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Data Recovery Investigations at Three Small Pueblo Sites along the US 84/285, Santa Fe to Pojoaque Corridor, Santa Fe County, New Mexico

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Administrative Summary

The Office of Archaeological Studies conducted excavations at three sites along the Santa Fe to Pojoaque Corridor. The fieldwork was performed at LA 111326 on July 27 and 28, 2000; and at LA 390 and LA 145398 from September 21 to 28, 2004. All three sites are along US 84/285 in Santa Fe County, New Mexico, and were studied in conjunction with the reconstruction of that highway. LA 390 and LA 145398 were examined at a late stage in the project, when the Pueblo of Tesuque requested the additional construction of two turnouts along the highway at the north end of their grant. LA 111326 was examined as part of the larger Santa Fe to Pojoaque project and added to this report because few cultural remains were found within the highway right-of-way, in contrast to other sites investigated during that project.

These studies were conducted at the request of the New Mexico Department of Transportation (NMDOT). All three sites are on the Pueblo of Tesuque Grant. Residential use of LA 390 and LA 145398 occurred during the Late Developmental period, but evidence suggests that both locations continued to be used into the Classic period. This is especially true of LA 145398, which also contains a Classic period canal segment and evidence of an associated corn field. No accurate date could be assigned to LA 111326 because no temporally diagnostic materials were recovered from the section of the site that was examined. No structures, features, or intact cultural deposits were found in the parts of LA 390 and LA 145398 that were examined, while the section of LA 111326 that was excavated contained only a thermal feature of questionable date.

As a result of this research, the potential of the examined portions of LA 390, LA 111326, and LA 145398 to yield information relevant to local prehistory has been exhausted.

NMDOT Project No. MIP-084-6(59)177, CN 2155

MNM Project Nos. 41.678 (LA 111326) and 41.772 (LA 390 and LA 145398)

NMCRIS Activity Nos. 89966 (LA 390 and LA 145398) and 67881 (LA 111326)

ARPA Permit Nos. BIA AAO-99-002 (LA 111326) and BIA/SRO-04-002 (LA 390 and LA 145398)

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Introduction

Jeffrey L. Boyer

Between 1997 and 2004, the Office of Archaeological Studies (OAS), Museum of New Mexico, conducted a series of archaeological investigations at 19 sites along US 84/285 between Santa Fe and Pojoaque, Santa Fe County, New Mexico (Fig. 1). The investigations were performed at the request of the New Mexico Department of Transportation (NMDOT) in anticipation of various planned highway construction and improvement activities associated with the US 84/285 Pojoaque South and Santa Fe to Pojoaque Corridor projects. The project directors were Jeffrey L. Boyer, James L. Moore, and Steven A. Lakatos.

Investigations at 3 of the sites—LA 390, LA 111326, and LA 145398—yielded little information relevant to research issues beyond their location. In each case, the portions of the sites within NMDOT construction areas were small relative to the total area of the sites. Archaeological investigations did not produce significant numbers of artifacts from surface or subsurface deposits or reveal significant surface or subsurface features or structures. This report presents the results of investigations at these 3 sites, including analyses of collected artifacts and other materials. Because they are discussed here, they are not discussed in subsequent reports on the US 84/285 Pojoaque South and Santa Fe to Pojoaque Corridor projects, which will deal with the other 16 sites.

The three sites are on the Pueblo of Tesuque Grant (Appendix 1). They are parts of a cluster of sites at or near the north boundary of the Pueblo of Tesuque Grant (Fig. 1 and Table 1).

Table 1. Administrative information for LA 390, LA 111326, and LA 145398

Site	NMDOT Project No.	NMDOT Control No.	MNM Project No.	NMCRIS No.	NMCRIS Activity No.	Right-of-Entry Letter (Tesuque Pueblo)	USDI BIA Permit No.
LA 390	MIP-084-6(59)177	CN 2155	41.772	50208	89966	9/2/2004	BIA/SRO-04-002
LA 111326 (testing)	MIP-084-6(59)177	CN 2155	41.678	50208	65471	8/12/1999	BIA/AAO-99-002
LA 111326 (excavation)	MIP-084-6(59)177	CN 2155	41.678	50208	67881	8/12/1999	BIA/AAO-99-002
LA 145398	MIP-084-6(59)177	CN 2155	41.772	50208	89966	9/2/2004	BIA/SRO-04-002

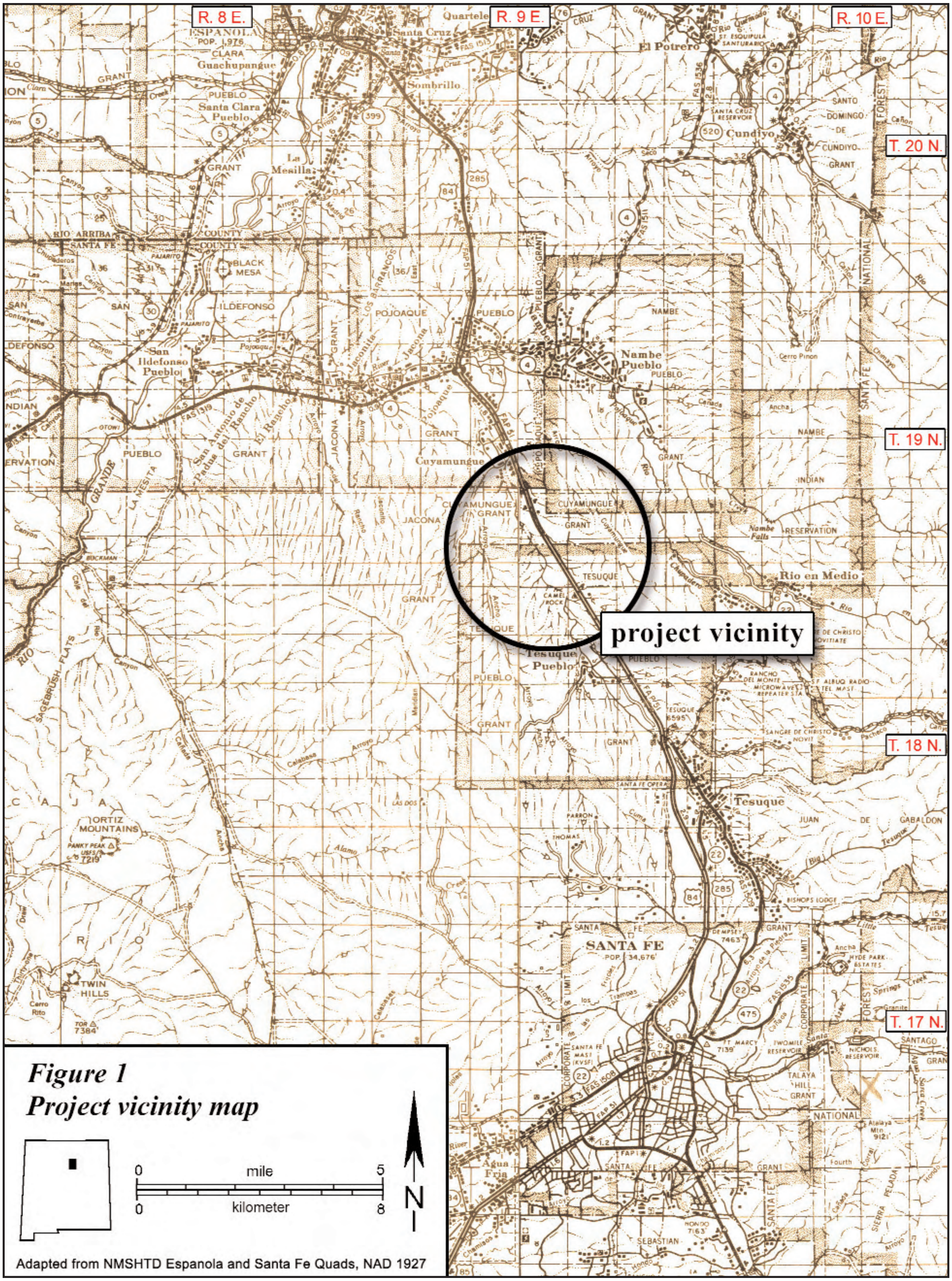

Figure 1
Project vicinity map

History of Site Investigations

LA 390

The name *LA 390* was assigned by H. P. Mera in the 1930s to a small mound assumed to be the remains of a prehistoric surface roomblock unit. The site was on the west side of the highway near the north boundary of the Pueblo of Tesuque Grant. Sherds collected by Mera from LA 390 belong to types associated with the Late Developmental period (ca. AD 900–1200; Lakatos and Montoya n.d.).

LA 390 was not referenced again in published or NMCRIS records until the OAS began investigations in the US 84/285 Santa Fe to Pojoaque Corridor project area in 1999 (Boyer and Lakatos 2000). At that time, *LA 390* referred to a scatter of artifacts and two large artifact concentrations, perhaps representing structural areas, on the south side of the grant boundary fence—the site discussed in this report. Subsequent examination of site records and collected artifacts showed that Mera's LA 390 was probably closer to the modern highway, at or near a location investigated by the OAS as LA 391 (Lakatos and Montoya n.d.). Given the differences in how sites were defined and recorded in the 1930s (Mera gave site numbers to obvious and presumed roomblock units, ignoring artifact scatters surrounding those units and scatters with no evident architectural features), the site investigated by the OAS as LA 390 may represent part of the artifact "halo" around Mera's LA 390. However, that conclusion cannot be securely demonstrated, and the location is treated and described in this report as a discrete site.

Excavations at LA 390 were performed in 2004 in anticipation of construction of the US 84/285 Tesuque north turnout (Moore and Boyer n.d.). The turnout is a short strip of pavement extending onto the Pueblo of Tesuque Grant and into LA 390 from an access road on the southwest side of the US 84/285 Cuyamungue interchange. Excavations at this site were directed by Jeffrey L. Boyer, who was assisted by Marlene Owens and Luke Suchy. A single grid system, established in 1999, links excavations at seven sites in the vicinity of the north boundary of the Pueblo of Tesuque Grant. Because of his familiarity with the site grid, Steven A. Lakatos directed extension of the grid to LA 390.

LA 111326

The name *LA 111326* was assigned by Hohmann et al. (1998) to a small artifact scatter along the west side of US 84/285 on the Pueblo of Tesuque Grant. The scatter had previously been recorded as a southern extension of a site thought to be Mera's LA 391 (McCrary 1983). Preliminary examination of existing site records by the OAS suggested that the site was the location of Mera's LA 389 (Boyer and Lakatos 2000). However, subsequent examinations of site records and artifacts collected by Mera from LA 389 show that this site was on a nearby ridge and had been largely removed during highway construction in the 1930s and 1960s (Lakatos and Montoya n.d.). Because it is a discrete artifact scatter, clearly separated from the site investigated by the OAS as LA 391, the site is identified in this report and in updated NMCRIS records as LA 111326. Test excavations were conducted at the site in 1999 (Boyer and Lakatos 2000). They revealed a hearth, a portion of which was excavated. In 2000 excavation of the hearth was completed, and a series of grid units surrounding the feature were excavated. These investigations, conducted by Richard Montoya and Paul Cooter, were supervised by Steven A. Lakatos.

LA 145398

LA 145398 was first recorded during survey of the US 84/285 Tesuque east turnout (Moore and Boyer n.d.). Previous investigations along US 84/285 did not record a site in this area, but Hohmann et al. (1998) did record three isolated occurrences (IOs) there. Those IOs were found during the turnout survey and are included within the LA 145398 site area. The turnout is a short strip of pavement extending outside the east side of the existing US 84/285 right-of-way on the Pueblo of Tesuque Grant. Because no site had been recorded in the immediate vicinity of the turnout, the area was first surveyed. LA 145398 was discovered and recorded during the survey. Following the survey, excavations at the site were directed by James L. Moore and performed by Moore and Guadalupe Martinez. Because of his familiarity with the site, Steven A. Lakatos directed extension of the site grid to LA 145398 and the mapping.

Physical Environment

James L. Moore

Physiography and Geology

The study area is situated in the Española Basin, one of six or seven downwarped basins that formed along the continental rift now occupied by the Rio Grande between southern Colorado and southern New Mexico (Chapin and Seager 1975; Kelley 1979). Three episodes of deformation contributed to the development of these depressions, including formation of the ancestral Rocky Mountains during the late Paleozoic and the Laramide uplifts of late Cretaceous to middle Eocene times (Chapin and Seager 1975:299). These events created a north-trending tectonic belt, along which the Rio Grande rift formed. Chapin and Seager (1975:299) note, "The Rio Grande rift is essentially a 'pull-apart' structure caused by tensional fragmentation of western North America. Obviously, a plate subjected to strong tensional forces will begin to fragment along major existing zones of weakness and the developing 'rifts' will reflect the geometry of the earlier structure." The early deformations weakened the continental plate, causing it to split along the Rio Grande depression and resulting in the formation of downwarped basins as the plate pulled apart.

The Española Basin, an extension of the Southern Rocky Mountain Province (Fenneman 1931), is enclosed by mountains and uplifted plateaus (Kelley 1979:281). The Rio Grande flows through the long axis of the basin, entering through Taos Gorge on the north and exiting through White Rock Gorge on the south (Kelley 1979). Boundaries for this physiographic feature include the Taos Plateau on the north, the Brazos and Tusas Mountains on the northwest, the Sangre de Cristo Mountains on the east, the Cerrillos Hills and north edge of the Galisteo Basin on the south, the La Bajada fault escarpment and Cerros del Rio on the southwest, and the Jemez volcanic field on the west.

