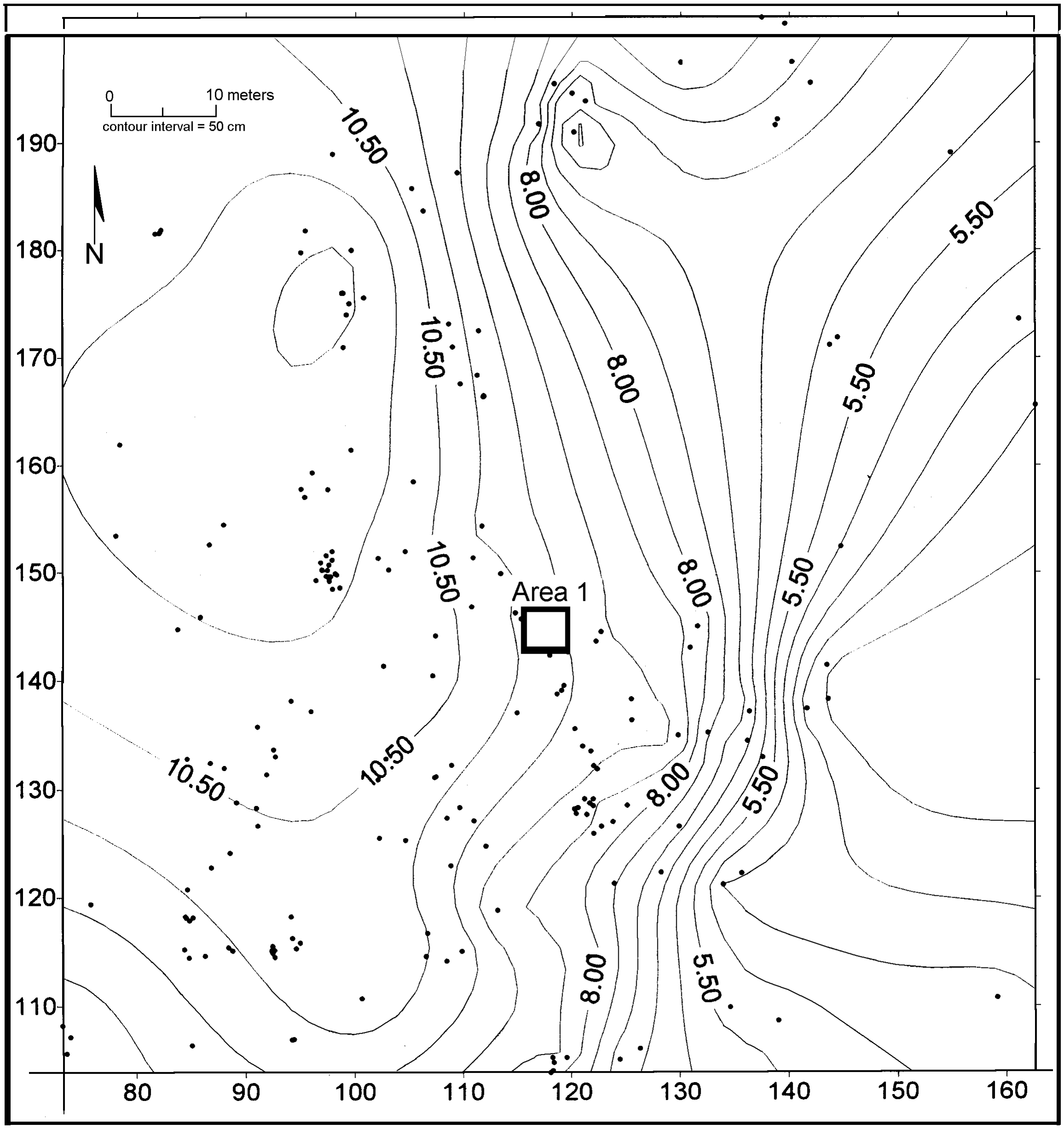


Figure 20. LA 61321, surface artifact distribution.

is more common. Early stage debris has 60 percent or greater dorsal cortex. These cortical debitage percentages are lower than the Area 1 assemblage, but they are much higher than the surface artifact assemblage at LA 61315. The difference in dorsal cortex for the two sites' surface assemblages may reflect the more complete reduction of raw material at LA 61315 in conjunction with the late Archaic period residential occupation of Excavation Area 1. The LA 61321 surface assemblage debitage strongly resembles low intensity raw material procurement.

Cores. Sixteen cores were field recorded, accounting for 8 percent of the assemblage. This core percentage is higher than was observed for the Area 1 assemblage. The distribution map shows the cores scattered throughout the site area. One core occurred within each minor cluster, but was not necessarily associated with the chipping event that produced the debitage. The widespread core distribution indicates an accumulation from multiple procurement or reduction episodes. In fact, it is probable that in the context of an expedient or casual quarry, each core represents a single site visit.

All cores were made from local chert. The core types include multidirectional, bidirectional, unidirectional, and a tested cobble. Dorsal cortex occurs on 75 percent of the cores with only 25 percent of the cores exhibiting more than 50 percent dorsal cortex coverage. Dorsal scar counts range from 6 to 17 on cortical cores. The cores show a wide range of dimensions with lengths between 46 and 123 mm, widths between 36 and 90 mm and thicknesses between 23 and 74 mm.

Cores show a wide range of attribute variability that reflect long-term use of the site as an expedient or casual lithic procurement area. The occurrence of cores with high numbers of dorsal flake scars and low dorsal cortex coverage remain from intensive reduction of material for flakes and by-products rather than for cores. The lesser number of cores with low flake scar counts and high dorsal cortex indicate that material testing occurred. The core data clearly reflect that LA 61321 was used to procure raw material as part of an embedded strategy related to daily foraging, and perhaps, staged processing of plant materials.

Multipurpose Tool. FS 30 was surface collected from Grid 182N/69E. It is a lustrous, fine-grained white chert core flake that shows edge modification and wear on two edges and a projection. The core flake is 26 mm long by 26 m wide by 5 mm thick. Edge 1 is 20 mm long, slightly concave with a 45 degree edge angle. It exhibits unidirectional flake scars, such as might remain from scraping. Edge 2 is 20 mm long, straight, with a 40 degree edge angle. It also exhibits unidirectional wear. The projection is triangular in outline and 3 mm long. The tip is broken, but the lateral edges are rounded from rotary use.

Surface Artifact Summary

The surface artifact scatter is probably an accumulated deposit that remains from on-site activities as well as from material testing and procurement by seasonal foragers. Visual examination of artifact location plots show the spatial patterning of three or four distinct reduction episodes within a dispersed scatter, the remains of which are from the low intensity land use pattern that dominated the area for 7,000 years. The surface artifact database is useful for comparison with the LA 61315 and other site assemblages from the Northwest Santa Fe Relief Route and Las Campanas projects.

Site Summary

LA 61321 was redefined as a spatially extensive chipped stone scatter with two surface hearths, one of which, Feature 2, was excavated. A second potential activity area was investigated, but determined to be a natural deposit. Feature 2 had three Coalition period utility sherds suggesting it was used during the thirteenth or fourteenth centuries. The abundant fire-cracked rock combined with the large, shallow pit suggest a specialized function, perhaps for roasting. Expedient or situational use of the available lithic raw material indicates brief, low-level use of the area for diurnal foraging. The shallow, but large feature, and the abundant core reduction debris is a pattern most often associated with Pueblo occupation, although temporally diagnostic artifacts were not recovered from outside the Feature 2 area. Excavation defined LA 61321 as a much larger site with a more specialized and larger feature than was identified by testing. The data recovered from artifact piece-plotting and field recording and feature excavation are used to address questions about Pueblo economic exploitation of the piñon-juniper piedmont.

RESULTS OF FLOTATION AND RADIOCARBON SAMPLE ANALYSIS AT LA 61315 AND LA 61321

Pamela J. McBride and Mollie S. Toll

In this study, a major effort was made to address the often poor preservation conditions present at Santa Fe area sites. At LA 61315, over 113 liters of soil were floated to recover floral remains from a pit structure floor, thermal features, and both interior and extramural pits. Area 2 at LA 61315 dates from the early Archaic period. Area 1 has a pit structure and extramural features from the Basketmaker II period. Area 3 has a single large Coalition period thermal feature. The sites are in the piñon-juniper vegetation zone. Plant taxa that occur in this zone include: piñon, juniper, gray oak, rabbit brush, snakeweed, big sagebrush, four-wing saltbush, prickly pear and cholla cacti, and a variety of annual and grass species.

Early sites in the Santa Fe area tend to be shallow, deflated, and lack structures (all traits mitigating against preservation of perishables, or even carbonized perishables). In addition to being rare, early sites (and smaller, limited activity sites of all periods) suffer from lack of botanical analyses (Gossett and Gossett 1991; Schmader 1987) or very low recovery of cultural botanical remains in the sampled proveniences (Dean 1993a, 1993b; Toll 1994). An exception is Schmader's work on the southwestern edge of the city at Tierra Contenta (1994a:12-14) that documents the existence of structural sites dating to at least the late Archaic and possibly earlier. A rich array of recovered weedy annual, grass, and perennial seeds at the Tierra Contenta sites points to broadly based subsistence activities, and encourages the pursuit of such information at other sites.

In the Coalition and Classic periods, occupation includes an abundance and variety of small site types (some apparently geared to specific short-term activities and some occupied repeatedly but for short periods) and a few large pueblos. The economic and social ties between these very different contemporary site types are of particular interest. The substantial, protective structures of the large pueblos hold the possibility of far better preservation conditions for plant materials. Pindi (LA 1) was excavated in the 1930s, when flotation wasn't considered a part of archaeological analysis; a small collection of macrobotanical remains were collected during excavation, and happily reported in print by Volney Jones (in Stubbs and Stallings 1953:140-142). Excavation of Arroyo Hondo by the School of American Research was a model of thoroughness for archaeology of the early 1970s. Botanical studies gave attention to some vital interpretive and comparative issues, such as nutritional adequacy and productive capacity with respect to changing environmental and demographic traits (Wetterstrom 1986). The down side to such attention to interpretive objectives is difficulties in reconstructing the data used to support conclusions. Agua Fria Schoolhouse (LA 2) was excavated recently, but only partially; the data here are clear and dependable, but meager (five flotation samples; Cummings 1989). Thus, data available from large, complex, and potentially well-preserved pueblos is very uneven, and the contemporary small limited-activity sites have very little floral data at all (Cummings and Puseman 1992; Toll 1989). We are left with a common interpretive conundrum: does this lack of floral remains at small sites represent a genuine difference between site types in handling of subsistence resources, or is it an artifact of systematically different preservation conditions?

Methods

Flotation Processing

The 58 soil samples collected during excavation were processed at the Museum of New Mexico's Office of Archaeological Studies by the simplified "bucket" version of flotation (see Bohrer and Adams 1977). Flotation soil samples averaged 3.8 liters in volume, ranging in size from 1.0 to 13.2 liters. Each sample was immersed in a bucket of water, and a 30-40 second interval allowed for settling out of heavy particles. The solution was then poured through a fine screen (about 0.35 mm mesh) lined with a square of "chiffon" fabric, catching organic materials floating or in suspension. The squares of fabric were lifted out and laid flat on coarse mesh screen trays until the recovered material had dried.