According to Kelley (1979), the Ortiz surface is the most widespread and well-preserved pediment in the Española Basin, but it has mostly been removed by erosion. Black Mesa represents a remnant of the Ortiz surface in the northern Española Basin, and the Ortiz surface forms uplands at the south and west edges of the Española Basin, including the Pajarito Plateau and Cerros del Rio (Kelley 1979:282). There are also several lower pediments in the basin, but none occur in the project area. Extensive erosion during the Quaternary formed the inner valleys of the Rio Grande depression, and this dissection was most extensive in the Española Basin (Kelley 1979:285). This process formed valleys and gorges with as much as 300 m of relief (Kelley 1979:285).

The Rio Chama is the main tributary of the Rio Grande in the Española Basin, and the confluence of these rivers is near the center of the basin (Kelley 1979). The Rio Tesuque and Rio Pojoaque, the principal drainages in the study area, originate in the Sangre de Cristo Mountains. Both streams flow through narrow valleys and merge northwest of Pojoaque Pueblo, then trend west to empty into the Rio Grande (Anschuetz 1986).

As subsidence proceeded, sediments were eroded into the Española Basin from the highlands to the north, northwest, and east, forming the Santa Fe Group. This group of mostly sedimentary formations contains thick deposits of poorly consolidated sands, gravels, mudstones, conglomerates, siltstones, and volcanic ash beds (Lucas 1984). At one time the Tesuque formation of the Santa Fe group was covered by the Ortiz Pediment gravels, but severe erosion removed most of the latter, leaving isolated remnants on high ridges and hilltops. Subsequent gravel deposition occurred as channel deposits along the Rio Grande.

In places the Santa Fe Group sediments were covered by volcanic deposits, especially in the north and northwest parts of the basin. There, the Puye fanglomerate, which formed after erosion of the Ortiz Pediment began, was covered by a thick layer of Bandelier tuff and local basalt flows. These igneous deposits form the Pajarito Plateau and Black Mesa.

Soils

Soils in the study area can be divided into two groups based on geomorphology. Soils of the category known as dissected piedmont plain are most common in the area, and soils of recent alluvial valleys also occur (Folks 1975). The Pojoaque–Rough Broken Land association, comprising the former group, is derived from Quaternary sediments and alluvium of the Tesuque formation of the Santa Fe Group (Lucas 1984). These deep soils are well drained and occur on rolling to hilly uplands dissected by intermittent gullies and arroyos, though a few nearly level to gently sloping valley bottoms and floodplains next to intermittent streams are also included in the association. Most of these soils are forming in unconsolidated coarse to medium-textured and gravelly old alluvium, which is usually calcareous and contains sandy clay loam, sandy loam, or gravelly sandy loam surface layers. Lag-gravel deposits often cover the surface of these soils (Folks 1975:4; Maker et al. 1974:33).

Soils of the Rough Broken Land association occur on broken topography, steep slopes, and rock outcrops. This association is dominated by rock outcrops and small areas of highly variable soils (Maker et al. 1974:24). Intermingled with Pojoaque soils, Rough Broken Land soils tend to occur on ridgetops between drainages.

The El Rancho–Fruitland association dominates the soils of recent alluvial valleys. They are deep and loamy like the Pojoaque soils but unlike them tend to occur on low terraces along the Rio Tesuque and Rio Pojoaque. El Rancho–Fruitland soils are derived from sedimentary rocks of the Tesuque formation and granites of the Sangre de Cristo Mountains (Folks 1975:3). They are currently used for irrigated crops, while the Pojoaque soils are not used in modern agriculture.

Plants and Animals

The condition of local plant and animal populations is far from pristine due to human exploitation of the project area for a variety of purposes through time. Archaeologically, we know that the Tesuque area was used by transient human populations by the Late Archaic period, and that type of use can be projected back several thousand years before that. Pueblo farmers had started living in the project area by perhaps AD 900 and had a profound effect on the local plant and animal populations. The general project area contains four of the Pueblo villages encountered by early Spanish expeditions into New Mexico (Tesuque, Pojoaque, Nambe, and Cuyamungue), and that farming population was augmented by Spanish farmers in the historic period. Drastic changes in the biotic structure of the project area probably did not occur until it was occupied by farmers, but even hunter-gatherers could have affected the ecology of the region to some extent.

Human use of the project area since the Late Developmental period has undoubtedly caused changes in the biotic environment. Use of wood for building, cooking, and heating probably left zones around villages virtually denuded by the end of the prehistoric period. Field clearing and cultivation also helped change the character of the region as the Pueblo population grew and expanded. Similarly, Spanish use of the region for farming and grazing affected the distribution and types of plants used for forage by cattle and sheep. Heavy historic use of wood for building and fires probably left the area nearly denuded around settlements. While the woodlands have begun recovering since more efficient means of heating and cooking became widely available, grazing and farming in the region have continued to change the character of the biotic environment. Thus, descriptions of local flora and fauna based on modern data are not directly comparable to the prehistoric situation.

Local Vegetation

The distribution of plants is conditioned by availability of water, exposure, and soil type. Thus, the plants growing adjacent to the Rio Tesuque are different from those occupying the floodplain and adjacent upland areas. Three basic plant communities are found in the project area: juniper-piñon grasslands, dry riparian, and riparian/wetlands. Juniper-piñon grassland, the most widespread community, supports an overstructure dominated by juniper and piñon pine, with an understructure containing muhly grass, grama grass, other less common grasses, four-wing saltbush, sagebrush, rabbitbrush, prickly pear, and cholla. Russian knapweed, a recent invader, commonly occurs in the northern part of the project area.

The dry riparian habitat can be found in arroyo bottoms, on arroyo banks, and on floodplains adjacent to some of the wider drainages (Anschuetz 1986). Plants commonly found in this community include rabbitbrush, four-wing saltbush, mountain mahogany, scrub oak, Rocky Mountain beeplant, Indian ricegrass, three-awn grass, side oats grama, and flax (Pilz 1984). The riparian/wetland habitat occurs only along perennial streams such as the Rio Tesuque and Rio Pojoaque (Anschuetz 1986). Today, this habitat supports willow, cottonwood, tamarix, rushes, and sedges (Pilz 1984).

Local Fauna

Piñon-juniper woodlands support at least 70 species of birds and 48 species of mammals. The distribution of species is determined by geography and the type of piñon-juniper habitat (Gottfried et al. 1995:104). Birds that commonly live in piñon-juniper woodlands include the piñon jay, scrub jay, screech owl, gray flycatcher, mockingbird, lark sparrow, and plain titmouse; turkeys also live where ponderosa pine is available for roosting (Gottfried et al. 1995:104). Several types of raptors are found in this zone, including golden eagle, Swainson's hawk, Cooper's hawk, red-tailed hawk, kestrel, and great horned owl (Gottfried et al. 1995:105). Many species of bats have been netted at night in piñon-juniper woodlands; they may forage there or roost in the trees (Gottfried et al. 1995:105).

Artiodactyls commonly found in piñon-juniper woodlands include mule deer and elk, and pronghorns live in the more open zones. Predators include mountain lion, coyote, gray fox, long-tailed weasel, western spotted skunk, and hog-nosed skunk (Gottfried et al. 1995:105). Common small mammals are cliff chipmunk, rock squirrels, brush mice, piñon mice, rock mice, white-throated woodrats, and Mexican woodrats (Gottfried et al. 1995:105). Jackrabbits, cottontails, prairie dogs, pocket gophers, and kangaroo rats also live in this environment (Anschuetz 1998:253).

Small numbers of mule deer now occur in the study area, as do black bears (Pilz 1984). Animals that were once common at higher elevations include elk, mule deer, wolf, coyote, bobcat, mountain lion, squirrel, various species of mouse, chipmunk, prairie dog, woodrat, jackrabbit, cottontail, skunk, raccoon, and black bear (Anschuetz et al. 1985; Fiero 1978). The Pueblo of Tesuque has reintroduced elk to the area and keeps a small protected herd.

Climate

Temperature is a function of latitude and elevation. The latter is the more powerful determinant in New Mexico. Temperature decreases more rapidly with a rise in elevation than with an increase in latitude (Tuan et al. 1973). Mean annual temperatures reported for Española are 49.4–50.7 degrees C (Gabin and Lesperance 1977). Summers tend to be warm, and winters are cool. The Española area averages 152 frost-free days during the growing season (Reynolds 1956).

Cold-air drainage is a common feature of deep New Mexican valleys. Night-time, down-valley winds are cool and change to warm, up-valley winds during the day (Tuan et al. 1973:69). While narrow canyons and valleys create their own temperature regimes by channeling air flow in this way, temperatures on broad valley floors are influenced by local relief (Tuan et al. 1973:69). A study of these patterns has shown that temperature drops before sunrise are gradual or at least not extreme when winds are relatively stable throughout the night during spring and fall (Hallenbeck 1918:364–373). However, on clear nights accompanied by gentle horizontal gradients, sudden dips in temperature are not uncommon, and crop damage can result (Tuan et al. 1973:70). Studies at Hopi and Mesa Verde demonstrate that cold-air drainage can significantly shorten the length of the growing season in valleys (Adams 1979; Cordell 1975). This phenomenon may be responsible for a shorter growing season in the Española area than in the Santa Fe area, which is higher in elevation (Anschuetz 1986).

New Mexico is one of three places in the United States that receives over 40 percent of its annual rainfall during the summer months (Tuan et al. 1973). Summer rainfall in the Southwest follows a true monsoon pattern (Martin 1963).

Moisture-laden winds flowing north from the Gulf of Mexico are the main source of summer moisture, and their movement is controlled by a high-pressure system over the Atlantic Ocean. The amount of summer precipitation in the Southwest depends on the positioning of this system. When it is in a northward position, moist tropical air flows into the Southwest, and the summer is wet. When it is positioned southward the summer can be dry, a condition that may be caused by abnormally cold years in north temperate latitudes (Martin 1963).

Winter precipitation is derived from air masses originating in the extratropical regions of the Pacific Ocean or in Canada. While summer storms are generally short and intense, winter precipitation usually falls as snow, which melts slowly and soaks into the soil rather than running off, like most summer rain. Though all precipitation is beneficial to local biota, winter precipitation is more effective because it soaks into the ground and recharges soil moisture reserves.

This is not to say that precipitation patterns are consistent across the Southwest. Indeed, great variation in rainfall patterns has been found between different parts of the region. Dean and Funkhouser (1995:92) suggest that a bimodal precipitation pattern prevails in much of the southern Colorado Plateau (northwest component) with extremes in both winter and summer. Conversely, a unimodal pattern with a summer extreme seems to prevail in the San Juan Basin and Northern Rio Grande Valley (southeast component). This pattern has prevailed since AD 966 or earlier (Dean and Funkhouser 1995:92). There have been disruptions of the pattern since that time, but they have mostly occurred in the northwest component (Dean and Funkhouser 1995:94).

Annual precipitation records from Española indicate that the study area receives a mean of 237–241 mm of precipitation per year (Gabin and Lesperance 1977). However, precipitation levels can be quite variable from year to year. July through September are the wettest months in the area, receiving about 45 percent of the annual precipitation (Gabin and Lesperance 1977). However, the violence of summer storms results in a great deal of runoff, reducing the amount of moisture actually available for plant growth. Quite a bit of moisture is also lost through evaporation from plants and the soil surface, resulting in an annual moisture deficit of 691 mm in Española (Anschuetz 1986). Climatological data suggest that the inner Española Basin is a high-risk area for dry farming (Anschuetz 1986).

An Overview of the Prehistoric Period

James L. Moore, Steven A. Lakatos, and Jeffrey L. Boyer

The Northern Rio Grande region stretches from the south edge of La Bajada Mesa to the north end of the Taos Valley and encompasses the Santa Fe area, Galisteo Basin, Pajarito Plateau, Tewa Basin, Pecos area, and Taos District. The prehistory of this large region became closely linked after agriculture appeared and spread, and farming populations began moving in response to the need for more land or to climatic change. Since some parts of this region are better known than others, this discussion will not always focus specifically on the study area, but on the Northern Rio Grande in general. This discussion concludes with the Spanish settlement of New Mexico, since none of the components covered in this report were occupied during the historic period.

Paleoindian Period (11,200–7500 BP)

The earliest occupation of the Southwest was during the Paleoindian period, which contains three broad temporal divisions. Holliday (1997:225) provides dates for these divisions from the southern Plains: Clovis (11,200 BP–9900 BP), Folsom (10,900–10,000 BP), and Late Paleoindian (10,000–9000 BP). Dates for these divisions probably have similar ranges in northern New Mexico, though the end of the Late Paleoindian tradition is usually given as 7500 BP in that area. The Late Paleoindian division groups together several different artifact complexes distinguished by variations in projectile point styles and tool kits that may reflect differences in lifestyle. Fiedel (1999) has reevaluated Early Paleoindian radiocarbon dates in light of information provided by other dating methods. He concludes that radiocarbon dates between 12,500 and 10,000 BP are problematic because of large-scale fluctuations in C-14 ratios, yielding dates that may be off by as much as 2,000 years. Thus, he suggests that the Clovis occupation should be redated at 13,400–13,000 BP (11,400–11,000 BC), and Folsom should be similarly dated about 2,000 years older than it currently is. This view has not gained widespread acceptance.

At one time all Paleoindians were classified as big-game hunters. Some researchers now feel that the Clovis people were unspecialized hunter-gatherers, while Folsom and many later groups turned increasingly toward the specialized hunting of migratory game, especially bison (Stuart and Gauthier 1981). While some Paleoindians drifted out of New Mexico with the migratory big game, those who remained undoubtedly subsisted by a broadly based hunting-gathering economy. The Early Archaic inhabitants of the region probably developed out of this population, since there is no good evidence of wholesale population replacement. Evidence of Paleoindian occupation is rare in the Northern Rio Grande and typically consists of isolated diagnostic projectile points and butchering tools found on the modern ground surface or in deflated settings (Acklen et al. 1990).

Recently, two Clovis period components have been reported in the Jemez Mountains (Evaskovich et al. 1997; Turnbow 1997). Data recovery at one of these locales identified two medial Clovis point fragments associated with a single thermal feature and tool manufacturing debris (Evaskovich et al. 1997). Identification of Paleoindian occupations in a montane setting may suggest a changing subsistence adaptation. An increased focus on the hunting of smaller game and collection of wild-plant foods toward the end of the Paleoindian period may reflect changes in climate (Haynes 1980; Wilmsen 1974).

In 1961 Alexander (1964) found a "late Paleo-Indian point" on a pueblo site near the mouth of Taos Canyon. This site was revisited in 1981 (Wood and McCrary 1981), but the point could not be relocated. Bases of Belen-Plainview points have been found on sites with later components at Guadalupe Mountain (Seaman 1983) and south of Carson (Boyer 1985). Boyer (1988) found a reworked obsidian Folsom point north of Red Hill on the northwest side of the Taos Valley. The point was submitted for obsidian hydration dating, but the material source could not be determined, so no date was obtained (Condie and Smith 1989).

Two isolated late Paleoindian Cody complex artifacts have been reported from the Galisteo Basin (Honea 1971; Lang 1977), and Boyer (1987) reports an isolated Cody knife from the mountains south of Taos. The little evidence of Paleoindian occupation that has been found on the Pajarito Plateau is mostly restricted to isolated projectile points (Powers and Van Zandt 1999). Isolated Clovis, Folsom, Agate Basin, Milnesand, and Scottsbluff points have been found on the Pajarito Plateau and in the nearby Cochiti Reservoir District (Chapman and Biella 1979; Root and Harro 1993; Steen 1982; Traylor et al. 1990). The presence of a handful of diagnostic artifacts indicates that Paleoindians were present in the Chama–Ojo Caliente Valleys. Anschuetz et al. (1985) note that isolated Clovis and Folsom points have been found in that region, and a secondarily deposited horizon of possible Paleoindian date was identified in the Abiquiu Reservoir area.

The most detailed study of the distribution of Paleoindian materials in the Rio Grande Valley was conducted by Judge (1973) in the Central Rio Grande region between the confluence of the Rio Grande and Rio Puerco on the south, Bernalillo on the north, the Rio Puerco Valley on the west, and the Sandia and Manzano Mountains on the east. A total of 59 Paleoindian occupational loci were identified by this study (Judge 1973:62), mostly occurring in the dissected uplands between the Rio Grande and Rio Puerco. Sites dating from the Clovis through Late Paleoindian periods were identified, though early remains were rare, and locales dating from the Folsom period on were much more common. Though Judge's survey suggests that Paleoindian sites are not common in the Rio Grande Valley, they are present, though sites from this period are perhaps obscured in the heavily alluviated river bottom floodplains.

Thus, the relative paucity of Paleoindian remains through much of this area may be attributed to low visibility rather than lack of occupation. Paleoindian remains may be masked by later Archaic and Pueblo deposits. Poor visibility may also be attributed to geomorphology—surfaces or strata containing Paleoindian remains may be deeply buried and only visible in settings where those deposits are exposed. Cordell (1978) contends that the locations of known Paleoindian sites correspond to the areas of New Mexico where erosion has exposed ancient soil surfaces. If so, it is not surprising that no Paleoindian sites have as yet been identified in the Tewa Basin, which is an area of regional soil accumulation and only local erosion.

The Archaic Period (7500 BP–AD 600)

At an early date, archaeologists realized that the Archaic occupation of northern New Mexico was in many ways distinct from that of its southern neighbor, the Cochise. Bryan and Toulouse (1943) were the first to separate the northern Archaic from the Cochise, basing their definition of the San Jose complex on materials found in dunes near Grants, New Mexico. Irwin-Williams (1973, 1979) defined the northern Archaic as the Oshara tradition, and investigations along the Arroyo Cuervo in north-central New Mexico allowed her to tentatively formalize its developmental sequence. However, in applying that chronology outside the area in which it was developed, one must realize that specific trends might not occur throughout the Oshara region. Thus, at least some variation from one area to another should be expected.

The Oshara tradition is divided into five phases: Jay (7500–6800 BP), Bajada (6800–5200 BP), San Jose (5200 to 3800 BP), Armijo (3800 to 2800 BP), and En Medio (2800 BP–AD 400 or 600). Jay and Bajada sites are usually small camps occupied by microbands for short periods of time (Moore 1980; Vierra 1980). The population was probably grouped into small, highly mobile nuclear or extended families during these phases. San Jose sites are larger and more common than those of earlier phases, which may suggest population growth. Ground stone tools are common at San Jose sites, suggesting a significant dietary reliance on grass seeds. Irwin-Williams (1973) feels that corn horticulture was introduced by the beginning of the Armijo phase (ca. 3800 BP). Others (Berry 1982; Wills 1988) feel that corn did not appear in the Southwest until somewhat later, perhaps no earlier than 3000 BC. Base camps occupied by macrobands appeared by the late Armijo phase, providing the first evidence of a seasonal pattern of population aggregation and dispersal.

The En Medio phase corresponds to Basketmaker II elsewhere and represents the transition from a nomadic hunter-gatherer pattern to a seasonally sedentary lifestyle combining hunting and gathering with some reliance on corn horticulture. During this phase the population again seems to have increased. Seasonally occupied canyon-head home base camps became more numerous and began occurring in previously unoccupied locations (Irwin-Williams and Tompkins 1968). A strongly seasonal pattern of population aggregation and dispersal seems likely, with a period of maximum social interaction at home base camps followed by a breakup into microbands occupying smaller camps in other locations. While some corn was grown during this period, there does not seem to have been a high degree of dependence on horticulture, and the population mostly subsisted on foods obtained by hunting and gathering.

Variation from this pattern occurred in southeast Utah, where Basketmaker II people appear to have been nearly sedentary and highly dependent on corn (Matson 1991). Similarly, during the late San Pedro phase in southeast Arizona (which corresponds to Basketmaker II in many ways), semisedentary villages exhibiting a high degree of reliance on corn horticulture appear to have existed (Huckell et al. 2002; Roth 1996). Thus, in some parts of the Southwest the Archaic was coming to an end during this period. Northern New Mexico varied from this pattern, and no sedentary preceramic villages have been identified in that region. While the Archaic period ended around AD 400 in northwest New Mexico when pottery and the bow were introduced and a shift was made to a more sedentary agricultural subsistence system, this process seems to have occurred later in the Northern Rio Grande. There, the Archaic is thought to have ended around AD 600 in some areas, and even later in others.

The Northern Rio Grande Archaic may or may not be related to Irwin-Williams's Oshara tradition. Projectile points illustrated by Renaud (1942, 1946) resemble the Jay, Bajada, and San Jose types commonly attributed to the Oshara tradition. Cordell (1979) compared Archaic remains from the Northern Rio Grande to those in the Arroyo Cuervo district and saw many similarities. However, similar Archaic point styles occur over a vast region stretching from California to Texas, and northern Mexico to the southern Great Plains, so stylistic resemblance cannot always be taken as evidence of similar cultural affinity. Subsequent cultural developments in the Northern Rio Grande suggest that the people in this area differed from those occupying the traditional Pueblo heartland in the Four Corners region. Those differences quite likely had their basis in the makeup of the Archaic populations that originally occupied those regions. Thus, a similarity in projectile point styles does not necessarily mean that the Northern Rio Grande and Four Corners areas were occupied by groups of common cultural or even linguistic origin. Indeed, it is quite likely that they were not.

Most Archaic sites found in the Santa Fe area and Tewa Basin date between the Bajada and En Medio phases, though Early and Middle Archaic sites tend to be rather rare. These occupations are generally represented by widely dispersed sites and isolated occurrences (Anschuetz and Viklund 1996; Doleman 1996; Lang 1992; Post 1996, 2000). Early and Middle Archaic assemblages represent brief occupations with an emphasis on hunting. Materials associated with these occupations are typically mixed with deposits of later temporal components. Early and Middle Archaic sites have been recorded along the Santa Fe River and its primary tributaries (Post 2004). Until recently, temporal information from this period was derived from obsidian hydration dating (Lang 1992). However, recent excavations in the Santa Fe area have identified thermal features that yielded radiocarbon dates between 6000 and 5000 BC (Anschuetz 1998; Larson and Dello-Russo 1997; Post 2000). The limited number of associated artifacts recovered by these excavations indicates brief occupations geared toward hunting by small, highly mobile groups.

Although several Middle Archaic sites have been identified in the Jemez Mountains (Larson and Dello-Russo 1997), archaeological evidence of Middle Archaic occupations in the Santa Fe area are rare. A single, hafted San Jose scraper was identified at a site southeast of Santa Fe

(Lang 1992). This tool was mixed with Late Archaic and Pueblo period materials, making it difficult to associate an obsidian hydration date with a discrete component of the chipped stone assemblage. Archaeologists with the Las Campanas project, northwest of Santa Fe, identified a late San Jose phase site that yielded one temporally diagnostic projectile point, tool production debris, and ground stone artifacts (Post 1996). These artifacts were associated with one thermal feature, but no datable charcoal was obtained.

Recently, excavations along the Santa Fe Relief Route identified four Middle Archaic sites. Radiocarbon dates obtained from thermal features ranged between 3200 and 1800 BC. Two sites contained shallow structures with associated chipped and ground stone artifacts (Stephen Post, pers. comm., 2000). Although associated materials were not abundant, they may indicate a longer and more formal site occupation than is visible at earlier sites (Post 2000). In a synthesis of Archaic information from the Northern Rio Grande, Post (2002:41) notes, "Radiocarbon dates indicate that the Jay to San Jose occupation sequence was continuous, and evidence favors the development of Renaud's Upper Rio Grande culture out of a Paleoindian tradition." However, Post (2002:41) also cautions that Early Archaic remains in the Northern Rio Grande are often subtle and easy to confuse with later or noncultural deposits. This could bias the archaeological record in favor of later Archaic occupational periods. Thus, larger and more distinct site signatures for the Late Archaic may indicate a change in settlement/subsistence system rather than intensified Archaic use of the Northern Rio Grande. Post's (2002:40) observation that similarities in projectile point styles suggest continuity between Paleoindian and Early Archaic populations is both interesting and important. Our knowledge of Late Paleoindian lifestyles is sadly lacking, but if there is continuity in projectile point styles, one might also expect to find some evidence of continuity in settlement and subsistence systems, suggesting that late Paleoindian populations might have been generalized hunter-gatherers rather than specialized big game hunters, as has often been asserted. If this is so, when did the Archaic actually begin? Though our knowledge of the Archaic adaptation has grown through the years, this increase in the data base also serves to point out just how large the gaps are, and how little we really know for certain.

Early and Middle Archaic sites seem to be rare in the Cochiti Reservoir area, just south of La Bajada Mesa. Chapman (1979:64) indicates that the only diagnostic artifacts reflecting use of that area during the Early or Middle Archaic were two bases of either Bajada or San Jose points. Otherwise, the types of projectile points and point fragments described during that survey suggest that the main Archaic use of the Cochiti Reservoir area occurred during the Armijo and En Medio phases (Chapman 1979:64). Considering Post's (2002) observations, these results may be illusory. Archaic use of this area may have been continuous, but scaled differently.

Middle and Late Archaic sites are common in the lower Rio Chama basin, but most of the Archaic sites investigated in the Rio Chama region are in and around Abiquiu Reservoir, in the upper part of the valley. Schaafsma (1976, 1978) completed the first systematic research on the Archaic occupation of this area. Fifty-six Archaic sites were identified in his study, of which 13 were excavated. Most were simple scatters of chipped stone artifacts or isolated projectile points, but five were large base camps situated at the mouths of major drainages on the Rio Chama terrace. More recent work in this area has been completed by Bertram et al. (1989). Eighteen sites were investigated in this study, of which eight contained Archaic components. A late Archaic occupation was suggested for four sites, all of which seem to have been reused at later times (Bertram 1989; Schutt et al. 1989). Middle to Late Archaic occupations were noted at five sites, and in some instances multiple occupations were suggested by the presence of diagnostic projectile points or obsidian hydration dates from various time periods (Bertram 1989; Schutt et al. 1989).