Full-Sort Analysis

Each sample was sorted using a series of nested geological screens (4.0, 2.0, 1.0, 0.5 mm mesh), and then reviewed under a binocular microscope at 7-45x. Charred and uncharred reproductive plant parts (seeds and fruits) were identified and counted. The actual number of reproductive plant parts encountered in each sample is recorded in Table 12. 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 post-occupational intrusion, data in tables are sorted into categories of “Cultural" (all carbonized remains), 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 from the 4 mm and 2 mm screens of flotation samples was identified, to a maximum of 10 pieces from each screen size. Each piece was snapped to expose a fresh transverse section, and then 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.

Scan Analysis

Scanning involves looking at all the material larger than 2.0 mm, and most material larger than 1.0 mm. Corn kernels and cob fragments (relatively common in flotation samples) and bean and squash remains (relatively rare in flotation samples) are almost entirely restricted to these two screen sizes, so that scanning provides a reliable view of the presence or absence of agricultural taxa. Wild taxa recovered in these larger screen sizes may include twigs and seeds or berries from shrubs or trees, large seeds from perennial species like yucca or squawberry, and grass and weed seeds with particularly large seeds, such as ricegrass and beeweed. Most annual weed seeds are caught in the 0.5 mm screen, which is usually examined partially in the scanning procedure.

Scanning accurately picks up the presence of higher-frequency weed taxa, such as the chenopods, pigweed, and purslane. Among the material that passes through the smallest screen size, botanical remains are often completely absent or else consist of fragments of seed types encountered in larger screens. Rarely, low frequencies of small seed types, such as tansy mustard or dropseed, will occur in the smallest screens without also occurring in the larger screens. For the time invested, then, scanning provides relatively reliable presence/absence flotation data, as well as general information about relative quantities of specific taxa and about whether carbonized specimens are present.

Table 12. LA 61315, Flotation Full-Sort Results

Feature No.	3	4	5	1	1	1	1	1
Feature	X-M Basin-Shaped Pit	X-M Basin-Shaped Pit	X-M Basin-Shaped Pit	Pit Structure Floor Fill	102N 92E, Floor Fill	103N 92E, Floor Fill	Pit Structure Floor Fill	103N 92E, Floor Fill
FS No.	46	57	64	70	72	74	76	77
CULTURAL Annuals: Cheno-am					1*			1*
Perennials: *Juniperus* juniper				1*	7 frags.*	1*	3*	
Pinus edulis piñon					needle+*		needle+*	
NONCULTURAL Perennials: cf. *Cercocarpus* mountain mahogany	leaf+							
Juniperus juniper		twig+	twig+	twig+	twig+	+; twig+	twig+	
Pinus edulis piñon	needle+	needle+	needle+	needle+				
cf. *Pinus ponderosa* ponderosa pine								needle+

Table 12. Continued.

Feature No.	6	7	7	8	8	8	9	9
Feature	Roasting Pit in Pit Structure	Roasting Pit in Pit Structure	Roasting Pit in Pit Structure	Roasting Pit in Pit Structure	Roasting Pit in Pit Structure	Below Floor of Roasting Pit in Pit Structure	W ½ Thermal Feature	E ½ Thermal Feature
FS No.	86	82	83	84	89	90	102	103
CULTURAL Annuals: *Chenopodium* goosefoot				1*				
Grasses: cf. *Oryzopsis hymenoides* ricegrass				1*				
Perennials: *Juniperus* juniper	2*	2*	1*					
Pinus edulis piñon				needle+*				
NONCULTURAL Annuals: *Helianthus* sunflower							+	
Other: Dicotyledonae dicot					leaf+			
Perennials: *Juniperus* juniper	twig+; G cone+		twig+	twig+	twig+; G cone+	twig+	twig+	twig+
Pinus pine			needle+					
Pinus edulis piñon	needle+			needle+	needle+	needle+	needle+	

Table 12. Continued.

Feature No.	11	10	10	1	13	12
Feature	X-M Surface Cavity	X-M Shallow Burned Pit, North of Pit Structure	X-M Shallow Burned Pit, North of Pit Structure	Fill under Metate in Pit Structure	Heating Feature	N ½ Roasting Pit
FS No.	105	109	110	111	132	143
CULTURAL Other: Undetermined					3 plant parts*	
Perennials: *Juniperus* juniper			1*	1*		1*
NONCULTURAL Other: Dicotyledonae dicot		leaf+				
Perennials: *Juniperus* juniper			twig+			twig+
Pinus edulis piñon	needle+		needle+		needle+	needle+

Note: + = 1-10/liter, * = charred.

Charred and uncharred seeds, fruits, and nonreproductive plant parts such as bark were identified, but not counted. Plant remains were recorded like the nonreproductive plant parts during full-sort analysis, as relative abundance per liter of soil floated.

Radiocarbon Sample Analysis

Charcoal specimens examined prior to submission for radiocarbon dating were examined in the same manner as for flotation charcoal, but the objective was to secure at least 5 grams with the fewest pieces, rather than aiming to examine both large and small pieces. Charcoal was separated by taxon, weighed, and placed in labeled foil packets.

Results

The pit structure floor fill, the Feature 8 roasting pit in the pit structure, and extramural Area 2 were the only proveniences at LA 61315 that yielded floral remains not directly related to structural remains or fuel wood use (Tables 13 and 14**)**. Cheno-ams were identified in floor fill samples and goosefoot and ricegrass seeds were recovered in one of the roasting pit samples. Charred remains from all other proveniences included juniper seeds, piñon needles, and pine cone scales, all of which can be attributed to debris from firewood use. Of the 25 samples that yielded floral remains, 52 percent (n=13) produced only uncharred specimens, likely representing modern noncultural intrusives.

Cultural plant remains were found most frequently in floor fill samples (Table 14). Conifer duff and juniper seeds were identified in all provenience categories. Ricegrass was found only in one interior pit. Weedy annuals were not found in any of the exterior pit features, suggesting the seeds were largely processed and consumed inside the pit structure.

With the exception of one piece of undetermined nonconifer wood recovered from a possible hearth (Feature 13) in Area 2, flotation wood was totally coniferous (Table 15). Piñon and juniper were the dominant taxa, with small amounts of pine and undetermined conifer. The genus pine is used when the charcoal is too fragmentary to identify to species. Undetermined conifer is applied

Table 13. LA 61315, Flotation Scan Results

Feature No.	5	1	1	1	8	10
Feature	X-M Basin-Shaped Pit	Pit Structure	Pit Structure	103N 92E, Floor Fill	Roasting Pit in Pit	X-M Shallow Burned Pit, N of

		Floor Fill	Floor Fill		Structure	Pit Structure
FS No.	64	70	76	77	89	110
CULTURAL Annuals: Cheno-am		+*				
Chenopodium goosefoot				+*		
Perennials: *Juniperus* juniper		+*				
Pinus pine						
NONCULTURAL Perennials: *Juniperus* juniper	+; twig++					+
Pinus pine	needle+		needle+		bark+	
Undetermined conifer	twig+					

Table 13. Continued.

Feature No.		12	13	12	12
Feature	X-M Area 2	Roasting Pit	Heating Feature	N ½ Roasting Pit	N ½ Roasting Pit
FS No.	123	129	132	135	143
CULTURAL Annuals: *Chenopodium* goosefoot	+*				
Other: Undetermined			plant part+*	plant part+*	
Perennials: *Juniperus* juniper			+*		cf.+*
Pinus pine		conescale+*; needle+*	bark+*; conescale+*	conescale+*	
Pinus edulis piñon					cf. nutshell+*

Note: + = 1-10/liter, ++ = 11-25/ liter, * = charred.

Table 14. LA 61315: Ubiquity of Cultural Plant Remains Compared by Provenience Category

Provenience Category	Extramural Pits (n = 10)	Interior Pits (n = 8)	Floor fill (n = 6)
Annuals: cheno-am			50%
goosefoot		10%	17%
undetermined	seed 10% plant part 30%		
Grasses: ricegrass		10%	
Perennials: juniper	30%	20%	100%
pine	conescale 20% needle 10%		
piñon		needle 10%	needle 17%
Total taxa	3	4	4

Extramural Pits: FS 46, 57, 64, 105, 109, 110, 129, 132, 135, 143; Interior Pits: FS 82, 83, 84, 86, 89, 90, 102, 103; Floor Fill: 70, 72, 74, 76, 77, 111.

Table 15. LA 61315, Flotation Wood Charcoal Species Composition

Feature No.	3	4	5	1	1	1	1	1
Feature	X-M Basin-Shaped Pit	X-M Basin-Shaped Pit	X-M Basin-Shaped Pit	Pit Structure Floor Fill	102N 92E, Floor Fill	103N 92E, Floor Fill	Pit Structure Floor Fill	103N 92E, Floor Fill
FS No.	46	57	64	70	72	74	76	77
Juniperus			6/0.1	13/0.1	13/0.1	19/0.2	18/0.1	5/<0.1

juniper								
Pinus pine	1/<0.1	2/<0.1						
Pinus edulis piñon			3/<0.1	6/0.1	7/<0.1	1/<0.1	2/<0.1	12/<0.1
Unknown Conifer	4/<0.1	12/0.1	9/0.1	1/<0.1				
Totals	5/<0.1	14/0.1	18/0.2	20/0.2	20/0.1	20/0.2	20/0.1	17/<0.1

Table 15. Continued.

Feature No.	7		8	6	8	8	9	9	11
Feature	Roasting Pit in Pit Structure		Roasting Pit in Pit Structure	Roasting Pit in Pit Structure	Roasting Pit in Pit Structure	Below Floor of Roasting Pit in Pit Structure	W ½ Thermal Feature	E ½ Thermal Feature	X-M Surface Cavity
FS No.	82	83	84	86	89	90	102	103	105
Juniperus juniper	2/<0.1		7/0.1	7/0.4	5/0.1	9/0.3	20/0.8	19/1.5	
Pinus pine					4/0.2				
Pinus edulis piñon	18/0.5	20/0.6	13/0.3	13/1.1	11/0.2	11/0.3		1/<0.1	17/0.4
Unknown Conifer									3/<0.1
Totals	20/0.5	20/0.6	20/0.4	20/1.5	20/0.5	20/0.6	20/0.8	20/1.5	20/0.4

Table 15. Continued.

Feature No.	10		1		12			13	Totals	
Feature	X-M Shallow Pit, North of Pit Structure		Fill under Metate in Pit Structure	X-M Area 2	Roasting Pit			Possible Hearth		
FS No.	109	110	111	123	129	135	143	132	Weight	%
Conifers: *Juniperus* juniper	15/0.2	12/0.1	4/<0.1	2/<0.1	14/0.2			19/0.3	4.6	45
Pinus pine									0.2	2
Pinus edulis piñon		8/0.1	5/<0.1	1/<0.1	6/0.2	20/1.0	17/0.4		5.2	50
Unknown Conifer			2/<0.1	4/<0.1			3/0.1		0.3	3
Nonconifers: Unknown nonconifer								1/<0.1	<0.1	<1
Totals	15/0.2	20/0.2	11/<0.1	7/<0.1	20/0.4	20/1.0	20/0.5	20/0.3	10.3	100

Note: Wood recorded in number of pieces/weight in grams.

Table 16. LA 61315, Wood Use (Percent Weight) by Provenience Category

Provenience Category	Extramural pits n = 172 pieces, 3.3g	Interior pits n = 160 pieces, 6.4g	Floor fill n = 108 pieces, 0.6g
Juniper	27%	50%	83%
Piñon	64%	47%	17%
Pine		3%	
Undetermined conifer	9%		<1%
Nonconifer	<1%		
TOTAL	100%	100%	100%

Extramural Pits: FS 46, 57, 64, 105, 109, 110, 129, 132, 135, 143; Interior Pits: FS 82, 83, 84, 86, 89, 90, 102, 103; Floor Fill: FS 70, 72, 74, 76, 77, 111.