Anschuetz et al. (1985) note interesting regional variations in the distribution of Archaic sites in the lower Chama Valley. Tools associated with intensive food processing are rare or absent at sites near Abiquiu but common at sites near the confluence of the Rio Chama and Rio Grande. They feel this demonstrates a differential pattern of seasonal use and exploitation from one end of the valley to the other. In addition to hunting and gathering activities, the Chama Valley was also the source of Pedernal chert between the Paleoindian and Protohistoric periods. Though this material is abundant in Rio Chama and Rio Grande gravels, Pedernal chert was also quarried around Cerro Pedernal and Abiquiu Reservoir, and quarries in the former location were originally attributed to the Los Encinos Culture (Bryan 1939).

Late Archaic sites are fairly common in the Santa Fe area, which is consistent with regional data (Acklen et al. 1997). An increase in sites during the Late Archaic may be due to changes in settlement and subsistence patterns. Changes in settlement patterns include evidence of seasonal aggregation, longer periods of occupation, and use of a broader range of environmental settings. Subsistence changes include the adoption of horticulture, which has been identified at sites south of La Bajada Mesa. Late Archaic sites have been identified in the piedmont area around the Santa Fe River (Post 1996, 2000; Schmader 1994). These sites range from small foraging camps to larger base camps with shallow structures. Radiocarbon dates obtained from thermal features suggest they were occupied between 1750 and 900 BC (Post 1996, 2004; Schmader 1994).

An Archaic site at the edge of the Tewa Basin and Pajarito Plateau was occupied during the late Armijo or early En Medio phase (Moore 2001). Excavations at LA 65006 indicated that it was reoccupied on several occasions, and that during its main occupation the site was a workshop for the manufacture of large, general-purpose bifaces (Moore 2001). Though a few corn pollen grains were recovered from this site, their context was unclear because no macrobotanical evidence of corn was recovered. Indeed, a few kilometers south of LA 65006, Lent (1991) excavated a Late Archaic pit structure with an associated roofed activity area that dated between ca. 610 BC and AD 180, and recovered no evidence of the use of domesticates.

En Medio phase sites are the most common evidence of Archaic occupation in the Santa Fe area. These sites are widely distributed across riverine, piedmont, foothill, and montane settings (Acklen et al. 1997; Kennedy 1998; Lang 1993; Miller and Wendorf 1955; Post 1996, 2000, n.d.; Scheick 1991; Schmader 1994; Viklund 1988). This phase is represented by finds ranging from isolated occurrences to limited-activity locales to base camps with structures and formal features. Increased diversity in settlement pattern and site types suggests population increase, longer site occupations or reduced time between occupations, and truncated foraging ranges.

A wide range of En Medio phase habitation and special-activity sites have been identified north of La Bajada Mesa in the Santa Fe area and Tewa Basin. Although many of these sites contain structures, formal features, and grinding implements, evidence of horticulture is virtually nil. Excavation of Late Archaic sites at Las Campanas, near Santa Fe (Post 1996), yielded projectile points diagnostic of the period between AD 500 and 850. This, in addition to a lack of evidence of the use of horticulture during this period, suggests that Archaic subsistence strategies may have continued to be used into the early or middle AD 900s north of La Bajada Mesa (Dickson 1979; McNutt 1969; Post 1996).

The Pueblo Period (AD 600–1600)

The Pueblo period chronology follows the framework presented by Wendorf and Reed (1955), which subdivides the Northern Rio Grande Pueblo occupation into Developmental (AD 600–1200), Coalition (AD 1200–1325), and Classic (AD 1325–1600) periods. They further subdivide the Developmental and Coalition periods according to changes in pottery types and architectural characteristics. The Developmental period is divided into Early Developmental (AD 600–900) and Late Developmental (AD 900–1200), and the Coalition period into Pindi and Galisteo stages. Although Wendorf and Reed (1955) coined names for these stages, they did not assign absolute dates, merely inferring them.

Modifications to the terminology and temporal divisions developed by Wendorf and Reed (1955) have been proposed by Wetherington (1968), McNutt (1969), and Dickson (1979). Wetherington assigned phase names to the periods in the Santa Fe and Taos districts and slightly modified the dates. McNutt renamed one period, preferring "Colonization" to "Developmental," divided that period into components, and changed the dates for the Coalition period. Dickson subdivided each period into three phases. Terminology aside, each of these researchers found a need to subdivide each period of the Pueblo occupation into early and late, and for one researcher, middle components. Again, subdivisions were based on perceived changes in pottery types and architecture. For each researcher, these subdivisions may have been appropriate and useful in addressing the goals of their studies. For the purpose of this discussion, however, only the Developmental and Classic periods are divided into early and late subperiods.

Early Developmental Period (AD 600–900)

Early Developmental period sites dating before AD 800 are rare in the Northern Rio Grande. While sites dating between AD 800 and 900 are more common, they typically occur as limited-activity areas and small settlements (Wendorf and Reed 1955). Most reported Early Developmental period sites are south of La Bajada Mesa, primarily in the Albuquerque area, with a few reported at higher elevations along the Rio Tesuque, Rio Nambe, and Santa Fe River drainages (Lang 1995; McNutt 1969; Peckham 1984; Skinner et al. 1980; Wendorf and Reed 1955). Early Developmental period sites tend to be situated along low terraces overlooking primary and secondary tributaries of the Rio Grande. These locations may have been chosen for their access to water and farmland (Cordell 1978). Terrace locations may also have provided access to ecozones with a wide range of foraging resources (Anschuetz et al. 1997).

Early Developmental period habitation sites typically contain 1–3 shallow, circular pit structures with little or no evidence of associated surface structures (Allen and McNutt 1955; Peckham 1954, 1957; Stuart and Gauthier 1981). One exception is a settlement north of Santa Fe, identified by Lang (1995), that apparently contains between 5 and 20 structures. Unfortunately, the contemporaneity of the structures in this small settlement has not been established.

Excavation data indicate that a suite of construction methods was employed to build these early structures. Typically, pit structures were excavated up to 1 m below the ground surface and were commonly 3–5 m in diameter. Walls were sometimes reinforced with vertical poles and adobe (Allen and McNutt 1955; Condie 1987, 1996; Hammack et al. 1983; Peckham 1954; Skinner et al. 1980). Walls, floors, and internal features commonly lacked plaster. Ventilators were on the east to southeast sides of these structures. An exception was a ventilator on the north side of a structure reported by Peckham (1954). Common floor features include central hearths, ash-filled pits, upright deflector stones, ventilator complexes, ladder sockets, and four postholes. Other, less common, floor features include small pits identified as sipapus, warming pits, pot rests, and subfloor pits of various sizes and depths (Allen and McNutt 1955; Condie 1987, 1996; Hammack et al. 1983; Peckham 1957).

Ceramics associated with Early Developmental period sites include plain gray and brown wares, red-slipped brown wares, and San Marcial Black-on-white (Allen and McNutt 1955). These types persist through the Early Developmental period, with the addition through time of neck-banded types similar to Alma Neckbanded and Kana'a Gray, as well as Kiatuthlanna Black-on-white, La Plata Black-on-red, and Abajo Red-on-orange (Wendorf and Reed 1955). The accumulation of pottery types and surface textures, as opposed to sequential types and textures, appears to be characteristic of the Developmental period and the Highland Mogollon area (Wilson et al. 1999).

Some types of decorated pottery found at Early Developmental period sites might be indicative of cultural affiliation with peoples living west and northwest of the Northern Rio Grande. However, Early Developmental period inhabitants also obtained red and brown wares through trade with Mogollon peoples to the south and southwest (Cordell 1978). Although cultural affiliation may seem more secure in assemblages that are clearly dominated by specific ware groups, this is difficult to determine for Early Developmental period sites that contain various percentages of gray, brown, and white wares.

No Early Developmental residential period sites containing diagnostic pottery have been securely identified in the study area, or indeed have any been found in the Tewa Basin or adjacent Chama–Ojo Caliente Valleys. Though some sites in the Chama–Ojo Caliente Valleys are considered evidence of periodic temporary use during the Early Developmental period, those assertions are largely based on projectile point styles rather than more temporally sensitive artifacts like pottery (Moore 1992; Schaafsma 1976). In general, these are small corner-notched arrow points that are often considered to have fallen out of use by about AD 900. However, this is based on data from the Four Corners area, and the situation seems to have been quite different in the Northern Rio Grande. Indeed, Moore (2003a) demonstrates that this type of point was manufactured into the seventeenth century in the Pecos area, and it also occurs at several Late Classic period farming sites in the Ojo Caliente Valley (Moore in prep. a). The persistence of corner-notched arrow points in the Northern Rio Grande is similar to the cumulative pattern noted in projectile point assemblages from the Highland Mogollon region (Moore 1999), where new point styles were added without replacing earlier types, resulting in a suite of styles occurring on Late Pueblo period sites. Thus, small corner-notched arrow points are probably not temporally sensitive in the Northern Rio Grande, and their presence alone cannot be taken as evidence of an Early Developmental period component.

Late Developmental Period

Late Developmental period sites have been identified from the Taos Valley on the north to the Albuquerque area on the south. This period is marked by an increase in the number and size of residential sites, the occupation of a wider range of environmental settings, and the appearance of Kwahe'e Black-on-white pottery (Cordell 1978; Mera 1935; Peckham 1984; Wendorf and Reed 1955; Wetherington 1968). Late Developmental period residential sites expanded into higher elevations along the Rio Grande, Rio Tesuque, Rio Nambe, and Santa Fe River drainages (Allen 1972; Ellis 1975; McNutt 1969; Peckham 1984; Skinner et al. 1980; Wendorf and Reed 1955). These sites are commonly on low terraces overlooking the primary and secondary tributaries of these rivers, which provided access to water, farmland, and a variety of foraging resources (Anschuetz et al. 1997; Cordell 1978). Although Late Developmental period sites are more common at higher elevations than Early Developmental period sites, there is little evidence of Late Developmental period occupation on the Pajarito Plateau (Kohler 1990; Orcutt 1991; Steen 1977). Toward the middle of this period, the first Pueblo residential sites were established in the Taos district (Boyer 1997).

Late Developmental period sites typically consist of a house group containing one or two pit structures, a shallow midden, and sometimes an associated surface structure containing 5 to 20 rooms (Ellis 1975; Lange 1968; Peckham 1984; Stubbs 1954; Stuart and Gauthier 1981; Wendorf and Reed 1955). These house groups occur singly or in clusters that are sometimes considered to comprise a community (Anschuetz et al. 1997; Wendorf and Reed 1955). The Pojoaque Grant site (LA 835), often used as an example of one of these early communities, contains 20–22 house groups of 10–20 rooms each, their associated pit structures, and a large kiva. However, all of these house groups were probably not occupied contemporaneously. House groups are along low ridges that trend southwest from a prominent sandstone mesita. Those built near the base of the mesita and near the large kiva appear to have been occupied by AD 900. Other groups seem to have been built at different times during the Late Developmental period.

An array of construction techniques has been identified in Late Developmental period residential sites (Ahlstrom 1985; Allen 1972; Boyer and Lakatos 1997; Ellis 1975; Lange 1968; McNutt 1969; Stubbs and Stallings 1953; Skinner et al. 1980). Surface structures are commonly built of adobe, and little evidence of actual masonry has been reported. Masonry is generally limited to stones incorporated into adobe walls or upright slabs used as foundations or footers for adobe walls (Lange 1968; McNutt 1969; Stubbs 1954). Contiguous rectangular rooms are most common, but subrectangular and D-shaped rooms are also reported. Floors are often unplastered. A few adobe, cobble, and slab floors have been reported (Ahlstrom 1985; Boyer and Lakatos 1997; Ellis 1975; McNutt 1969; Stubbs 1954; Skinner et al. 1980). Floor features are not common in surface rooms, and when present they typically include hearths and postholes.

Variation in size, shape, depth, and building technique is typical of Late Developmental pit structures. Circular pit structures are most common, followed by subrectangular structures. Structure depths range from 0.3 to 2 m below ground surface, and they tend to be 3–5 m in diameter. Structure wall-surface treatments vary from the unplastered surface of the original pit excavation to multiple courses of adobe (with or without rock), wattle and daub, upright slab foundations, adobe reinforced with vertical poles, or combinations of these techniques (Allen and McNutt 1955; Boyer and Lakatos 1997; Lange 1968; Stubbs 1954; Stubbs and Stallings 1953). Floors range from compact use-surfaces to well-prepared surfaces. Common floor features include central hearths, upright deflector stones, ash-filled pits, ventilator complexes, ladder sockets, and four postholes near the interior of the structure. Other, less common floor features include sipapus, subfloor channels, pot rests, and subfloor pits of various sizes and depths. Ventilators were built by connecting the exterior vent shaft to the interior of the structure with a tunnel or narrow trench. Trenches were subsequently roofed using latillas, effectively creating a tunnel. Exteriors of shallow structures were connected to the interior through an opening in the wall. Ventilators were commonly oriented to the east and southeast (Allen and McNutt 1955; Boyer and Lakatos 1997; Lange 1968; Stubbs 1954; Stubbs and Stallings 1953).

Utility wares found at Late Developmental period sites include types with corrugated and incised exteriors in addition to the plain gray, brown, and neck-banded types associated with the Early Developmental period. The array of decorated white wares includes imported and locally manufactured types. Common types are Red Mesa Black-on-white, Gallup Black-on-white, Escavada Black-on-white, and Kwahe'e Black-on-white. Less common pottery types include Socorro Black-on-white, Chupadero Black-on-white, Chaco Black-on-white, and Chuska Black-on-white (Allen 1972; Franklin 1992; Lange 1968; Peter McKenna, pers. comm., 2000). Although decorated red wares occur in Late Developmental assemblages, they are rare and include types from the Upper San Juan, Tusayan, and Cibola regions.

The quantity of imported decorated pottery and appearance of Kwahe'e Black-on-white, a locally made type similar to white wares produced in the northern San Juan region, is believed to illustrate a continued affiliation between the Northern Rio Grande and San Juan regions (Gladwin 1945; Mera 1935; Warren 1980; Wiseman and Olinger 1991). Although most imported decorated pottery types suggest a continued relationship with people to the west and northwest, Late Developmental period peoples also obtained decorated pottery and brown utility wares from the Mogollon region to the south and southwest (Cordell 1978).

Coalition Period

The Coalition period is marked by three major changes—an increase in the number and size of residential sites; the use of surface rooms as domiciles rather than for storage, as was common during the Late Developmental period; and a shift from mineral to vegetal paint for decorating pottery (Cordell 1978; Peckham 1984; Stuart and Gauthier 1981; Wendorf and Reed 1955). The apparent increase in number and size of residential sites during this period suggests population increase and an extension of the village-level community organization identified during the Late Developmental period. Areas like the Pajarito Plateau, which saw very limited use during the Late Developmental period, are thought to have become a focus of occupation during the Coalition period, while areas like the Tewa Basin, which saw heavy use during the Developmental period, are often considered to have lost much of their population by AD 1200. However, these patterns may actually be a function of the areas that have been extensively studied by archaeologists and point to the amount of work that has been done on the Pajarito Plateau as opposed to elsewhere in the Northern Rio Grande.

Coalition period sites are commonly at higher elevations along terraces or mesas overlooking the Rio Grande, Rio Tesuque, Rio Nambe, Santa Fe River, and Rio Chama drainages (Cordell 1978; Dickson 1979). These locations provided access to water, farmland, and a variety of foraging resources (Cordell 1978). Although residence at higher elevations provided more reliable supplies of water and arable land, innovative methods were needed to produce crops in these cooler settings (Anschuetz et al. 1997), including intensification of water management and farming practices. The use of check dams, reservoirs, and gridded fields, especially during the later parts of this period and the succeeding Classic period, are examples of this intensification (Anschuetz 1998; Anschuetz et al. 1997; Maxwell and Anschuetz 1992; Moore 1981, in prep b).

Coalition period residential units typically contain 10–20 surface rooms, 1–2 associated pit structures, and a shallow midden (Peckham 1984; Stuart and Gauthier 1981; Wendorf and Reed 1955). Surface structures often consist of small linear or L-shaped roomblocks oriented north-south. These roomblocks are one or two rooms deep, incorporating a pit structure or kiva, or associated with one to the east (Kohler 1990; Steen 1977, 1982; Worman 1967). Sites exhibiting this layout are usually considered to date to the early part of the Coalition period. Although most Coalition period sites are relatively small, some contain up to 200 ground floor rooms (Stuart and Gauthier 1981) and are commonly U-shaped and oriented to the east, enclosing a plaza or plazas. Generally, large Coalition period sites with enclosed plazas are dated to the late part of the period (Steen 1977; Stuart and Gauthier 1981).

A variety of construction techniques were used to build Coalition period surface and subsurface structures. Walls were built from adobe (with or without rock), masonry, or both. Adobe construction incorporated unshaped tuff into adobe walls on the Pajarito Plateau (Kohler 1990; Steen 1977, 1982; Steen and Worman 1978; Worman 1967). Masonry walls usually consist of unshaped or cut tuff blocks mortared with adobe and sometimes chinked with small tuff fragments (Kohler 1990). The most common room shape is rectangular, though a few examples of subrectangular and D-shaped rooms have been reported (Kohler 1990; Steen 1977, 1982; Steen and Worman 1978; Worman 1967).

Variety in the size, shape, and depth of pit structures is common during the Coalition period. Circular pit structures are the most common type, followed by subrectangular structures. Pit structures range in depth from 0.3 to 2 m below ground surface and were commonly 3–5 m in diameter; with walls built with the same techniques used for surface rooms. Common floor features include central hearths, upright deflector stones, ash-filled pits, ventilator complexes, and four postholes. Other, less common floor features include sipapus, entryways, pot rests, and subfloor pits of various sizes and depths. Ventilators were built by connecting exterior vent shafts to the interior of the structure with a tunnel, though shallow structures were simply vented by an opening in the wall. Ventilators were most commonly oriented to the east and southeast (Kohler 1990; Steen 1977, 1982; Steen and Worman 1978; Stuart and Gauthier 1981; Stubbs and Stallings 1953; Wendorf and Reed 1955; Worman 1967).

Coalition period utility wares commonly have corrugated, smeared corrugated, or plain exteriors, and more rarely have striated, incised, or tooled exteriors. Decorated white wares include Santa Fe Black-on-white, Galisteo Black-on-white, Wiyo Black-on-white, and very low percentages of Kwahe'e Black-on-white. Few trade wares are reported from Coalition period sites; those that are found tend to be White Mountain Red wares (Kohler 1990; Steen 1977, 1982; Steen and Worman 1978; Worman 1967).

In the Santa Fe area, large villages like the Agua Fria School House Ruin (LA 2), LA 109, LA 117, LA 118, and LA 119 were established early in the Coalition period. Other large sites, such as Pindi (LA 1) and Tsogue (LA 742), seem to have been established during the Late Developmental period and grew rapidly during the Coalition period (Franklin 1992; Stubbs and Stallings 1953). The Coalition period also saw the first establishment of farming villages on the Pajarito Plateau (Crown et al. 1996; Orcutt 1991) and in the Galisteo Basin (Lang 1977). At the same time, the first permanent Pueblo population was becoming established in the Chama–Ojo Caliente region.

Classic Period

Wendorf and Reed (1955:53) characterize the Classic period as "a time of general cultural fluorescence." Occupation shifted away from the uplands and began to concentrate along the Rio Grande, Rio Chama, Rio Ojo Caliente, and Rio Santa Cruz, as well as in the Galisteo Basin. Large villages containing multiple plazas and roomblocks were built, and regional populations peaked. The construction of large multiplaza communities superseded the village-level community organization of the Late Developmental and Coalition periods. In the Santa Fe area, large villages like the Agua Fria School House Ruin

(LA 2), Arroyo Hondo (LA 12), Cieneguilla (LA 16), LA 118, LA 119, and Building Period 3 at Pindi (LA 1) flourished during the early part of this period. Although these large villages grew rapidly during the early Classic period, most collapsed, and only Cieneguilla remained occupied after AD 1425.

Regional ceramic trends shifted to the use of carbon-painted biscuit wares in the northern part of the region, including the Tewa Basin, northern Pajarito Plateau, and the Chama–Ojo Caliente area. Polychrome glaze wares were dominant in the southern part of the region, including the Galisteo Basin and southern Pajarito Plateau. The Santa Fe area was essentially the dividing point for this variation in pottery styles. Biscuit wares were produced to the north and glaze wares to the south. Although reasons for the appearance and proliferation of glaze-painted pottery are ambiguous, many researchers believe it developed from the White Mountain Red Ware series. Similarities between types in the two regions are viewed as evidence of large-scale immigration into the Northern Rio Grande from the Zuni region and the San Juan Basin (Hewett 1953; Mera 1935, 1940; Reed 1949; Stubbs and Stallings 1953; Wendorf and Reed 1955). Other researchers attribute the changes seen during this period to expanding indigenous populations (Steen 1977) or the arrival of people from the Jornada Branch of the Mogollon in the south (Schaafsma and Schaafsma 1974).

For whatever reason, the Classic period was a time of village reorganization. Older sections of sites like Pindi and Arroyo Hondo were reoccupied (Lang and Scheick 1989; Stubbs and Stallings 1953). Intercommunity changes are also suggested by decreasing kiva-to-room ratios (Stuart and Gauthier 1981) and the revival of circular subterranean pit structures with an assemblage of floor features reminiscent of the Late Developmental period (Peckham 1984). Clearly defined plaza space and "big kivas" (Peckham 1984:280) suggest social organization that required centrally located communal space, which may have been used to integrate aggregated populations through ritual (Adams 1991).

The need for defined communal space may also be related to the introduction of the Kachina Cult into the Northern Rio Grande during this period (Adams 1991; Schaafsma and Schaafsma 1974). A shift from geometric designs to masked figures and horned serpents in kiva murals, and the occurrence of shield-bearing anthropomorphic rock-art figures suggest the acceptance of new concepts (Adams 1991; Dutton 1963; Hayes et al. 1981; Schaafsma 1992). Changes in community structure and settlement patterns during the Classic period may reflect adaptation of the indigenous inhabitants of the region to new populations, ideological elements, and organizational systems.

The process of aggregation into large villages and movement to areas bordering major streams continued through the Classic period in the Northern Rio Grande. Population decline began in the early Classic period on the Pajarito Plateau and continued through the middle of the period (Orcutt 1991). Most of the large villages in that area were abandoned by 1550, though some continued to be occupied into the late Classic period between 1550 and 1600 (Orcutt 1991). This population seems to have moved into the Rio Grande Valley, with Keres-like villages of Santo Domingo and Cochiti claiming affinity with Classic period villages on the southern Pajarito Plateau, and Tewa villages like San Ildefonso and Santa Clara claiming affinity with Classic period villages on the northern Pajarito Plateau. The Chama–Ojo Caliente Valleys were also abandoned by the end of the Classic period. Residents of San Juan Pueblo consider Homayo, Howiri, and Posi'ouingue in the Chama–Ojo Caliente valleys to be ancestral (Bandelier 1892:50; Ortiz 1979). Sapawe is also claimed as ancestral by some Tewa (Bandelier 1892:53). Jeançon (1923:76) reports traditions at San Juan and Santa Clara Pueblos that mention migration from the Chama Valley to their villages.

The Historic Period (after AD 1600)

Based on information gathered by Alvar Nuñez Cabeza de Vaca and his companions following the disastrous Narváez expedition to Florida (Covey 1961), the Spanish Empire became interested in lands north of New Spain in the 1530s. Fray Marcos de Niza was dispatched on a scouting mission into the Southwest in 1539, and a major expedition under Francisco Vázquez de Coronado explored the region between 1540 and

1542. No other formal contact between New Spain and New Mexico occurred until 1581, when Father Augustín Rodríguez and Capt. Francisco Sánchez Chamuscado led an expedition up the Rio Grande to the Pueblo country (Hammond and Rey 1966). Ostensibly to rescue two priests left behind by the Rodríguez-Chamuscado expedition, Antonio de Espejo led a party into New Mexico in 1582. Gaspar Castaño de Sosa attempted to illegally found a colony in 1590–1591 but was arrested and returned to Mexico (Simmons 1979). A second illegal attempt at colonization was made by Francisco de Legua Bonilla and Antonio Gutiérrez de Humaña in 1593, but their party was destroyed by conflict with Indians (Hammond and Rey 1953).

Castañeda's chronicle of the Coronado expedition of 1540–1542 mentions that the people of the province of Yuqueyunque (or northern Tewa) had "four very strong villages in a rough country, where it was impossible for horses to go" (Winship 1990 [1896]:137). These villages were not visited by Coronado. Schroeder (1979:250) believes they were in the Chama Valley and may have included the ancestral Tewa villages of Sapawi, Psere, Te'ewi, and Ku or Tsama. Though the rough country mentioned by Castañeda could have been a reference to the northern Pajarito Plateau, also occupied by ancestral Tewas, recent research suggests that the large Tewa villages on the Pajarito Plateau were mostly abandoned by the end of the Middle Classic period, ca. AD 1400–1500 (Preucel 1987), so this is unlikely.

Schroeder and Matson (1965:129–134) suggest that the village of Te'ewi in the Chama Valley may have been visited by de Sosa's expedition of 1590–1591. Otherwise the northern Tewa seem to have been concentrated in the Tewa Basin by that time and had completed their withdrawal from the Pajarito Plateau and Chama–Ojo Caliente Valleys. If so, then the abandonment of those regions was probably a response to changing environmental conditions rather than the Spanish occupation of New Mexico. Early Spanish explorers encountered at least eight villages in the Tewa Basin, including San Gabriel (Yunque), San Ildefonso (Powhoge), Santa Clara (Kapo), San Juan (Ohke), Jacona, Tesuque, Nambe, and Cuyamunge.

Juan de Oñate established the first legal and successful European colony in New Mexico at San Juan Pueblo in 1598. By 1600 the Spaniards had moved into San Gabriel del Yunque, sister village to San Juan, which was said to have been abandoned for their use by its residents (Ellis 1987). The lack of visible wealth in the new province caused unrest among the Spaniards (Espinosa 1988:7), many of whom seem to have accepted the challenge of establishing the new colony because they thought they would soon get rich. This unrest, in addition to Oñate's neglect of the colony while on frequent journeys of exploration, eventually contributed to Oñate's loss of the governorship. Oñate was replaced as governor in 1607 by Pedro de Peralta, who arrived in New Mexico in 1609 and moved the capital to Santa Fe, which he founded around 1610 (Simmons 1979).