Table 17. LA 61315, Species Composition of Charcoal Submitted for Carbon-14 Dating

FS	Provenience	*Juniperus* juniper	*Pinus edulis* piñon pine	*Pinus* sp. [cf. *ponderosa*] pine	Undetermined conifer	TOTAL
79	F. 1, floor, 103N/91E	2.60g				2.60g
81	F. 6 in F. 1, W ½, 14-20 cm bs	2.52g	2.14g			4.66g
87	Extramural test unit, 106N/94E, 20-30 cm bs	.22g	.32g	.65g	.45g	1.64g
91	F. 8 in F. 1, E½	4.00g	2.15g		.14g	6.29g
94	F. 7 in F. 1, E ½		7.26g		1.25g	8.51g
112	F. 13, Excavation Area B, Level 2	.32g	.09g		.10g	.51g
132	F. 12 (roasting pit), 88N/83E	.84g	.07g	.01g	.29g	1.21g
135	F. 12 (roasting pit), 92N/82E	8.56g[1] 3.43g	9.94g[1] 4.62g	.76g	1.40g	18.50g[1] 10.21g
152	F. 12 (roasting pit), 89N/85E	17.40g[1]				17.40g[1]
Total		25.96g[1] [72%] 13.93g [39%]	9.94g[1] [28%] 16.65g [47%]	1.42g [4%]	3.63g [10%]	35.90g[1] 35.63g

to those pieces of wood that are too small to determine if resin ducts are present or absent, precluding

Charred and uncharred seeds, fruits, and nonreproductive plant parts such as bark were identified, but not counted. Plant remains were recorded like the nonreproductive plant parts during full-sort analysis, as relative abundance per liter of soil floated.

The nine samples submitted for identification prior to radiocarbon dating were completely coniferous (Table 17), with juniper and piñon dominating the assemblage as in flotation wood. A small percentage of the radiocarbon wood was identified as closely resembling ponderosa pine (the only difference between ^{14}C wood and flotation wood).

Feature 2 at LA 61321 produced only uncharred mountain mahogany leaves and piñon needles that are debris from modern flora rather than any indication of past activity at the site.

Discussion

As is the case at most Santa Fe area sites, samples from the Northwest Santa Fe Relief Route project are replete with uncharred plant remains, insect exoskeleton parts and feces, and rootlets,

Table 18. Comparative Evidence for Utilization of Food Plants in the Santa Fe Area (Percent of Samples Found In)

Project/Site	No. of Samples	Annuals	Grasses	Trees	Other Perennials	Cultivars
ARCHAIC: Area 2, NWSFRR	2	*Chenopodium* 50%		*Juniperus* seeds 50% *Pinus* conescale 50%		
Tierra Contenta[1]	40	*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%	
Late Archaic/ Basketmaker II: Area 1, NWSFRR	20	Cheno-am 15% *Chenopodium 10%*	*O. hymenoides* 5%	*Juniperus* seeds 40% *Pinus edulis* needles 10%		
COALITION-EARLY CLASSIC: Area 3, NWSFRR	3			*Juniperus* seeds 33% *Pinus* conescale 33%, needles 33%		
Las Campanas[2] [LA 84759, 84793, 86150, 86159, 98683, 98690]	26	*Corispermum* 4%				
Agua Fria[3]	5	cheno-am 80% *Chenopodium* 40% *Portulaca* 20% *Cycloloma* 20% *Cleome* 20% undet. 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[4]	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%

Specimens are seeds unless otherwise specified.

[1]McBride 1994

[2]Toll and McBride 1995

[3]Cummings 1989

[4]Wetterstrom 1986, table 34

Table 19. Comparative Wood Use in the Santa Fe Area

Assemblages	n of samples [total weight or pieces]	*Juniperus*	*Pinus*	Other species/ Comments
Predominantly Juniper:				
ARCHAIC:				
Las Campanas[1] [LA 84787, 86139, 86159]	9 [17.46g]	92%	3%	5% undetermined conifer
Tierra Contenta[2]	3	dominant in 2 samples	dominant in 1 sample	
UNKNOWN DATE:				
Las Campanas[1] [LA 86159]	2 [.44g]	55%	7%	2% undetermined conifer 5% undetermined non-conifer 32% unknown
Rancho Viejo	109 [2.05g]	98%	2%	
Predominantly Piñon:				
DEVELOPMENTAL-MID CLASSIC:				
Dos Griegos[3] [site 283-3]	5 [108 pieces]	18%	80%*	2% Salicaceae
Major Portions of Both Juniper and Piñon:				
ARCHAIC:				
Airport Road[4]	6 [22.60g]	37%	54%*	9% undetermined conifer
COALITION-EARLY CLASSIC:				
Las Campanas[1] [LA 84759, 84793, 86150, 86159, 98690]	10 [6.81g]	40%	55%	1% undetermined conifer 4% unknown
Agua Fria Schoolhouse[5]	4	dominant in 2 samples; co-dominant in 1	dominant in 1 sample; co-dominant in 1	
Arroyo Hondo[6]	[1108 pieces]	21%	37%*	33% ponderosa pine, 4% doug-fir, 6% other
Santa Fe By-Pass[7]	2 [40 pieces]	43%	53%*	4% undetermined conifer

* *Pinus edulis* (piñon)
[1]Toll and McBride 1995
[2]McBride 1994
[3]Cummings and Puseman 1992
[4]Toll 1994
[5]Cummings 1989
[6]Creamer 1993, table 7.1
[7]Toll 1989, table 1

indicating near-surface deposits impacted by recent biological activity. Few of the charred remains can be linked to cultural activities other than fuelwood use. Charred specimens of food plants such as ricegrass and goosefoot are so few in number that their interpretation becomes difficult. Do the small number of plant remains recovered represent sampling error deriving from poor preservation or a focused collection strategy of these resources? Considering the meager record of floral remains from other sites in the area, it probably has more to do with preservation conditions than a lack of resource exploitation. The mere fact that goosefoot and ricegrass were recovered at all under these conditions, indicates that the two resources could have been heavily utilized. Goosefoot is found elsewhere in the Santa Fe area at Tierra Contenta Archaic sites (28 percent of samples) and two Coalition/early Classic sites (Agua Fria Schoolhouse, 40 percent of samples; Arroyo Hondo Pueblo, 34 percent). Additional weedy annuals at local sites include pigweed, purslane, bugseed, doveweed, winged pigweed, beeweed, groundcherry, and sunflower (Table 18). Ricegrass was also recovered at Arroyo Hondo Pueblo (in 7 percent of samples), but generally edible grasses are not a prominent part of the archaeobotanical record in the Santa Fe area. Ricegrass is a cool-season grass that ripens in the early summer when other resources are in short supply. Doebley (1984:59) describes ricegrass as probably the most valuable wild grass utilized by Southwestern Indians because it is large grained, abundant, and early-ripening. Piñon nut use is the most common evidence of the exploitation of the many perennial food resources available in juniper-piñon woodland. Cacti show up at three sites, while horsetail, yucca, and chokecherry had much more limited distributions. Recovery of domesticated crop plants was restricted to the larger Coalition/early Classic sites of Agua Fria and Arroyo Hondo.

With the exception of small percentages of undetermined nonconifer and cottonwood/willow wood, charcoal identified from sites in the Santa Fe area is totally coniferous throughout all time periods (Table 19). Even at Airport Road, where present-day junipers and especially piñons are considerably sparser, there is no sign of saltbush or sage use (Toll 1994), suggesting density and duration of population pressure was not sufficient to impact availability of preferred fuel types. This broad dominance of preferred fuelwood taxa through time in the Santa Fe area indicates that a consistent source of coniferous wood taxa was present. Perceived differences in dominance of piñon versus juniper may be attributed to differences in trash disposal practices or the feature type sampled, as opposed to any true temporal differences in conifer wood use.

Summary

Samples analyzed from Archaic, Basketmaker II, and Coalition/early Classic periods produced evidence for use of weedy annuals and possibly ricegrass. Floor fill proveniences were more productive of archaeobotanical data than either interior or extramural pits. The majority of plant remains was likely residue from fuelwood use or structural remains, such as juniper seeds, piñon needles, and pine conescales. The pattern of predominantly coniferous wood use at other Santa Fe area sites is duplicated at the NWSFRR sites. The presence of goosefoot, ricegrass, and possible piñon nutshell suggests that LA 61315 was occupied at least from early summer through the fall when piñon nuts mature.

LA 61315 FAUNA

Susan M. Moga

The excavation at LA 61315 was divided into three areas. Two of the these areas produced fauna. A burned pit structure (Area 1) subsequently used as a refuse area produced the largest amount of bone, and an Archaic campsite (Area 2) contributed a minimal amount of bone.

Methods

A complete analysis was performed on the 147 pieces of bone recovered from LA 61315. The bone was dry brushed for cleaning and each piece was assigned a lot number for identification.

Faunal information was recorded by coded variables. The variables include site, field specimen (FS) and lot numbers, count, taxon, element, side, portion of the element, age of the animal, criteria for aging, environmental, animal, and thermal alteration, and evidence of human processing or bone modification. The Office of Archaeological Studies comparative collections were used to identify the bone. Sources on New Mexico fauna (Bailey 1971; Findley et al. 1975) were consulted to determine which species inhabit the site area. Descriptions are provided for the fauna represented in the assemblage.

Table 20. Taxa Recovered from LA 61315

TAXON	COMMON NAME	FREQUENCIES	PERCENT
Small mammal	Jackrabbit or smaller	131	89.1
Small to medium mammal	Dog or smaller	3	2.0
Large mammal	Deer size	3	2.0
Neotoma sp.	Woodrats	1	.7
Sylvilagus audubonii	Desert Cottontail	4	2.7
Lepus calfornicus	Black-tailed jackrabbit	5	3.4
Total		147	100.0

Taxa Recovered

Unidentifiable Taxa

The assemblage was separated into three size ranges including small mammal (jackrabbit or smaller), small to medium (dog or smaller), and large mammal (deer size) (Table 20). The choice of size ranges for these severely fragmented bones is based on the thickness of the compact tissue.

Small mammal bones (n=131) are the most abundant in the assemblage, followed by three bones each in the other two unidentifiable categories. The small mammal bones are probably cottontail, based on the compact tissue thickness. All of the small mammal bones are from mature individuals based on their nonporous structure.

The three small to medium-sized mammal bones are at the small end of the size spectrum. They are larger than a jackrabbit but smaller than a dog, and range more toward porcupine size. The three small- to medium-size bones are mature in age and display thermal alterations.

Three large mammal bones were probably from deer or pronghorn. Mule deer inhabit a variety of regions in New Mexico, with the exception of open grasslands, and pronghorn have a preference for grasslands (Findley et al. 1975:328-333). The site is located in a piñon-juniper forested environment, with nearby open grasslands, so the probability of either species is feasible.

Neotoma sp. (Woodrats)

Four woodrat species inhabit the site area, *Neotoma micropus* (southern plains woodrat), *Neotoma albigula* (white-throated woodrat), *Neotoma mexicana* (Mexican woodrat), and *Neotoma cinera* (bushy-tailed woodrat) (Findley et al. 1975:238-251). The only distinguishing difference between the species is the first upper molar (M1). The folds in the first upper molar tooth pattern are often missing or so shallow that it is difficult to differentiate between the species (Hoffmeister and De La Torno l960:477).