Oñate's colony was a disappointment because of its failure to find the wealth that was expected to exist in New Mexico. Many settlers wanted to abandon the colony, and the Crown was seriously considering doing just that (Espinosa 1988:8–9). However, the baptism of 7,000 Pueblo Indians in 1608 and reports that many others were ready for conversion provided a viable alternative to an economically autonomous colony (Espinosa 1988:9). New Mexico was therefore allowed to continue, with its maintenance almost entirely underwritten by the royal treasury (Simmons 1979:181). The colony was maintained as a mission area in the seventeenth century, and its main function was conversion of the Pueblos to Christianity.

Documents related to Oñate's colonizing expedition in 1598 provide a confused list of villages in the Tewa area (Hammond and Rey 1953:346). The list seems incomplete and includes names that were not mentioned by any other expedition. Five of the eight historically known northern Tewa villages are listed, including Tesuque (possibly), San Ildefonso, Santa Clara, San Juan, and San Gabriel, as are possible versions of names for Tsirege and Tsama, which are considered ancestral by the northern Tewa but had been abandoned by the early 1600s or earlier (Schroeder 1979:250). Five other villages are listed for the Tewa district, but their names are suspiciously similar to those of several southern Tiwa pueblos (Schroeder 1979:250). This may represent a clerical error, since these names are not associated with the Tewas in other documents. Any villages in the Chama–Ojo Caliente Valleys that were still occupied when the early Spanish expeditions explored New Mexico seem to have been abandoned by the time that Oñate's colony was established, since there is no further mention of them in the existing documents. Though some of those pueblos could feasibly have been abandoned because of the Spanish policy of forcibly combining villages to make governing them easier, the likelihood is that their populations had already moved into other villages in the Tewa Basin by the time the Spanish colony was established. Eight villages were occupied by the northern Tewa in the 1620s, as noted by Fray Alonso de Benavides in his Memorial of 1630 (Ayer 1965). Two of these villages—Jacona and Cuyamunge—were abandoned after the Pueblo Rebellion of 1696 and never resettled. The six remaining villages were inhabited through the Spanish period and continue to exist to the present day, interacting with the European populations that moved into the region.

Field Methods

James L. Moore

The same general methods were used to examine all three sites discussed in this report, but since individual sites possess unique characteristics, it was sometimes necessary to tailor investigative techniques to specific cases. This accounts for why certain areas were selected for excavation, how zones around features were treated, and whether and how mechanical equipment was used. For a more comprehensive discussion of our data recovery techniques, see Boyer and Moore (2000).

Except under certain circumstances, field work was confined to areas within construction limits. However, to fully document the sites, each area was completely mapped when feasible and only when allowed by the landowner. This included areas that were both within and outside construction limits. Mapping was accomplished using an EDM or an optical transit, metric tape, and stadia rod. All features visible on the surface, both cultural and topographic, were plotted. Part of the mapping process included the establishment of vertical and horizontal datums from which measurements could be taken during excavation and that would facilitate the layout of the individual 1 by 1 m grid units used for excavation outside mechanical trenches.

General Excavation Procedures

Horizontal Proveniencing: The Grid Systems

All three of the sites discussed in this report were tied into a cartesian coordinate system established for a nearby cluster of sites investigated during earlier phases of the Santa Fe to Pojoaque Corridor project: LA 388, LA 391, LA 740, LA 750, and LA 4968. This coordinate system was aligned with magnetic north, and its main datum was designated as the intersection of the 500N and 500E grid lines. This placed all eight sites entirely in the northeast quadrant of the coordinate system. Subdatums tied into the larger coordinate system were established for the three sites discussed in this report and were used to reference all horizontal and vertical measurements taken during these investigations.

All surface collection and excavation units were tied into the coordinate system and provenienced according to the grid lines that intersected at their southwest corners. For example, a grid unit that had the 510N and 515E grid lines crossing at its southwest corner would be labeled 510N/515E. With the exception of small features, all hand excavation was conducted in 1 by 1 m grid units, a method considered to be the most efficient means of recovering and recording artifacts and other data. However, grid units are not always the most efficient divisions of excavation, and under certain circumstances were not be used.

The cartesian coordinate system was artificially imposed over sites to allow the accurate proveniencing of cultural materials and features. This facilitated the preservation of their original relationships for later study. However, cultural features rarely conform to a grid system, and their original construction never took into consideration the needs of future archaeologists. Thus, the coordinate systems imposed over sites often have to be ignored to a certain extent when dealing with cultural features. When features are large it may be desirable to excavate by grid units to provide detailed information on the distribution of cultural materials. However, excavation by grid unit is often awkward in small features, especially when a feature extends into two or more grid units. Thus, features rather than the grid units in which they occurred were usually treated as independent excavation units, though when they were mapped they were carefully placed into the coordinate system to preserve their spatial locations.

Vertical Proveniencing: Depth below Datum

Just as the grid coordinate systems of individual sites was tied to the main datum established for this site cluster, so were all vertical measurements. Vertical measurements were made in meters below datum to avoid problems that can be encountered when dealing with both positive and negative elevations. When variation in surface elevation is extreme, it may be necessary to select a new location for a vertical proveniencing datum, especially if it is not at the highest point on the site. Another way to account for such variation is to assign an arbitrary depth to the main datum. In this case it does not matter whether there are higher elevations, and all measurements can be made consistent. This was the preferred method of accounting for variation in surface topography used in this study. The main datum for this site cluster was assigned an arbitrary elevation of 10 m below datum to account for topographic variation. Subdatums were established for each of the investigated sites, and their elevations were measured relative to that of the main datum to maintain consistency in vertical proveniencing.

Strata and Levels

In general, during all phases of the Santa Fe to Pojoaque Corridor project, the vertical treatment of deposits varied according to the nature of those soil layers. Cultural deposits were carefully excavated to preserve as much of the vertical relationship between materials as possible. Such care was not taken with noncultural deposits, since the relationship between artifacts in deposits that built up naturally is rarely meaningful. For example, abandoned structures were sometimes used for trash disposal, filling with debris discarded by the inhabitants of nearby houses that were still occupied. Conversely, other structures were simply left open to the elements, filling naturally with a combination of eolian and colluvial sediments. Cultural materials usually occur in both cases, but they have completely different meanings. Materials that were purposely discarded are referred to as *trash*. Trash can often be separated by strata to determine the sequence of deposition, allowing researchers to look for minute and meaningful changes in artifact assemblages. Artifacts in naturally deposited strata rarely have any similar meaning. Cultural deposits require careful excavation to preserve the relationship between artifacts discarded at different times. Noncultural deposits tend to be jumbled, and the relationship between artifacts is almost always obscured because they were moved from their original context and redeposited. Thus, accurate vertical controls were unnecessary in some cases. While we endeavored to excavate cultural deposits by natural layers, that level of control was only attempted in noncultural strata when it appeared that it would provide data of potential importance to site interpretation. Excavation by strata was considered optimal in cultural deposits because soil layers tend to represent specific depositional episodes.

To define the nature and extent of soil strata at these sites it was necessary to examine subsurface stratigraphy in cross section. This was accomplished by excavating auger test transects across the areas of interest, allowing an evaluation of subsurface strata and their potential for containing cultural materials. After augering, mechanically excavated exploratory trenches were sometimes used to provide a broader cross section of strata in the areas of interest, allowing a more detailed evaluation of auger test results. When subsurface deposits, features, or structures were thought to be present, exploratory trenches were excavated by hand, preserving the integrity of potential cultural materials. Sections of the exposed walls of mechanically and hand-excavated trenches were profiled, and descriptions of visible soil strata were prepared.

Two separate recording units were used to track vertical excavation: strata and levels. Soil strata were natural layers that could be discriminated from one another by color, texture, content, or all three. Each stratum encountered at a site was assigned a number as it was identified. This method of assigning stratigraphic designations often meant that strata in specific profiles did not have sequential numbers. Descriptions of each stratum were recorded on individual forms. Because the surface represented an arbitrary layer with no thickness, it was designated Stratum 0. Since strata were not always assigned sequential numbers, a method was needed that would allow the position of each stratum to be tracked in its localized sequence. This was done by assigning a level number to each unit of vertical excavation. Levels were assigned within specific excavation units, such as grids, and they were sequential from the surface to the bottom of excavation. Once again, the surface was considered an arbitrary level with no thickness and designated Level 0. The first vertical excavation unit was Level 1, the second was Level 2, and so on. Stratum and level numbers represented two completely different series—stratum numbers were not always sequential as excavation proceeded downward, but level numbers were always in sequence from the surface down.

Auger Tests

Soil augers were used to help locate potential subsurface cultural deposits, features, and structures. No standard spacing between auger transects or auger tests within transects were used at other than the site level, and the spacing used depended on conditions encountered at each site. (Auger-transect and test-hole spacing are detailed in individual site reports.) Auger tests were excavated in 10–20 cm levels, which is approximately the amount of soil the attached buckets could hold. All soil removed from auger tests was screened through 1/8-inch mesh hardware cloth to determine whether cultural materials were present. The results of each auger test were recorded on standard forms, detailing changes in soil texture, color, content, and what cultural materials (if any) were recovered and from what depths.

Recording Excavation Units

Information on location, depths of excavation, soil units encountered, cultural materials recovered, and other descriptive data were recorded for each excavation unit. Three basic types of excavational units were used—auger tests, grid excavation units, and nongrid excavation units. Auger tests were discussed above. Grid excavation units were 1 m square. They were assigned locational information based on the grid lines that intersected at their southwest corners, as described earlier. Nongrid excavational units were variably sized and labeled according to what they represented—which half of a feature was being excavated, the room quadrant being examined, etc. Separate forms were used to record data retrieved from grid and nongrid excavation units. All cultural materials collected from an excavational unit were linked to their provenience by a field specimen number. Artifacts and samples were sorted by type and bagged separately. A single unique field specimen number was then assigned to all artifact classes recovered from a specific excavation unit and logged on field specimen forms.

Separate forms were used to record other data. All features were described and recorded on feature forms after their excavation. Each stratum defined was individually described to ensure consistency in the types of data recorded. Photographs were recorded on photo log forms, and samples were recorded on sample log forms.

Recovery of Cultural Materials

Most artifacts were recovered by surface collection or by screening soil though hardware cloth with variably sized mesh. Other materials were collected in bulk samples that were processed in the laboratory rather than in the field. Most artifacts were recovered by systematically screening soil strata. All sediments from exploratory grids and features were passed through screens made from two different sizes of mesh. Most fill was passed through 1/4-inch-mesh hardware cloth, but 1/8-inch-mesh hardware cloth was also used.

While most interpretable artifacts are usually large enough to be recovered by 1/4-inch-mesh hardware cloth, some that are too small to be retrieved by that size screen can provide important clues about the activities that occurred at a site. As the size of the mesh used decreases, the amount of time required to process soil and recover artifacts increases. Sampling is a way to balance these concerns, and smaller mesh was only used in specific situations. Rather than establishing precise guidelines for sampling with 1/8-inch-mesh screens, the decision was left to site supervisors. However, as a minimum, all soil from certain types of features (such as hearths and ash pits) was screened through 1/8-inch mesh. At times, 1/8-inch-mesh hardware cloth was also used to screen materials from cultural strata, when the types and sizes of cultural materials warranted it.

Specific Excavation Methods

The excavation of various parts of each site was approached in different ways, even though the mechanics of excavation were usually the same. Most excavation was carried out with hand tools. However, in some cases it was preferable to use mechanical equipment to expedite the removal of noncultural deposits or trench through parts of a site and examine soil profiles for buried cultural deposits and features. One or both of these methods were used at most sites.

Features

Features constituted individual units of excavation. Each feature was given a number. Small features (less than 2 m in diameter) were usually excavated differently than large features (more than 2 m in diameter). After defining the horizontal extent of a small feature like a hearths or ash pits, it were divided in half. One half was excavated in 10 cm arbitrary levels to define internal strata, and a profile of the exposed fill was drawn. The second half was then removed by strata. Data from small features was recorded on nongrid unit excavation forms and paralleled that recorded on grid excavation forms. All soil removed from small features was screened through 1/8-inch-mesh hardware cloth. Plans showing locations and sizes of excavation units were drawn for each feature. A second cross section illustrating the vertical form of the feature perpendicular to the profile was drawn, as was a plan of the feature. A summary form, completed after excavation, indicated the feature's shape, contents, and construction details.

Large features like trash middens were usually excavated by grid. The number of exploratory grids was kept to a minimum, and as much of the feature as possible was excavated by soil strata. Standard grid unit excavation forms were completed for each excavated unit in large features. A sample consisting of one or more grids (at the discretion of the site supervisor) was often screened through 1/8-inch-mesh hardware cloth; otherwise, 1/4-inch mesh was used. At least two perpendicular profiles were drawn, when possible, and summary forms and plans describing feature shape and contents were completed. Large features not treated in this way were excavated by the methods applied to small features. The method of excavation used for a particular feature was left to the discretion of the site supervisor. All features were photographed before and after excavation, when possible. Other photographs showing details of construction or excavation were taken at the discretion of the excavator.