A femur, which was only 25 to 50 percent present, could be identified as woodrat and the specimen represents one mature individual. The femur is heavily burned and retrieved from a hearth (Feature 8).

Sylvilagus audubonii (desert cottontail)

Desert cottontails are distributed throughout the Southwest, with a preference for open grasslands (Chapman et al. 1982:83; Bailey 197l:54). They feed on succulent grasses and plants. During periods of drought they survive by eating dry grasses and use the moisture from cactus as their source of water. Cottontails have extremely high rates of reproduction. This asset provides the local inhabitants with a renewable meat and pelt resource (Chapman et al. 1982:102, 111).

Four cottontail bones, a radius, an innominate, and two tibiae are from at least one mature individual. Burned bones were recovered from Area 1, two are blackened and two calcined.

Lepus californicus (black-tailed jackrabbit)

Jackrabbits are found throughout New Mexico in regions below the ponderosa zone (Findley et al. 1975:93-94). Their diet fluctuates with the dry and rainy seasons of the high desert. Jackrabbits have a preference for yucca, snakeweed, spurge, mesquite leaves, and seedpods. In the Southwest, jackrabbit breeding cycles begin in January and end in August or September. The average reproduction rate is 14 offspring annually (Dunn et al. 1982:128).

At least one mature individual is represented in the assemblage by a femur, a tibia, and two scapula fragments. The bones are either blackened or calcined from burning.

Taphonomy

Taphonomic processes are those that affect the condition of biological remains (Lyman 1994:1). These variables include environmental, thermal, and animal alterations.

Environmental alterations affect faunal materials through exposure to the sun, moisture, and temperature change. The degree of weathering will vary with the amount of exposure. The preservation rate of small mammal bones on a surface exposed to the elements is extremely low. Large mammal bones preserve better than small mammals because of a higher bone density (Lyman 1994:397-398).

Only one small mammal bone was environmentally altered by root etching, which occurs when bone is buried. Roots of plants excrete humic acid and when they come in contact with bone, roots dissolve the bone where they grow against the bone surface (Lyman 1994:375).

Table 21. Taxa with Frequency and Percent of Burning at LA 61315

Common Name	Burn Type					
	Unburned	Light/Scorch	Light to Black	Black	Calcined	Total
Small mammal	27 20.6	3 2.3	5 3.8	25 19.1	71 54.2	131 100.0
Small to medium mammal				1 33.3	2 66.7	3 100.0
Large mammal					3 100.0	3 100.0
Woodrats				1 100.0		1 100.0
Desert cottontail				2 50.0	2 50.0	4 100.0
Black-tailed jack rabbit	1 20.0			2 40.0	2 40.0	5 100.0
Total	28 19.0	3 2.0	5 3.4	31 21.1	80 54.4	147 100.0

The majority of the faunal assemblage (n=119) is burned (Table 21). Only 28 bones, 1 jackrabbit and 27 small mammal bones, are not burned. Several small mammal (n=3) bones are lightly scorched from either roasting the flesh on the bone or from close proximity to fire. They appear light tan or brown in color. One of these bones was removed from a thermal feature (Feature 9) and the other two bones are from excavated grids outside features.

Light to heavy, or graded burning, can result when flesh remains on a portion of the bone and the defleshed portion of the bone was exposed directly to the flames, blackening it. Five small mammal bones were collected from thermal features (Features 8 and 9).

A good number (n=31) of bones in the assemblage are heavily charred. Heavily charred bone is produced by excessive heat. The collagen in the bone becomes carbonized and the bone turns black. All of the taxa in the assemblage have blackened bone, with the exception of large mammal (n=3). The pit structure (Feature 1) and three thermal features (Features 7, 8, and 9) within the pit structure produced blackened bone (n=31).

The largest portion of burned bone (n=80) was calcined. With excessive and continuous heat, carbonized bone becomes calcified (Lyman 1994:384-385). The small mammal category has the largest number of calcined bone (n=71) but also has the largest sample size.

The calcined bone was distributed throughout eight different features (Table 22). Area 1, with the pit structure and its thermal features produced the largest number of calcined bone. Three of the thermal features (Features 7, 8, and 9) aligned in the pit structure are assumed to be contemporaneous, dating from the late Archaic to Basketmaker II. Twenty- three pieces of calcined, small mammal bone came from Feature 8.

In Area 2, located southwest of the pit structure, four calcined bones were recovered from the excavated area and two calcined bones came from a deflated hearth (Feature 13). These bones were tossed into an active fire and redistributed by erosion subsequent to abandonment.

Table 22. Frequencies of Burned Taxa within Features at LA 61315

	FEATURE										
COMMON NAME	BURN TYPE	1	2	6	7	8	9	10	13	Area 2 Grids	Total
Small mammal	Unburned	6		3	3	15					27
	Light/scorched						1	1		1	3
	Light to Black					4	1				5
	Black	10				10	5				25
	Calcined	21		5	4	21	15	1	2	2	71
Small to medium mammal	Heavy or Black					1					1
	Calcined						1			1	2
Large Mammal	Calcined					2	1				3
Woodrats	Black					1					1
Desert Cottontail	Black				2						2
	Calcined	1					1				2
Black-tailed jackrabbit	Unburned					1					1
	Black				1	1					2
	Calcined	1	1								2
Total		39	1	8	10	56	25	2	2	4	147

The contrast in sizes of animals exhibiting burning is 116 (76 percent) burned small mammal bones compared to 3 (100 percent) burned, large mammal bones. There is a possibility there were more large, unburned mammal bone at this site, but they could have disintegrated in time through weathering. Burning of bone removes the collagen, making the bone more brittle, but it also preserves the bone, because the carbon is resistant to biodegradation (Lyman 1994:389-39l). Burned bone is more susceptible to fragmentation. Foot traffic in an occupied space, such as a pit structure, will cause immediate breakage of burned bone (Stiner et al. 1995:234-235).

It is difficult to determine whether bone was burned after consumption and tossed into the fire or discarded during processing. Alternatively, the bone could have been swept into the hearth during pit structure maintenance and eventually burned, or burned when the pit structure was abandoned and burned. The abundance of small mammals and burned bone recovered at LA 61315 is characteristic of Archaic subsistence patterns.

Proveniences

Areas 1 and 2 produced 147 pieces of bone, most of which exhibits heavy burning (n=119 or 81 percent). Area 3 has one feature, a possible roasting pit, but is completely lacking in faunal remains (Table 23).

Table 23. Frequency and Percent of Taxa within Areas 1 and 2 at LA 61315

COMMON NAME	AREA 1	AREA 2	TOTAL
Small mammal	126 96.25%	5 30.8%	131 100.0%
Small to medium mammal	2 66.7%	1 33.3%	3 100.0%
Large mammal	3 100.0%		3 100.0%
Woodrats	1 100.0%		1 100.0%
Desert cottontail	4 100.0%		4 100.0%
Black-tailed jackrabbit	5 100.0%		5 100.0%
Total	141 95.9%	6 4.1%	147 100.0%

Dating from the late Archaic to early Basketmaker, Area 1 had the remains of a subterranean structure with several interior features and several extramural features. The structure (Feature 1) was utilized either as a short-term residential occupation or by hunter-gatherers on a seasonal basis. Subsequently, the structure was burned and filled with refuse.

Stratum 2, the fill, in Feature 1, a gray compacted sandy loam with gravels, had large amounts of fire-cracked rock but produced only three small mammal bones.

Stratum 3, the floor fill, a compacted layer of dark, sandy loam, contained numerous chunks of charcoal, artifacts, and 36 burned bone fragments. The fragments consist of pieces of small mammal and rabbit bone. The only evidence of a floor was small patches of oxidized sand, indicating the structure had burned. No bone was recovered from this surface.

Table 24. Frequency and Percent of Burning within Features at LA 61315

	FEATURES										
BURN TYPE	1	2	6	7	8	9	10	13	15	Area 2 Grids	Totals
Unburned	6 21.4		3 10.7	3 10.7	16 57.1						28 19.0
Light/Scorch						1 33.3	1 33.3			1 33.3	3 2.0
Light to Black					4 80.0	1 20.0					5 3.4
Black	10 32.3			3 9.7	13 41.9	5 16.1					31 21.1
Calcined	23 29.9	1 1.3	5 6.5	4 5.2	23 29.9	18 22.5	1 1.3	2 2.5		3 3.8	80 54.4
Total	39 27.3	1 .7	8 5.6	10 7.0	56 39.2	25 17.0	2 1.4	2 1.4		4 2.7	147 100.0%

Of the four thermal features within the structure, three (Features 7, 8 and 9) were aligned and thought to be contemporaneous (Table 24). These features produced 91 bones with varying degrees of burning. Feature 6 is separate from this alignment, and possibly 800 years older. Eight small mammal bones were retrieved from this feature and five were calcined.

Feature 7, a small thermal feature, had 10 small mammal and rabbit bones. Seven of the bones are burned.

Feature 8, a hearth, had 56 faunal remains, 40 bones are burned, ranging from light to heavy to calcined. The bones encompass all of the taxa represented in the assemblage except cottontail.

Feature 9, a thermal feature, was the largest interior feature. It was extremely burned from use and produced 25 bones burned to varying degrees. A concentration of cobbles were lying flat on the bottom of the feature. The cobbles may have been utilized as a cooking platform.

Area 2

This is an early Archaic campsite with two deflated hearths (Features 13 and 15) and probably reoccupied over time by hunters and gatherers. Feature 13, a basin-shaped hearth, produced two calcined, small mammal bones. Feature 15, a deflated hearth with burned cobbles was completely devoid of faunal material. The excavated grids surrounding these two features yielded four small and small to medium-sized mammal bones. All the bones were burned, ranging from lightly scorched to calcined.

Conclusions

Excavation of LA 61315 yielded 147 animal bones. Ninety-nine faunal remains were recovered from a small structure (Feature 1) in Area 1 that is typical of the late Archaic to early Basketmaker transition period. This pit structure contained four thermal features (Features 6, 7, 8 and 9). Feature 6 was radiocarbon-dated to 1000 B.C., which predates the pit structure. This early component yielded eight small mammal bones. Features 7, 8, and 9 and the pit structure were radiocarbon-dated to the third century A.D. This residential component yielded 91 bones that were predominantly from small mammals that exhibited diverse degrees of burning. After the structure was abandoned and burned, it was trash-filled by later site residents. This final episode yielded small mammal bones that all evidenced degrees of burning (Post, this volume). These three late Archaic or early Basketmaker components display remarkable consistency in animal procurement as exhibited by the dominance of small mammals throughout the 1,400-year occupation. Preservation issues notwithstanding, reliance on small mammals during the late Archaic period does appear to be a strong pattern.

Two small fire-cracked cobble hearths (Features 13 and 15) excavated in Area 2, are associated with early Archaic base camps utilized by hunter-gatherers. Feature 13 a deflated hearth, produced two calcined bones from small-sized mammals. Feature 15, also a hearth, was completely devoid of faunal remains.

Archaic sites in the surrounding area display similar architectural and subsistence patterns. A late Archaic pit structure near Otowi (LA 51912) was small (2 to 3m diameter) and comparable in size to LA 61315. The taxa were also similar, with small mammals dominating the assemblage. But, most significantly, the percentage of burned fauna at Otowi was extremely high (90.8 percent) (Lent 1991:49). The burning statistics at LA 61315 were equally high: 81 percent of the faunal assemblage burned.

Two late Archaic sites (LA 84758 and LA 84787) at Las Campanas de Santa Fe are located northwest of Santa Fe. A pit structure with several hearth areas (LA 84758) produced only 18 bones of various sized mammals. Heavy charcoal stained fill suggested the structure was burned (Post l996a:78). Seven (38 percent) of the bones are burned. LA 84787 was a lithic scatter containing 33 mammal bones of all sizes. Twenty-four percent (n=8) of this assemblage exhibits thermal alterations. Both assemblages indicate the utilization of small to large mammals, but the small mammals dominate the assemblage (Mick O'Hara 1996:518).

The Archaic subsistence patterns in North America indicate a decline in large mammal procurement and a dependence on smaller species. Environmental changes during this period were accredited with the decline or near extinction of larger game animals (Bayham 1979:219-233). The reliance on small mammals and highly fragmented, burned bone are typical of Archaic processing strategies revealed at LA 61315 and surrounding sites.

THE GEOARCHAEOLOGY OF LA 61315

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The Geological Setting

This report contains a geoarchaeological description and assessment of the stratigraphy, as well as correlative and absolute placement in time of LA 61315. An effort was also made to locate possible prehistoric spring localities near the site area. Soil matrix samples were collected for oxidizable carbon ratio dating within the localities. This was the first attempt to apply this dating process to archaeological deposits in New Mexico.

The LA 61315 localities rest upon sediments of the Santa Fe Group that are primarily fluviatile, slightly consolidated sedimentary rocks (Galusha and Blick 1971:40). The Santa Fe Group retains the following characteristics: "(1) All the beds are slightly cemented, and the finer-grained members have concretions of calcium carbonate; (2) all the deposits are deformed, mostly by normal faults . . . ; (3) the beds within any one basin are of diverse lithologic types ranging from coarse fanglomerate to silt and clay, and abrupt changes in the kind and sizes of the contained pebbles are characteristic; and (4) these markedly different materials attributed to one formation conform in their arrangement to a geographic pattern consistent with the laws of deposition in basins" (Galusha and Blick 1971:40-41).

The site rests upon outcroppings of the Tesuque Formation, the most widely exposed outcrops in the Santa Fe Group. The Tesuque Formation includes only those beds in the Santa Fe Group that are of dominantly granitic origin and these are divided into five members (from lowermost to uppermost): (1) Nambe Member, (2) Skull Ridge Member, (3) Pojoaque Member, (4) Chama-El Rito Member, and (5) the Ojo Caliente sandstone. The three localities of LA 61315 rest upon the Nambe Member (Galusha and Blick 1971:45).

The Nambe Member sediments are predominantly coarse-grained, alluvial fan deposits of the lower Tesuque Formation. The beds of the member consist of basically two parts, a lower or conglomeratic sandstone, and an upper fossiliferous portion. The deposits of conglomeratic sand and sandstone that crop out in the area of site LA 61315 consist of coarse angular sands, angular gravel, and conglomerates. The source of the Nambe Member deposits is in the Sangre de Cristo range to the east, where granite and gneiss outcrop. The absolute age of the Nambe Member is approximately 3.3 million years, or middle Miocene Epoch.

Area 1

Matrix Description

There are no boundaries; the sample was taken from hearth excavation in the center of a previously excavated area 10 cm from surface; red (10R5/6d) to dark reddish gray (10R4/1d) with many fine to medium prominent mottles; sandy clay loam; weak fine to medium subangular blocky; very friable, nonsticky, nonplastic to plastic; few micro to vesicular to interstitial roots; no cutans; effervescent; 6.8 neutral pH. Pedogenesis is highly minimal, but some has very minimally occurred by evidence of the 2.7 percent clay/silt accumulation in the mechanical analysis (Table 25).

Table 25. Mechanical Analysis of Area 1 Soil

Grain Size	Percentage
Very coarse sands	3.173
Coarse sands	5.968
Medium sands	25.05
Fine sands	36.988*
Very fine sands	21.393
Coarse silt	4.646
Fine silt and clay	2.728
*This large percentage of fine sands is probably and indicator of eolian deposition. Oxidizable Carbon Ratio Age Determination = A.D. 1662 Radiocarbon Age Determination = A.D. 260	

<u>Area 2</u>

Matrix Description

There are no boundaries; the sample was taken from center of excavation 10 cm from previously excavated surface. Weak red (10R4/3m) very coarse sandy loam; massive, very friable, nonsticky, nonplastic; very few microvesicular roots; no cutans; 7.0 neutral pH; slightly effervescent. Texture through mechanical analysis reveals that pedogenic processes are very slightly more evident than in the Area 1 matrix sample (Table 26).

Table 26. Mechanical Analysis of Area 2 Soil

Grain Size	Percentage
Very coarse sands	12.234
Coarse sands	12.150
Medium sands	20.879
Fine sands	25.149
Very fine sands	17.979
Coarse silt	8.053
Fine silt and clay	3.555
*This large percentage of fine sands is probably and indicator of eolian deposition. Oxidizable Carbon Ratio Age Determination = A.D. 1718 Radiocarbon Age Determination = 5215 B.C.	

Area 3

Matrix Description

A sample was taken from the center of the previous excavation 10 cm from the surface. It is weak red to dark reddish gray (10R5/4 d to 10R4/1d), weak fine to medium subangular blocky; very friable, nonsticky to slightly sticky, nonplastic to slightly plastic; few micro to coarse vesicular to interstitial to tubular roots; no cutans; 7.0 neutral pH; slightly effervescent. Texture through mechanical analysis reveals that pedogenic proceses are developmentally on a par with Area 1.

It must be noted that the final textural commentary in each of the three area matrix descriptions does imply horizonization. In each area there was not ample exposure of a vertical section to determine horizon development. It is doubtful that there would have been any horizon development to be seen given the colluvial nature of the deposits and the steepness of the slope. Clay fraction commentary here is revealing only in that its presence might indicate some minimal illuvial process that is reflective of relative in situ age (Table 27).

Table 27. Mechanical Analysis of Area 3 Soil

Grain Size	Percentage
Very coarse sands	10.294
Coarse sands	13.744
Medium sands	26.304
Fine sands	27.657
Very fine sands	4.901
Fine silt and clay	2.757

*This large percentage of fine and medium sands is probably and indicator of eolian deposition.
Oxidizable Carbon Ratio Age Determination = A.D. 1886
Radiocarbon Age Determination = AD. 1220

Superposition of Areas 1, 2, and 3

Area 1 rests at datum 00.00 m as designated. Area 2, the most deeply buried, rests at between 2.84 and 3.18 m below datum. Area 3 surface elevation rests at 1.25 m below datum.

On surficial submersion below colluvial wash alone (superposition), Area 2 is relatively the oldest. This observation is confirmed by the radiocarbon date of 5215 B.C.

Although Area 3 (radiocarbon dated A.D. 1220) is slightly below Area 1 (radiocarbon dated A.D. 260), in elevation (superposition) it is the younger of the two localities. However, these two localities are approximately 6 to 8 m apart and separated by a ravine and other topographic undulations so that the superposition is not necessarily significant.

In summary, the geochronology demonstrates that Area 2 was the earliest occupation at the site (5215 B.C.) followed by a period of mass wasting and sheet deposition at elevations above Area 2. Subsequent occupations in Areas 1 and 3 occurred after A.D. 260. The interval between the occupations at Areas 1 and 3 is also characterized by mass wasting and sheet deposition, processes that continue today.

Higher elevations lie to the north and west of the three localities. Trenches in these areas might provide information that would clarify the temporal gaps between the three localities.

Oxidizable Carbon Ratio Age Determinations

The oxidizable carbon ratio age determinations were not accurate. This is a new and experimental process and I was unaware that I needed to report the degree and amount of slope of Areas 1, 2, and 3 along with the other field data..

Springs

The area around the site was intensively examined for surface evidence of calcium carbonates (travertine), which would be evidence of prehistoric springs. None was found.

Conclusions

Illuviation as one of the soil-forming processes (pedogenesis) is often highly expressed in mechanical analysis. This process reveals the downward movement of clays (among other substances) that aggregate or cluster at a given level in the section. When they do, their presence may be observed and measured. The relative amounts per level of elevation may be a clue to relative age.

Such is the case here. Clay fractions in the three matrix samples show: Area 1 = 2. 75 percent, Area 2 = 3.5 percent, Area 3 = 2.75 percent. The ages of Areas 1, 2, and 3 as seen by their amounts of clay illuviation pedogenetically coincide with the ages revealed by their radiocarbon absolute ages.

Superposition is also a salient factor in age determination. Area 2, the oldest and most clayey, is the most deeply buried beneath the present surface. Areas 1 and 3 are just below the present surface.

Absolute dating, superposition, and pedogenesis all reveal the same general conclusion. Area 2 occupation is the oldest, followed by Area 1 and then Area 3. Areas 1 and 3 are geomorphically and pedogenetically very similar, but the radiocarbon ages separate them by approximately a millennium.

Finally, no surface evidence of prehistoric springs was observed within the purview of the geoarchaeologist in the immediate area of the excavations.

RESEARCH DESIGN CONSIDERATION FOR LA 61315 AND LA 61321

Excavation of LA 61315 and LA 61321 was conducted in close accordance with procedures proposed in the data recovery plan. Preliminary evaluation of the excavation indicated that data could be used to address the research questions suggested for the "Use of Chippable Stone," "Foraging," "Other Subsistence Activities," and "Settlement-Subsistence System" problem domains (Wolfman et al. 1989).

Problem Orientation

The following discussion of problem orientation and domains is abstracted from the data recovery plan (Wolfman et al. 1989:152-159). Some portions of this have been modified or updated to reflect current research in the Santa Fe piedmont.

Theoretical developments in the past three and one-half decades, 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 potential 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, allow 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. They were locations where chippable stone could be obtained, tested, and initially worked prior to transportation to habitation sites or foraging or resource extraction locations. They 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, they 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 efforts, therefore, should be to better define these three functions *as parts of larger subsistence and settlement patterns* (though only two of these general functions apply to the LA 61315 and LA 61321).

As a further consideration, many of the Northwest Santa Fe Relief Route sites cannot be fully interpreted in terms of the traditional concern with placing remains within phases or other slices of time. This is because the temporal orientation of many Southwestern archaeological studies is predicated on the existence of 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 represent a single, short-term occupation, as 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 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, at which these activities would tend to be 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. Extensive but shallow cultural deposits exist on the ridge and terrace slopes (Post 1996a; Lang 1996). 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 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 individuals. 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, an emphasis on chronology-based interpretations may be inappropriate for many sites, though LA 61315 has radiocarbon dating from three distinct temporal components. For some sites or components, we may be able to tell which periods saw the heaviest use of the project corridor, due to the number of diagnostic artifacts from those periods, and by the temporal distribution of radiocarbon and other dates, but it may often be impossible to associate dates with specific remains. In the absence of dated contexts, one 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 the use of checkdams a practical farming tactic in this specific area? And why were local gravels such an attractive source of chippable stone?

As originally conceived, a site-based approach was to be supplanted by viewing the Northwest Santa Fe Relief Route corridor as part of an "archaeological landscape" formed over a 7,000-year period. Within this landscape, the proper analytical units are feature, artifact cluster, or site artifact scatter, while final analysis synthesizes the combined data for each as a group. Once analysis of the excavation data are complete, it may be possible to define finer grained cultural or temporal trends, but such distinctions are not the primary goal of the study. Instead, we are trying to understand the use of a landscape in a general sense, over hundreds or even thousands of years.