Extramural Excavation Areas

Areas outside structures, especially those around extramural features like hearths, were often used as work areas. Thus, certain zones were examined to determine whether work areas could be defined. Excavation in these zones proceeded by grid units. Most soil encountered during these investigations was screened through 1/4-inch-mesh hardware cloth. Plans of each extramural area investigated were drawn, detailing the grid units investigated and any features encountered.

Botanical Sampling

The collection of samples for botanical analysis focused on contexts that could provide the best information on plant use and food, or provide materials amenable to absolute dating. Four types of botanical samples were collected for analysis from these sites when available: flotation, pollen, radiocarbon, and macrobotanical. Flotation samples were taken at or near the base of deposits in features that were large enough to produce sufficient material for sampling. Pollen samples were obtained from areas suspected of having served as prehistoric fields and from auger tests at depths between 10 and 20 cm below the surface. Any macrobotanical samples available during excavation were collected to aid in defining plant and food use. No standard strategies were designed for collecting macrobotanical samples; rather, their collection was opportunistic. Radiocarbon samples, when available, were taken from targeted locations, including thermal and trash-filled features. The species composition of radiocarbon samples was determined to provide data on fuel use.

Analytic Methods and Research Issues

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The results of artifact studies were entered into computerized data bases to expedite interpretation of results. Links between the various data bases created during these analyses were facilitated by the use of a detailed proveniencing system which pinpointed the location and context from which all specimens were obtained. The same provenience file was linked to all analysis files from a specific site, allowing access to all materials recovered from a particular provenience.

Ceramic Artifact Analysis

Ceramic data from archaeological sites provide clues concerning the time and context of occupation as well as an examination of trends related to the production, decoration, use, and exchange of pottery vessels. To examine various issues, a wide variety of data was recorded in the form of attribute classes and ceramic type categories.

Sherds were sorted into lots consisting of individual types based on an examination of several attributes. Thus, all plain ware jar body sherds with polish on their exterior surfaces would be examined and entered as a single line of code and the number of sherds in a specific category recorded under *count*.

Attribute categories were similar to those employed in other recent OAS projects in the Northern Rio Grande: temper type, paint type, surface manipulation, modification, and vessel form. These attributes were recorded for all sherds examined during analysis. Other trends were examined using ceramic type categories. Ceramic types are identified by various combinations of paste and surface characteristics with known temporal, spatial, and functional significance. Sherds were initially assigned to a specific tradition based on probable region of origin as reflected by paste and temper. They were then assigned to a ware group based on general surface manipulation and form. Finally, sherds were assigned to temporally distinctive types based on surface texture or painted design styles.

Temper

Temper refers to aplastic particles that were intentionally added to clay or fragments occurring naturally in clay that served the same purpose. Temper categories were recorded by examining freshly broken sherd cross sections through a binocular microscope and distinguished by combinations of color, shape, size, fracture, and sheen of observed particles. It is often not possible to differentiate rock types based on microscopic analysis of temper fragments, so the categories employed are best considered to be groups with similar visual characteristics rather than specific rock and mineral types. Still, recognition of such categories provides information on the basic types of resources used by potters in a particular area.

Pigment

Pigment categories were recorded for decorated sherds. *Organic paint* refers to vegetal pigments that soak into the surface of a vessel rather than remaining unabsorbed on its surface. Streaks and polish are often visible through organic paints, the painted surface is generally lustrous from surface polishing, and the pigment may be gray, black, bluish, or occasionally orange. Edges of painted designs are often fuzzy when an organic paint was used.

Matte mineral paint refers to the use of ground minerals such as iron oxide as pigments. These were usually powdered compounds applied with an organic binder. This type of pigment forms a physical layer that rests on the vessel surface, often thick enough to exhibit visible relief. Mineral pigments usually cover and obscure surface polish and irregularities.

Glaze paint refers to the use of lead as a fluxing agent to produce a vitreous paint. Glaze-painted surfaces exhibit a heavy sheen or gloss and are often black or green but may be brown, yellow, or red. Glaze pigments are often very thick and runny, and bubbles may protrude through the surface. A glaze paint can weather from the surface of a sherd, leaving a thin organic layer behind.

Manipulation

Manipulation refers to the treatment of a sherd surface. *Plain unpainted* refers to surfaces with no evidence of textured treatments, polishing, or painting. *Polish* implies intentional smoothing with a polishing stone to produce a compact and lustrous surface. Evidence of polishing over an unslipped surface was recorded as plain polish. Similar manipulations over a low-iron slip were recorded as polished white slip, while that over a high-iron slip was recorded as polished red slip. Lustrous black surfaces resulting from intentional reduction of a polished surface were classified as polished smudged. Textures reflecting various treatments of coils that were not completely obliterated on corrugated utility wares included narrow coil, clapboard, smeared indented corrugated, and smeared wide neckbanded.

Vessel Form

Sherds were assigned to vessel form categories based on their shape and the portion of the vessel from which they were assumed to have originated. The consistent placement of all sherds into similarly defined vessel form categories allows basic interpretation of functional trends represented by sherd assemblages. *Indeterminate* refers to cases where the type of vessel from which a sherd originated could not be determined. *Bowl rim* refers to rim sherds exhibiting inward curvature indicative of bowl forms. *Bowl body* refers to body sherds exhibiting polish or painted decoration on the interior surface, indicating that they were fragments of bowls. Bowl rim sherds exhibiting significant flaring or eversion toward the rim were classified as flared bowl rim. *Jar neck* includes sherds with a curvature that indicated they originated somewhere along the upper portion or neck of a jar. *Jar rim* refers to forms with relatively wide rim diameters that could have been used for cooking or storage. *Seed jar rim* refers to sherds from spherical vessels that do not exhibit distinct necks but have small openings near the top.

Modification

Modified sherds indicate postfiring alterations such as shaping, wear, or repair. These categories incorporate information on item shape and size as well as processes of shaping and use. While most sherds do not exhibit postfiring modifications and are coded as *none*, those that do provide information about the actual use and modification of sherds and vessels. *Drilled hole for repair* refers to holes drilled along fractures that allowed a broken vessel to be repaired by lacing the fragments together. Repair holes are usually within 2 cm of a break. Sherds exhibiting shaping and wear patterns indicative of use in pottery vessel manufacture were classified as ceramic scrapers. Those exhibiting at least one shaped edged were classified as beveled edge. Those that were shaped on all sides were assigned to the shaped object category. Sherds exhibiting spalls or pitting from exposure to repeated cooking cycles were assigned to distinct categories.

Dimensions

Thicknesses were obtained with sliding calipers for selected sherds, but no effort was made to obtain the dimensions of all sherds. Weights were obtained for each lot with a digital or balance-beam scale, but no effort was made to weigh individual sherds.

Chipped Stone Artifacts

Chipped stone artifacts were analyzed using a standardized format developed by the Office of Archaeological Studies (OAS 1994). This analysis includes a series of mandatory attributes that describe material type, artifact type and condition, cortex, striking platforms, and dimensions. Several optional attributes are also available for examining specific questions. Both mandatory and optional attributes were used in this analysis.

The main areas that this analysis was designed to explore were material selection, reduction technology, and tool use. These topics provide information about ties to other regions, mobility patterns, and site function. While material selection studies cannot reveal *how* materials were obtained, they can usually provide some indication of *where* they came from. By studying the reduction strategy employed at a site we can determine how its occupants approached the problem of producing usable chipped stone tools from raw materials, and how the level of residential mobility affected reduction strategies. The types of tools recovered from a site can be used to assign a function, especially to artifact scatters that lack features. Tools can also be used to assess the range of activities that occurred at a locale. In some cases chipped stone tools can provide temporal data, but they are usually less time sensitive than other artifact classes like pottery and wood.

Each chipped stone artifact was examined using a binocular microscope to define morphology and material type, examine platforms, and determine whether it was used as a tool. However, surface artifacts were not examined for evidence of tool use because traffic across the surface of a site often results in a considerable amount of edge damage that is totally unrelated to tool use. Since this type of noncultural damage can render any definition of cultural edge damage suspect, we opted to simply eliminate this part of our analysis for surface artifacts. The level of magnification used to examine artifacts varied between 10x and 80x, and higher magnification was used to identify wear patterns and platform modifications. Utilized and modified edge angles were measured with a goniometer; other dimensions were measured with a sliding caliper. Individual chipped stone artifacts were weighed on a digital or balance-beam scale.

Four general classes of chipped stone artifacts were recognized in this analysis: flakes, angular debris, cores, and tools. Flakes were debitage that exhibited one or more of the following characteristics: definable dorsal and ventral surfaces, bulb of percussion, and striking platform. Angular debris lacked these characteristics. Cores were nodules from which debitage was struck and on which three or more negative flake scars originating from one or more platforms were visible. Tools were debitage or cores whose edges were damaged during use or were modified to create specific shapes or edge angles for certain tasks.

Analytic Attributes

Material type and quality, artifact morphology and function, amount of surface covered by cortex, portion, evidence of thermal alteration, edge damage, and dimensions were recorded for all artifacts; platform information was recorded for flakes only.

Two attributes were used to record information on the various materials used in chipped stone reduction. Material type was coded by gross category unless specific sources or distinct varieties were recognized. Codes were arranged so that major material groups fell into specific sequences of numbers, progressing from general material groups to specific varieties. Analysis of material texture and quality provided information on the basic flakeability of materials. Texture subjectively measured grain size *within* rather than *across* material types and was scaled from fine to coarse for most materials. Fine textures exhibit the smallest grains, and coarse the largest. Obsidian was classified as glassy by default, and this category was applied to no other material. The presence of flaws that could affect flakeability, including crystalline inclusions, fossils, visible cracks, and voids, was recorded under *quality*. Inclusions that did not affect flakeability such as specks of different-colored material or dendrites were not considered flaws. Material texture and quality were recorded together as a single attribute.

Two attributes were used to provide information about artifact form and use. The first was artifact morphology, which categorized artifacts by general form such as flake or early-stage biface. The second was artifact function, which categorized artifacts by inferred use such as utilized debitage or scraper. These attributes were coded separately.

Cortex is the chemically or mechanically weathered outer rind on nodules; it is often brittle and chalky and does not flake with the ease or predictability of unweathered material. The amount of cortical coverage was estimated and recorded in 10-percent increments for each artifact. For flakes the percentage of dorsal surface covered by cortex was estimated, while for all other artifact classes the percentage of the total surface area covered by cortex was estimated, since other artifact classes lacked definable dorsal surfaces. Cortex type can be a clue to the origin of an artifact. Waterworn cortex indicates that a nodule was transported by water and its source was probably a gravel deposit. Nonwaterworn cortex suggests that a material was obtained where it outcrops naturally. Cortex type was identified for artifacts on which it occurred; when identification was not possible, cortex type was coded as indeterminate. Cortical surface coverage and cortex type were recorded separately.

All artifacts were coded as whole or fragmentary. When an artifact was broken, the portion was recorded if it could be identified. Artifact portions can provide important information on the use of sites. The presence of mostly complete tools at a site can suggest an entirely different function than that of predominantly broken tools. Proportions of flake sections can also provide data on postreduction impacts to an assemblage. If most flakes in an assemblage are broken, and proximal and distal fragments are represented by similar percentages, the assemblage may have been exposed on the surface for a significant period of time and damaged by traffic across the site. In this case, any wear patterns observed on debitage edges was probably caused by noncultural impacts. Thus, an examination of the condition and distribution of artifact portions can provide critical interpretive information.

Three attributes were examined for flake platforms, when present. *Platform type* refers to the shape of and modifications to the striking platform on whole flakes and proximal fragments. *Platform lipping* refers to the presence or absence of a lip at the ventral edge of a platform. This attribute provides information on reduction technology and can often be used to help determine whether a flake was removed from a biface or core. Platform lipping was coded as present or absent. *Platform thickness* was the maximum distance between the ventral and dorsal edges of platforms.

Thermal alteration was recorded for all artifacts on which it occurred. Cherts can be modified by heating at high temperatures, improving its flakeability. This process can realign the crystalline structure and sometimes heals minor flaws like microcracks. Heat treatment can be difficult to detect unless mistakes were made during processing. When present, the type and location of thermal alteration was recorded to determine whether or not an artifact was purposely altered.

Two attributes were used to record edge damage caused by cultural use: wear pattern and edge angle. Use of a piece of debitage or core as an informal tool can result in edge damage, producing patterns of scars indicative of the way it was used. Cultural edge damage denoting use as an informal tool was recorded and described when present on debitage or cores recovered from subsurface contexts. A separate series of codes, used to describe formal tool edges, were much more general in nature. The utilized edge angles of all formal and informal tools were measured and recorded; edges lacking cultural damage were not measured.

Maximum length, width, and thickness were measured for all chipped stone artifacts. On angular debris and cores, length was the largest measurement, width was the longest dimension perpendicular to the length, and thickness, the smallest measurement, was perpendicular to the width. On flakes and formal tools, length was the distance between the platform (proximal end) and termination (distal end), width was the distance between edges paralleling the length, and thickness was the distance between dorsal and ventral surfaces. The weight of all chipped stone artifacts was recorded.