Specifically for LA 61315 and LA 61321, site assemblages have been segregated into analytical units based on spatial distribution and radiocarbon dating. LA 61315 represented a departure from the majority of the Phase 3 sites investigated during the testing phase because it yielded structural remains and concentrated extramural deposits, in addition to the general site artifact scatter. Therefore, the LA 61315 feature and artifact assemblages can be compared with assemblages formed by Archaic and ancestral Pueblo activities across the piedmont landscape.

The following problem domains guided the excavation and material culture analysis. As stated, LA 61315 provides a more detailed perspective on late Archaic-Basketmaker II occupation and the first look at early Archaic site structure within the Santa Fe piedmont.

Problem Domain I: 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 a source of 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 inhabitants could obtain raw material as an embedded strategy within daily foraging or travel or specifically for transport back to the village. Prospecting would consist of cracking open or removing single flakes from likely looking surface cobbles. If the material was suitable, then the promising cores or flakes they had produced would be removed off-site, leaving the unwanted debris. The degree of dispersion following discard would depend on erosion, the degree of slope, how often the same location was visited, and how intensely the remaining debris was considered of high grade to the prehistoric collectors.

Archaeologists typically draw circles around artifact clusters and call them sites, but they 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 temporal assignment, but they should not deter the use of sites or components as tools for examining subsistence and land-use patterns at broader temporal scales. The Las Campanas study has shown that there is a continuum of assemblage and attribute level variability that reflects the range of activity and intensity at locations used by prehistoric populations (Post 1996a:468-470). Furthermore, comparison of temporally unknown sites with Pueblo or Archaic period sites and components shows that temporally unknown sites are more similar to the Pueblo period sites (Post 1996a:470-472). Individual sites with palimpsest or multicomponent distributions may not be informative, but the Las Campanas project has shown that assemblages of sites and components can be productive research domains. 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 site chipped stone assemblages are important.

Wolfman et al. (1989:153) defined one major concern for the study of chipped stone recovered from the Northwest Santa Fe Relief Route sites:

I.1. 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?

Lithic Raw Material Procurement and Subsistence at LA 61315 and LA 61321

Excavation of LA 61315 and LA 61321 resulted in six analytical units that can be used to address material procurement and subsistence. It was originally expected that these comparisons would have limited time depth. Instead, four components from the early Archaic, late Archaic-Basketmaker II, and Coalition periods were directly dated with radiocarbon samples or indirectly dated with pottery types. Two components fall under the category of general site scatter and are similar to the bulk of the data recovered during archaeological testing.

From excavation and analysis results, the temporal components of LA 61315 and LA 61321 were inferred to reflect different organizational aspects of prehistoric economy and land use. The early Archaic component (Area 2) from LA 61315 had a single cobble-lined hearth associated with a dart point and low frequencies of core reduction and tool production debris. This spatially discrete deposit was assigned to a short-duration hunting and gathering camp with activities geared to acquisition and consumption of locally available biotic resources. The LA 61315 late Archaic-Basketmaker II component was more complex, including burned structural remains with four intramural thermal features, extramural thermal features, midden deposits, and an artifact assemblage of core reduction and tool production debris, formal and expedient tools, and grinding implements. This component was residential with a full complement of domestic facilities, intramural and extramural features and an accumulation of production and processing debris. Multiple seasonal occupations were likely and the presence of multiple intramural features suggest cold weather occupation. The two Coalition period components, LA 61315, Area 3, and LA 61321, Area 1, were daily or overnight foraging and processing locations. This interpretation is based on the two large thermal features associated with low frequencies of core reduction debris and discarded tools. The thermal features may be large for capacity, but excavation indicated that they grew through accretion with successive uses expanding the pit limits or extent of the fire-cracked rock halo. Both sites had dispersed artifact scatters that undoubtedly were formed by repeated visits to the high-density gravel deposits on the nearby ridge tops and slopes. The artifact scatter also accumulated from material procurement related to activities conducted during the different dated occupations. Therefore, it is expected that the assemblage should reflect a mix of reduction strategies.

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. Basically, the null hypothesis will be that there is no difference in material procurement and selection across components. The alternative hypothesis is that different activities and their intensity will result in different strategies of procurement and reduction and that these differences are discernible in the archaeological record.

Raw material procurement can be examined from the perspective of selection, reduction, and use. Data for each component have already been provided and interpreted in the site reports. This section intends to compare assemblages using attributes of material type and texture, dorsal cortex, flake platforms, and artifact dimension. Attribute distribution is presented through time from early Archaic to unknown temporal period.

One of the most outstanding characteristics of all assemblages is the almost complete reliance on local raw materials. Except for the LA 61315 early Archaic component, which had 19 percent nonlocal materials, there is only one obsidian biface flake in the 1,173 artifacts from late Archaic-Basketmaker II or later assemblages. Apparently, local fine and medium-grained chert, quartzite, chalcedony, and so forth, were sufficient for formal and expedient tool production.

Are there material selection differences with respect to material grain size? All chipped stone artifacts from LA 61315 and LA 61321 were classified as glassy, fine, or medium. No coarse-grained materials were recognized. The distribution of fine- and medium-grained materials shows considerable variability as well as similarities between components (Table 28). For example, the early Archiac assemblage from LA 61315 and the Coalition assemblage from LA 61321 have 86 and 90 percent fine-grained material, respectively. The late Archaic-Basketmaker II assemblage from LA 61315, the Coalition assemblage from LA 61315, and the surface assemblage from LA 61315 have roughly equal percentages of fine- and medium-grained materials. The surface assemblage from LA 61321 is between these with 68 percent fine-grained material. The early Archaic assemblage from LA 61315 is different from the late Archaic-Basketmaker II assemblage from LA 61315, indicating that the early short-term residential occupation may have had a narrow range of activities for which higher quality materials were required, such as for small mammal butchering, or that the occupation was so short that the few local materials needed were fine-grained by chance of discovery rather than by design. In other words, fine-grained materials were available nearby and were selected. The late Archaic-Basketmaker II occupation at LA 61315 was longer with more activity variability, resulting in all potential raw materials being used or at least considered. Fine or medium-grained materials were sufficient for the range of tasks. Length of occupation resulted in a wider range of available raw materials selected. Just as the Archaic period sites do not present a monocausal pattern of raw material selection, there are also differences in the Coalition period assemblages. Ostensibly, the two components reflect similar foraging and processing organization with villagers moving across the landscape in daily or overnight visits and returning home with gathered resources. However, the two features, one an accumulation of fire-cracked rock and a diffused burned basin (LA 61321, Feature 2) and the other multiple stained pockets that formed a large thermal feature but with little fire-cracked rock, may reflect different processing technology as well as a different resource. Tool requirements may have been such that grain size and material quality were important resulting in the 90 percent fine-grained material from LA 61321, Feature 2, and only 60 percent from LA 61315, Area 3. The surface assemblages from the two sites provide some insight into these assemblage differences. The surface assemblage from LA 61315 is almost 50 percent fine and 50 percent medium-grained material, which closely matches the late Archaic-Basketmaker II assemblage and is close to the Coalition period assemblage from LA 61315. The surface assemblage from LA 61321 has a higher percentage of fine-grained material than the late Archaic-Basketmaker II and Coalition period components from LA 61315, but is more in line with the high percentage of fine-grained material found at LA 61321 Coalition period component. The spatial congruity of the raw material distribution suggests that the natural occurrence of fine and medium-grained materials may affect assemblage composition as much as mechanical needs. On the other hand, the distance between these two sites is less than 125 m, making all material sources equally available to all site occupants if they were geologically exposed at the time of occupation.

Table 28. Material Texture by Temporal Component, LA 61315 and LA 61321

	Fine-Grained	Medium-Grained	Total
Early Archaic, LA 61315	43 86.0	7 14.0	50
Late Archaic-Basketmaker II, LA 61315	364 50.3	360 49.7	724
Coalition, LA 61315	20 58.8	14 41.2	34
Coalition, LA 61321	56 90.3	6 9.7	62
Surface, LA 61315	75 49.7	76 50.3	151
Surface, LA 61321	136 68.3	63 31.7	199
Totals	694	526	1220

Finally, let's examine dorsal cortex distributions across components. Dorsal cortex remaining on artifacts is an index of reduction intensity. As raw materials are more intensively reduced the ratio of cortical to noncortical debris should decrease. If raw material procurement is the main activity and materials are tested for suitability without further reduction, then the percentage of cortical debris should remain high. Residential or highly mobile short-duration occupations are expected to result in low cortical debris percentages. Short-term foraging occupation reliant on local raw material should leave relatively equal ratios of cortical to noncortical debris. If raw material sizes are small, ratios of cortical to noncortical debris may stay high since the intensity of reduction is conditioned by the volume of available raw material.

Cross-tabulation of cortex classes by component exhibits a pattern that might explain variability observed in material texture distributions as well as reflect differences in technological organization by component (Table 29). As for material texture and local/nonlocal distributions, the early Archaic assemblage from LA 61315 has a high percentage of noncortical debris, which is consistent with expectations for highly mobile populations targeting a narrow range of resources. The late Archaic-Basketmaker II assemblage from LA 61315 also has a higher ratio of noncortical to cortical debris, which is consistent with high intensity reduction in support of a wide range of tasks carried out over an extended period or repeatedly for a number of years. The Coalition period components exhibit opposite percentages from material texture distributions. The Coalition period component from LA 61315 has 41 percent noncortical debris and only 18 percent debris with more than 60 percent cortical coverage. By comparison, the Coalition period component from LA 61321 has only 19 percent noncortical debris and 31 percent with more than 60 percent cortical coverage. The Coalition period component from LA 61321 had a high percentage of fine-grained material, but it appears that this distribution focused more on raw material testing than on production of fine-grained material tools for use during processing. The two surface assemblages have percentages that reflect an accumulation of debris from material testing, core reduction, and low intensity extended core reduction. In sum, they appear to have been used as casual quarries or lithic procurement areas.

Table 29. Dorsal Cortex by Temporal Component, LA 61315 and LA 61321

	Noncortical	10 to 50 percent cortex	60 to 100 percent cortex	Total
Early Archaic, LA 61315	38 76.0	9 18.0	3 6.0	50
Late Archaic-Basketmaker II, LA 61315	446 61.6	179 24.7	99 13.7	724
Coalition, LA 61315	14 41.2	14 41.2	6 17.6	34
Coalition, LA 61321	12 19.4	31 50.0	19 30.6	62
Surface, LA 61315	49 32.5	54 35.8	48 31.8	151
Surface, LA 61321	56 28.1	91 45.7	52 26.1	199
Totals	615	378	227	1220

What was the relationship, if any, between the procurement of chippable stone in the Northwest Santa Fe Relief Route area and the other adaptive behaviors (farming, food gathering) evident in the Northwest Santa Fe Relief Route sites? When examined from the perspective of six spatial-temporal components identified at LA 61315 and LA 61321, potential responses seem to change through time and in relation to the intensity of the occupation and subsistence organization. Clearly, these sites did not form as a result of casual long-term, low-intensity lithic procurement alone.

For the early Archaic component from LA 61315 and the late Archaic-Basketmaker II components from LA 61315, lithic raw material procurement supported daily activities and appears to have been seamlessly integrated. Some formal tool manufacture is evident, but production of expedient tools or raw material procurement was supplemented by nonlocal materials and tools made from nonlocal materials during the early Archaic. During the late Archaic-Basketmaker II, hunting activities, which often produce the most specialized tool assemblages and debris, are only minimally represented. Instead, the bulk of the chipped stone debris is from core reduction and expedient tool production, though few expedient tools were recognized. Material procurement and reduction focused on producing implements that supported on-site activities with little evidence that tool production supported logistical hunting and foraging. Material selection was nonspecific; the full range of local materials, fine and medium-grained, were equally used.

For the Coalition period components, it is likely that lithic raw material procurement was embedded in other foraging or processing activities. Differences in feature morphology and content suggest that they were used to process different resources, though no direct evidence was recovered. Precooking or roasting is difficult to identify because the associated artifacts do not necessarily remain from thermal feature-related activities. What is evident is that high percentages of cortical debris cluster around these features, which may remain from material testing or early stage core reduction. One core was recovered from the Coalition component at LA 61315, and three cores were recovered from the Coalition component at LA 61321. The LA 61315 Coalition component core is small (maximum dimension less than 60 mm) with 8 dorsal scars and only 20 percent cortex. It was intensively reduced and may remain from on-site activities associated with the thermal feature. The cores from LA 61321 are small, have five or fewer dorsal scars and between 20 and 90 percent dorsal cortex. These cores are less intensively reduced and could remain from material procurement or on-site tool production. The few cores from the Coalition period indicate that both procurement for on-site activities and procurement for transport to a village or processing site are likely. As would be expected, the patterns are not one-dimensional and are indicative of a flexible, long-term land-use strategy.

The pattern of flexible land use and multidimensional procurement strategies is further exemplified by the surface scatter core assemblage from both sites. Nine cores were recorded on LA 61315. Eighteen cores were recorded on LA 61321. Cores from both sites include a full range of platform types, dorsal scar counts range from 1 to 17, and maximum dimensions range from 37 to 123 mm. These broad ranges in attributes reflect an accumulation of discarded cores from all aspects of landscape use and resource management and exploitation. Heavily reduced cores may have been left on-site when suitable replacements were found. Raw materials were tested for suitability and cores or large flakes carried off. The attribute distributions are so variable that it cannot be determined if one strategy was more common than others. Obviously, raw materials were collected to support resource procurement on the piedmont and brought back to the village for daily use.

Did lithic procurement take place as part of subsistence activities, or independently from them? Clearly, lithic procurement was embedded in subsistence activities for all periods. During the Archaic period, situating camps and residences in the piedmont proximate to abundant gravel sources conferred the benefit of convenient access to raw materials for stone tool production as well as for rock used in food processing and facility construction and manipulation. That all potential lithic raw materials were used during the late Archaic-Basketmaker II component is apparent from the equal portions of fine- and medium-grained and cortical and noncortical artifacts. All materials were used as the length of occupation increased to a season or repeated seasons over the course of a generation or more.

The strong evidence for testing, initial reduction, and replacement of tool raw materials is evident in the Coalition period and general site scatter assemblages. Distributions indicate that assemblages accumulated from repeated visits rather than from a few isolated reduction or procurement episodes. This is precisely the kind of site formation process that would be expected if procurement was embedded in procurement and extraction activities. While, some resource extraction and processing occurred on LA 61315 and LA 61321, these sites were more commonly used as places where raw materials could be acquired on the way to other resource areas or on the way back to the village.

Problem Domain II: Foraging

The second major activity posited for the Northwest Santa Fe Relief Route that can be addressed with the site data is foraging for wild foods and collection of nonfood biotic and geologic resources (other than lithic raw materials). Wild food procurement could include both hunting and plant-food gathering. Wolfman et al. (1989:156) assumed that the emphasis was on plant 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 the Contemporary Environment section of this report, "Piñon-juniper woodlands had 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 single-day use sites in the Chaco Canyon area. According to Sebastian, 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. As Sebastian (1983) notes, "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) does provide some specific information on piñon nut gathering. Apparently, outings of a single day to several days were used to gather this resource. Many of the gathering camps described by Ellis contained no structures, but those used overnight often had perishable structures that might include a single dry-laid stone wall. Although it is not clear, Ellis seems to indicate that piñon nuts were roasted at the camps (see Sebastian 1983 on this point). Lanner (1981), in his brief description of Eastern Pueblo piñon collecting, describes the practice of roasting the nuts in the pueblos instead of in the field. Consequently, based on the limited ethnographic information, piñon nut gathering sites may or may not contain thermal features used for roasting nuts.

The situation is further complicated for archaeologists because it was a common aboriginal practice to tray-roast piñon nuts, using coals removed from hearths. Thus, even if a thermal feature was used as part of the nut-roasting process there may be no burned hulls present in the thermal feature itself. However, charred piñon hulls were recovered during testing from at least one thermal feature (LA 61286, Feature 3; see Wolfman et al. 1989), 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 1996b; Toll and McBride 1996). Recovery strategies varied from water and fine-screening of 2 to 4 liters of soil from features to removing all fill from the feature. The current effort focused on recovering large flotation samples to increase the probability that economic species might be recovered.

The following general questions were offered in Wolfman et al. (1989) as a guide to examining resource extraction and acquisition and processing and consumption along the Santa Fe Relief Route and on the piedmont.

II.1. What evidence of plant and animal foods is contained in the various thermal features located along the Northwest Santa Fe Relief Route? Do these 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?

II.2. Are there functional differences in thermal features that is evident in morphology, internal fill and structure characteristics, or artifact assemblage?

II.3. What are the ages of the various hearths? Do they occur over an extended time span, or are they most common in a single period?

II.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?

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

These five research domains inquire into the nature of the subsistence organization and what subsistence data can tell about past environments and changes in both. Because of the discovery and excavation of buried cultural deposits from multiple time periods it is possible to address these issues chronologically. Therefore, the discussion will be ordered by the main temporal components, early Archaic, late Archaic-Basketmaker II, and Coalition period.

Foraging and Hunting in the Piedmont

Radiocarbon dating of wood charcoal recovered from LA 61315 and indirect dating through pottery association at LA 61321 indicate three temporal components. Based on the background information already provided in this report, these three temporal components are assumed to represent seasonal aspects of different subsistence strategies practiced by Archaic hunter-gatherers and ancestral Pueblo farmer-foragers. For LA 61315 and LA 61321, and in general for most piedmont sites from all periods, there is a low recovery rate of archaeobotanical and archaeofauna specimens. This means that interpretations must rely more heavily on inferences drawn from ethnographic models and indirect archaeological evidence for subsistence organization and strategies. Indirect evidence in this case would include artifact assemblage composition, elements of site structure, including feature and activity area characteristics, and environmental variables such as site setting, past and present structure of the surrounding biotic environment, and paleoclimatic reconstructions.

Early Archaic subsistence organization for the Santa Fe River and piedmont is poorly understood because of the low frequency of directly dated sites reported for the area. Early Archaic period sites, as identified by associated dart points of Jay and Bajada styles, are more numerous for the southern Caja del Rio and La Bajada area (Doleman 1996; Hicks 1988). None of these sites have been directly dated and only the La Bajada site, LA 9500, has been test excavated (Hicks 1988). The southern Caja del Rio and La Bajada sites are adjacent to or are in lower elevation short-grass plains settings suggesting a focus on large mammal hunting or late spring or early summer seed gathering.

From the excavation of LA 61315, Area 2 a low frequency of artifacts was recovered and two possible thermal features were excavated and sampled for archaeobotanical remains. Also, a low frequency of archaeofaunal remains was recovered. This limited direct and indirect evidence restricts interpretation. Some inferences can be made about early Archaic subsistence and the paleoenvironment from these limited data.

Archaeobotanical remains from the two thermal features only included wood charcoal. No edible economic plant species were recovered. The wood charcoal was juniper and piñon, indicating that at 6,220 B.P. a woodland or mixed woodland-grassland environment existed. Presumably, many or all economic plant species that are found in this piñon-juniper woodlands today were available at 6,220 B.P. Differences in abundance, distribution, and seasonal yields may vary considerably from what is observed today. While it is very likely that all available resources were exploited, the lack of direct evidence precludes an assessment of what resources and during which season they were exploited.

Archaeofaunal evidence is only slightly more informative. The six animal bones recovered were small or medium mammals with species not further specified. The bones were charred, indicating discard into an active fire, which is good evidence that the bones are from on-site consumption. Small mammals are most indicative of daily hunting, such as would support a small commensal unit. Rabbits could have been hunted by almost any family member. For small groups, they were most likely hunted on an encounter basis with communal hunting unlikely for widely dispersed early Archaic populations. Ethnographic accounts give no information on rabbit hunting seasonality, though practically speaking, the largest rabbit population would be available in the fall and early winter.

Direct evidence of subsistence is minimally informative about early Archaic strategies. Presence of piñon and juniper charcoal in the thermal features indicates a biotic environment similar to present. The few small features and low frequency of lithic debris combined with small mammal bones indicates low intensity, small-scale foraging and hunting such as would be needed to support a small family group for a short-time.

The evidence from the late Archaic-Basketmaker II component from LA 61315 is only slightly more informative than the early Archaic component, again because of limited direct evidence for subsistence. The late Archaic-Basketmaker II component included the burned remains of a structure with four intramural thermal features, extramural features, and other evidence of intensive, long-term or repeated use of the area. Even with substantial containers or catchments for discarded subsistence refuse, the return is woefully low. Basically, more often than not, organic materials, even if they are burned, have a poor chance of preservation in colluvial, open-air sites.

Archaeobotanical evidence was limited to charred goosefoot and Indian ricegrass from within the structure (Feature 1) and Feature 8, the partly cobble-lined thermal feature in the structure.

Goosefoot is one of the most abundant charred plant seeds recovered in archaeological contexts along the Santa Fe River and elsewhere. Indian ricegrass thrives in lower elevation, sandy soils, but could be present in floodplain environments. As stated by McBride and Toll (this report), Indian ricegrass was recovered from the Arroyo Hondo Pueblo, indicating that it had been harvested in the Santa Fe area in the past. Sandy environments, such as alluvial fans along major arroyo floodplains, may have been suited to Indian ricegrass. The Cañada del Rincon to the east, which is overlooked by LA 61315, may have supported periodic Indian ricegrass stands.

Indian ricegrass is often interpreted as a late spring or early summer resource that is common in San Juan Basin sites and a major piece of evidence for interpreting warm season occupation. Along the Santa Fe River, it is rarely found in archaeological contexts. Its recovery at LA 61315 lends beginning support to an interpretation that late Archaic-Basketmaker II occupations may have tended toward permanence by A.D. 100 or 200. During some years, sufficient resources may have been available to support small groups from the late spring into the winter. Two major lines of evidence lacking from LA 61315 are the evidence for storage and plant foods in sufficient abundance to suggest that commensal unit caloric needs could be met and sustained.

Archaeofaunal remains are interesting, even though they occur in a low frequency. Identified species include cottontail rabbit, black-tailed jackrabbit, and woodrat. These are complemented by a full range of small, medium, and large mammals, though the latter two occur in low frequency. These species and size ranges represent the full mammal spectrum that was available for food and could be obtained through daily hunting or by logistically organized forays into prime large mammal habitats. That such a range of fauna is present at LA 61315 indicates a longer duration occupation, consistent with the site structure and archaeobotanical evidence.

Bone was burned and unburned. Burning may be inconclusive, but it is most likely that burned bone in thermal features reflects on-site consumption and structure and activity area maintenance. High frequencies of large mammal bone in association with intensive tool production are not evident. Instead, the tools reflect foraging and relatively expedient manufacture and the majority of the bone is from small mammals reflecting local hunting. Long-distance forays could have been staged from LA 61315, but there is little evidence of gearing up (Binford 1980; Bleed 1986; Kelly 1988).

Basically, the archaeobotanical and archaeofauna data show no observable difference between biotic resources acquired, processed, and consumed by LA 61315 late Archaic-Basketmaker II inhabitants and those that are available today. Faunal remains consistent with the environmental setting were identified, but in greater quantities than have been reported for similar aged sites (Post 1996a; Schmader 1994a; Kennedy 1998). Increased potential for preservation caused by burning and presence of suitable catchments or containers preserved a rare seed of Indian ricegrass. Broad-spectrum hunting and gathering is expected from mobile populations. However, in this case the remains suggest that in addition to exploiting a broad spectrum of resources, a small commensal group occupied the site for 6 to 8 months in an environment that was similar to the present.

The Coalition period occupation as represented by Feature 12 in Area 3 of LA 61315 and Feature 2 in LA 61321, as well as the few nonfeature-associated sherds found on the sites' surface, produced the least direct evidence of subsistence. Neither feature yielded economic plant species nor animal bone. While it is hypothesized that the majority of these near-surface or surface thermal features found along the Santa Fe Relief Route right-of-way represent processing or roasting, there is little supporting evidence. Feature 12, LA 61315, yielded juniper and piñon charcoal indicating that fuel wood availability was similar to the present. Their co-occurrence in the latest temporal component completes a 6,700-year span when they were available to all site occupants. This long-term similarity suggests the basic biotic environment has been fairly consistent through time or that the area was occupied when the environment was productive–a status that is arguably an accurate characterization of today's environment.

Thermal Feature Variability Through Time

Examination of feature function and its implication for subsistence strategies and economic change is difficult to address given the small site sample and low frequency of features from the early Archaic and Coalition period components. However, there are some differences that are consistent with the unique subsistence and settlement patterns suggested by the archaeological record of each broad cultural period.

The small area excavated at LA 61315, Area 2, exposed two thermal features. One, Feature 13, was an unlined pit with charcoal flecks in a charcoal-stained colluvial fill. The other, Feature 15, was a collapsed cobble concentration in a circular outline associated with lightly charcoal-stained colluvial sand that is interpreted as a hearth. The deteriorated condition of both features limits interpretation of function based on morphology, internal fill, and structure. Their maximum inferred dimensions of 28 cm and 75 cm are in the small to medium range such as would be expected for intramural features or those used by a small group with a limited range of processing or cooking activities. Both were probably used with fire and are not temporary storage or holding facilities. They occur in near enough proximity to be from the same occupation, which would indicate limited facility flexibility relative to needs.

Late Archaic-Basketmaker II feature variability can be examined in terms of intramural and extramural location. The structure, Feature 1, had four intramural thermal features, Features 6, 7, 8, and 9, with Feature 6 possibly left from an earlier site occupation. All four features were deep relative to area with Features 6, 7, and 8 lacking a cobble lining. The cobble lining in Feature 9 combined with the slightly larger area relative to depth indicated that it may have had a different function than Features 6, 7, and 8, as described previously in this report. Based on ethnographic (Opler 1941; Smith 1974; Steward 1938) and mechanical studies (Wandsnider 1997), these steep-sided, deep thermal features would be best suited for cooking or processing of foods that need to be slow roasted. Slow roasting and smothering coals would leave charcoal and not ash. These pits were filled with blackened soil from diffused charcoal. They had small capacities, which would have been more manageable and predictable for indoor fire use.

Feature 9 has morphological and content attributes that are consistent with an actively used thermal feature. It is the largest and shallowest of the interior features. It shows evidence of intense burning. The fill contained burned and splintered bone fragments, which would have been tossed into an active fire. It had a concentration of 13 cobbles on the interior bottom. These were lying flat and form a platform. The cobbles segregate the interior feature space into open fire and roasting or cooking platform. This internal division suggests multipurpose functions, such as would be expected of a frequently used domestic feature. It is possible that Feature 9 could have been the fuel source with coals transferred from it to Features 7 and 8.

Extramural features have from small to medium diameters and can be classed as roasting pits or hearths and small undifferentiated pits. These pits are associated with abundant fire-cracked rock and chipped stone debris suggesting a wide range of processing activities. Morphological variability in Features 2, 3, 4, 5, and 11 may reflect functional differences. Features 2, 3, and 4 are shallow to moderately deep basin-shaped pits. They are associated with or contain abundant fire-cracked rock. Their shallow depth allowed frequent access and would have allowed rapid combustion of wood into a coal bed that could have been used for meat roasting or fruit and seed parching. Open, basin-shaped pits are the most versatile and are the most commonly reported in the ethnographic literature (Opler 1941; Smith 1974; Steward 1938). Slight differences in size may reflect the volume of processed goods or the size of the meat to be roasted. These features may be typical of the suite of extramural processing features that would accompany a habitation.

Feature 5 was larger and deeper than the other thermal features, had a cobble lining, and was located away from the main activity area, suggesting a more specific function such as a roasting pit for medium or large-game mammals. Such a large pit, filled with fire and coals, would be hazardous and would generate tremendous heat, making its more remote placement necessary in terms of traffic and extramural space management.

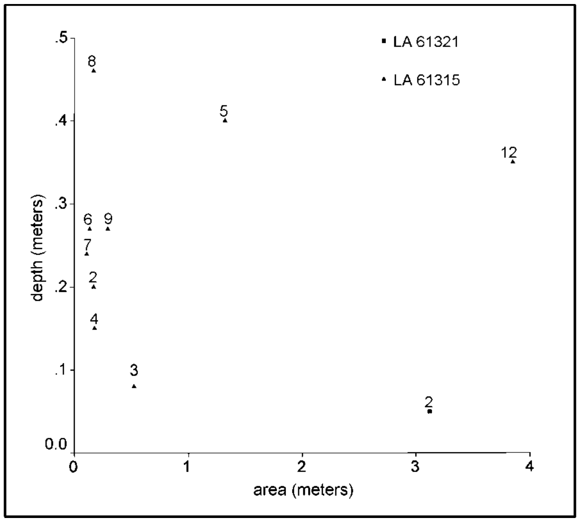

Figure 22. LA 61315 and LA 61321 features, depth by area, no early Archaic.

Intramural and extramural feature morphology and function may be most dependent on location within a site. Intramural feature morphology and functional range are expected to be constrained by practical aspects of maintenance, cleanliness, and fire hazard reduction. Extramural features are expected to be constrained by productive and processing capacity and need. This dichotomy between function and location does appear to be played out in the LA 61315, Area 1, feature assemblage. Figures 21 and 22 are scatterplots that show the relationships between length and width and depth and area for intramural and extramural features. Intramural features have a narrower or more clustered distribution in both scatterplots. They cover smaller areas relative to depth and they tend to have smaller horizontal dimensions. Some extramural features fall within the intramural feature range, but Features 3 and 5 are outliers that are larger regardless of depth. These larger features provided greater productive capacity and probably less pyrotechnic control and were therefore located outside. Feature 3 is associated with abundant fire-cracked rock, further emphasizing the reduced maintenance constraint on outdoor features (Binford 1983:156-157). This difference, based on location and productive capacity, may be more apparent when features from all periods are compared.

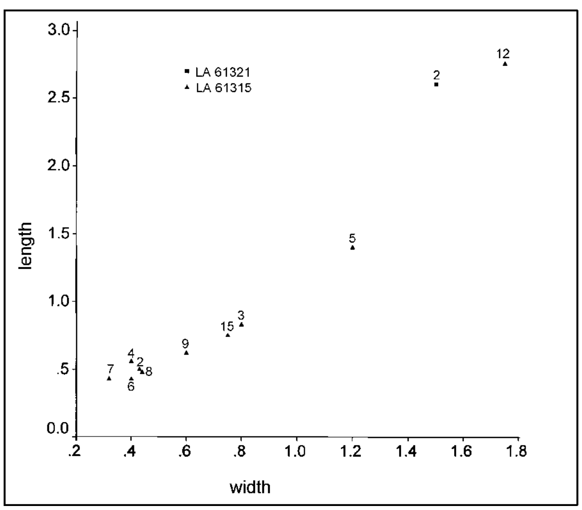

Figure 21. LA 61315 and LA 61321 features, length by width, no early Archaic.

Coalition period features are expected to vary from early Archaic and late Archaic-Basketmaker II because they result from very different settlement pattern and subsistence organization. Daily or overnight foragers in search of food or resources that were transported back to a distant village site had technological needs that were different from those found in hunter-gatherer base camps. Occupation was shorter. The range of resources procured and processed at any one place would be expected to be restricted. Technology should have been geared to reducing non-nutritional or useful components prior to transport.

The two Coalition period features from LA 61315 and LA 61321 are morphologically different from one another and they are very different from early Archaic and late Archaic-Basketmaker II features. Unfortunately, neither yielded direct evidence of their function. Both features cover between 3 and 4 sq m. However, Feature 12, LA 61315, is .35 m deep and Feature 2, LA 61321, is only .03 m deep. The former lacked fire-cracked rock, but retained abundant charcoal-infused colluvium, while the latter was deflated and may never have been deeply excavated into the rocky substratum. Feature 2, LA 61321, is similar to ring middens associated with roasting succulents in southeastern New Mexico (O'Laughlin 1980; Carmichael 1985). In size, Feature 12, LA 61315, is similar to Feature 3, LA 86150, in from the Las Campanas excavation (Post 1996a), but the latter was filled with heavily burned and fractured fire-cracked rock. Other large thermal features have been identified south of Santa Fe along the Cañada del Rancho ([LA 116418] Post 1998:70) and on the Santa Fe Ranch lease, east of the Cañada Ancha (Post 2000). The wide distribution of these large thermal features north and south of the Santa Fe River indicates that they were part of an ancestral Pueblo foraging strategy that was practiced by residents of most of the local large villages. The large capacity of these thermal features is interpreted to reflect the need to acquire and process large quantities of resources before transporting them back to the village. In other words, the foraging strategy was staged. There is little support for this kind of foraging strategy in the ethnographic literature, except for the long distances traveled by various Great Basin tribes and Rio Grande pueblo villagers to procure piñon nuts. In the case of these piedmont features, the distance is not great but they do tend to be 5 to 7 km from the nearest village.

The features from the three temporal components reflect fundamental changes in settlement and subsistence. The early Archaic period is represented by two thermal features in poor condition and from an area that was partly excavated. The features are small to medium in size and have morphological variability: one was lined with cobbles and the other was unlined. The features are small and they are associated with the most mobile and least sedentary settlement pattern. The late Archaic-Basketmaker II features reflect the variability resulting from a residential occupation established on the piedmont. Longer occupation duration results in a wider range of chipped stone debris and tools, more species of fauna represented by the splintered bone assemblage, and a feature assemblage geared to a broader spectrum of resource processing and preparation and also indoor and outdoor activities. Larger features with unique structure or content tend to be outdoors, while indoor features exhibit a smaller size and content variability. Finally, the Coalition period features are considerably larger than earlier features, exhibit evidence of reuse, and may reflect the need to increase foraging capacity. Increased foraging capacity could have resulted in an intermediate step of in-field processing or drying before the energy-bearing, nutritive, or useful products are transported to the village for consumption.

Problem Domain III: The Settlement-Subsistence System

The synthetic goal for this project is to be able to explain how the limited or seasonal activities encountered along the Northwest Santa Fe Relief Route form part of a greater subsistence and settlement system. Excavation of Phase 2 sites as well as excavations at Las Campanas will combine to provide a regional perspective of piedmont land-use strategies for a 7,000 year span. Because the analysis of Phase 2 is not complete, it would be premature to examine piedmont land use at this time. Therefore, Problem Domain 3 will not be addressed in this report, but a synthesis will be provided in the Northwest Santa Fe Relief Route, Phase 2, report.

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