Flake Categories

Several types of flakes may be present in an assemblage, and one analytic goal was to distinguish between flakes removed from cores and those that were the result of biface manufacture. Flakes were divided into these categories using a polythetic set of variables (Fig. 2). A polythetic framework is one in which fulfilling a majority of conditions is both necessary and sufficient for inclusion in a class (Beckner 1959). The polythetic set contains an array of conditions that model an idealized biface flake and includes data on platform morphology, flake shape, and earlier removals from the parent artifact. In order to be considered a biface flake, an artifact needed to fulfill at least 70 percent of these conditions in any combination. Those that did not match that percentage of conditions were classified as core flakes by default. This percentage was considered high enough to isolate flakes produced dur-

Whole Flakes

1. Platform:
   a. has more than one facet.
   b. is modified (retouched and abraded).

2. Platform is lipped.

3. Platform angle is less than 45 degrees.

4. Dorsal scar orientation is:
   a. parallel.
   b. multidirectional.
   c. opposing.

5. Dorsal topography is regular.

6. Edge outline is even, or flake has a waisted appearance.

7. Flake is less than 5 mm thick.

8. Flake thickness is relatively even from proximal to distal end.

9. Bulb of percussion is weak (diffuse).

10. There is pronounced ventral curvature.

Broken Flakes or Flakes with Collapsed Platforms

1. Dorsal scar orientation is:
   a. parallel.
   b. multidirectional.
   c. opposing.

2. Dorsal topography is regular.

3. Edge outline is even.

4. Flake is less than 5 mm thick.

5. Flake thickness is relatively even from proximal to distal end.

6. Bulb of percussion is weak.

7. There is pronounced ventral curvature.

Artifact is a biface flake when:

- If whole, it fulfills 7 of 10 attributes.
- If broken or platform is collapsed, it fulfills 5 of 7 attributes.

Figure 2. Polythetic set of variables for distinguishing biface flakes from core flakes.

ing the later stages of biface production from those removed from cores, while at the same time it was low enough to permit flakes removed from a biface that did not fulfill the entire set of conditions to be properly classified. While not all flakes removed from bifaces could be identified in this way, those that were can be considered definite evidence of biface reduction. Instead of rigid definitions, the polythetic set provided a flexible means of categorizing flakes and helped account for some of the variation in flake form and attributes that has been observed during flintknapping experiments.

Other flake types were identified by certain distinguishing characteristics. Two subvarieties of biface flakes were categorized separately. Notching flakes were produced when the hafting elements of bifaces were notched. This type of flake generally exhibits a recessed, U-shaped platform and a deep, semicircular scallop at the juncture of the platform and dorsal flake surface. Resharpening flakes were removed from formal tool edges that had become dull from use and usually fit the polythetic set for biface flakes. They are often impossible to distinguish from other biface flakes but can sometimes be identified by an extraordinary amount of damage on the platform and the dorsal surface adjacent to the platform. Bipolar flakes, the only subvariety of core flakes that was separately categorized, are evidence of nodule smashing. They usually exhibit signs of having been struck at one end and crushed against an anvil at the other.

Other flake categories are evidence of removals from tools or indicate inadvertent damage during thermal processing—ground stone flakes are debitage struck from a broken piece of ground stone, hammerstone flakes are debitage detached from a hammerstone by use, and pot lids are debitage that were blown off the surface of a chipped stone artifact during thermal alteration.

Core and Tool Categories

Cores are nodules of raw material that were modified by the removal of debitage during reduction. Some cores were efficiently reduced in a standardized fashion, while flakes were removed from others in a more haphazard manner. Core shape and size are often clues to the relative availability of materials. Materials represented by small, carefully reduced cores may have been uncommon or highly desired. Materials represented by large cores, often with haphazard or badly planned flake removals, tend to be common and not highly prized.

Cores were classified by the direction of removals, and in rare circumstances by shape. Unidirectional cores had a single platform from which flakes were removed in one direction or along one continuous surface. Blade cores are pyramidal with specially prepared platforms that allow the consistent removal of long, narrow flakes (blades). This category tends to occur only in Paleoindian assemblages in the Southwest. Pyramidal cores, a subdivision of the unidirectional category, resemble blade cores in shape but lack their specially prepared platforms. This core type represents an attempt to maximize the number of flakes removed by systematic reduction from one platform. Bidirectional cores have two opposing platforms or a single platform from which flakes were removed from two opposing surfaces. Multidirectional cores exhibit multiple platforms, and flakes are struck from any suitable edge. Bipolar cores, which tend to be rare, result from the smashing of small or exhausted cores or nodules between a hammerstone and an anvil.

Tools were separated into two basic categories—formal and informal. Formal tools are debitage or cores that were intentionally altered to produce specific shapes or edge angles. Alterations take the form of unifacial or bifacial retouch, and artifacts were considered intentionally shaped when retouch scars obscured their original shape or significantly altered the angle of at least one edge. Informal tools are debitage that were used in various tasks without being purposely altered to produce specific shapes or edge angles. This class of tool was defined by the presence of marginal attrition caused by use. Evidence of informal use was further divided into two general categories: wear and retouch. Retouch scars were 2 mm or more long, while wear scars were less than 2 mm long. While informal tools can also provide direct evidence of the reduction process, formal tools tend to provide indirect evidence unless they were discarded before being finished.

Formal tools were divided into three basic categories: cobble tools, unifaces, and bifaces. Cobble tools were usually massive in size and either unmodified or shaped. The former included tools that did not require modification for use, such as hammerstones. The latter exhibited unifacial or bifacial flaking along one or more edges while retaining enough unflaked surface that their original form remained recognizable. Unifaces were pieces of debitage that had one or more edges modified by flaking across a single surface. Bifaces were pieces of debitage that were flaked across two opposing surfaces. In all three categories, flaking was purposely done to alter edge shape or angle into a needed or desired form.

Reduction Strategies

An assessment of strategies used to reduce lithic materials at a site often provides evidence of residential mobility or stability. Two basic reduction strategies have been identified for the Southwest. Efficient (or curated) strategies entail the manufacture of bifaces that served as unspecialized tools and cores, while expedient strategies were based on the removal of flakes from cores for use as informal tools (Kelly 1985, 1988). Technology was usually related to lifestyle. Efficient strategies tended to be associated with a high degree of residential mobility, while expedient strategies were typically related to sedentism. The reason for this type of variation is fairly simple. Groups on the move tended to reduce the risk of being caught unprepared for a task by transporting tools with them. Such tools were transportable, multifunctional, and easily modified. Sedentary groups did not necessarily need to consolidate tools into multifunctional, lightweight configurations (Andrefsky 1998:38).

Of course, there are exceptions. Highly mobile groups living in areas that contained abundant and widely distributed raw materials or suitable substitutes for stone tools would not need to worry about efficiency in lithic reduction (Parry and Kelly 1987). Efficient reduction may have been impossible in areas where materials suitable for chipping occurred only as small nodules, and another strategy would have been used (Andrefsky 1998; Camilli 1988; Moore 1996). Neither of these exceptions applies to the study area.

The analytic scheme used in this study was designed to facilitate the examination of chipped stone assemblages and determine what type of reduction strategy was used by the occupants of a site. This not only permits us to suggest that an efficient or expedient reduction strategy was applied at a certain locale; it also allows us to compare degrees of efficiency or expediency in reduction technology through time. Information of this type provides a context in which to examine the nature of mobility at specific sites and in different time periods, allowing us to examine temporal changes in land-use patterns.

Botanical Artifacts

Along with faunal remains, botanical materials recovered from sites provide direct evidence of subsistence practices. Charred seeds can tell us what plants were included in the diet, both domestic and wild. Charcoal from hearths and trash deposits can be used to examine wood gathering. Floral materials contained in adobe bricks can be used to augment other types of botanical data. These types of information not only tell us what plant foods site occupants were gathering, growing, or trading for, they also provide important information on what the local environment might have looked like through time.

Botanical studies of archeological deposits included flotation analysis of soil samples, species identification and (where appropriate) morphometric measurement of macrobotanical specimens, and species identification of wood specimens from flotation and macrobotanical samples. Flotation is a widely used technique for separating floral materials from the soil matrix. It takes advantage of the simple principle that organic materials (and particularly those that are nonviable or carbonized) tend to be less dense than water and will float or hang in suspension in a water solution. Each flotation sample was immersed in a bucket of water. After a short interval in which heavier sand particles settled out, the solution was poured through a screen-lined with fabric with a mesh of 0.35 mm. The floating and suspended materials were dried indoors on screen trays, then separated by particle size using nested geological screens (4.0, 2.0, 1.0, and 0.5 mm mesh) before sorting under a binocular microscope at 7–45x.

Seed type was identified, where possible, and attributes such as charring, color, and aspects of damage or deterioration were recorded to help determine cultural affiliation versus postoccupational contamination. Noting the relative abundance of insect parts, bones, rodent and insect feces, and roots helped isolate sources of biological disturbance in the ethnobotanical record.

All macrobotanical remains collected during excavation were examined individually, identified, repackaged, and catalogued. The condition (carbonization, deflation, swelling, erosion, and damage) of samples was noted as clues to cultural alteration or modification of original size dimensions. When less than half of an item was present it was counted as a fragment; more intact specimens were measured as well as counted. Corn remains were treated in greater detail. Such attributes as width and thickness of kernels, cob length and midcob diameter, number of kernel rows, and several cupule dimensions were measured following Toll and Huckell (1996). In addition, the following attributes were noted: overall cob shape, configuration of rows, presence of irregular or undeveloped rows, and postdiscard effects.

Data Recovery and Treatment Plan

Jeffrey L. Boyer and James L. Moore

The sites discussed in this report were studied during two separate investigative phases. LA 111326 was excavated as part of the first phase of data recovery for the Santa Fe to Pojoaque Corridor project. Because the part of LA 111326 within the highway right-of-way yielded little data relevant to addressing the overall prehistoric data recovery plan for that project (Boyer and Lakatos 2000), the results of this study are reported here. LA 390 and LA 145398 were examined during a later investigative phase using a separate, but closely related, data recovery plan (Boyer 2004). Because these sites yielded little data useful in addressing issues in the overall data recovery plan, they are also reported here.

The Tesuque Turnouts study was designed to be implemented in phases for two reasons, both related to time constraints. The north turnout was at a known site location—LA 390. Because of time constraints we were unable to implement a separate testing phase to examine and evaluate the portion of LA 390 within the turnout to determine whether that area had the potential to yield important information on the prehistory of the southern Tewa Basin. Thus, a plan was developed that would allow a quick testing examination of the part of LA 390 within construction limits, with the option to proceed directly to data recovery if potentially significant features or deposits were encountered.

No archaeological site had been previously found at the east turnout. However, because this location was across US 84/285 from LA 111326, and because a complex of sites had been recorded and examined in this general area, the NMDOT requested additional survey at the turnout to confirm those results. From an archaeological standpoint, the number and large extent of archaeological sites in this vicinity suggested that it was unlikely that the east turnout would contain no cultural remains. Thus, and again because of time constraints, a plan for examining this area was developed that would permit the smooth and immediate movement from survey to testing and/or data recovery should potentially significant cultural remains be found at the east turnout. This design was implemented in an attempt to prevent any construction delays that might have occurred using a more conventional approach that maintained a clear separation between investigative phases.

The specifics of the phased investigations at the north and east turnouts are presented first. This is followed by a summary of the overall research framework developed for the prehistoric sites in the Santa Fe to Pojoaque Corridor project area. Both discussions are included here because LA 111326 was investigated as part of the overall data recovery plan, and the treatment strategy for the turnout locations was developed as an addendum to that plan.

Phased Treatment Plan for the East and North Tesuque Turnout Locations

A combination of survey, exploratory investigations, and intensive excavations was proposed for examining the north and east Tesuque turnouts. The specifics of investigation for each turnout varied, because different levels of treatment were needed for each location. The treatment plan for each location is presented here essentially as developed, with some modifications to minimize repetition of information discussed elsewhere in this report.

East Turnout

The first phase of investigation at the east turnout consisted of a pedestrian survey to determine whether or not cultural features or deposits occurred in that area. The survey was conducted in parallel transects spaced 3–5 m apart. When cultural materials are encountered during a pedestrian survey of this nature, a more intensive reconnaissance of the immediate area is usually made to define the nature and spatial distribution of associated cultural materials. This can help determine whether the find is relatively isolated or part of a larger agglomeration of artifacts and cultural features. For management purposes, cultural materials need to be classified to ensure that they receive appropriate treatment. Two classes of archaeological manifestations are commonly encountered during surveys: archaeological sites and isolated occurrences. An archaeological site contains types and quantities of artifacts and/or cultural features with some assumed integrity, which may have potential to yield information on the activities that occurred at that location. An isolated occurrence does not meet these criteria and contains little information potential beyond that provided by the recording of its description and location. Archaeological sites often require further treatment, while isolated occurrences rarely require any further examination.

In addition to the pedestrian examination of the modern ground surface, a series of auger tests were to be excavated, constituting a limited testing phase. This form of testing was planned whether or not the surface expression of an archaeological site was found in this location, because it would allow the examination of subsurface sediments and soils for evidence of buried cultural remains that might be masked by subsequent soil development or land use. Had the archaeological survey and limited auger testing revealed no surface artifacts or other evidence of archaeological remains, no further studies would have been conducted at this location. However, if surface or subsurface cultural remains were found, a more intensive investigative phase was to be implemented.

The more intensive investigative phase would consist of archaeological data recovery, scaled to the size of the study area and to the extent of archaeological remains found at this location. Were an archaeological site be found at the east turnout, data recovery would begin by imposing a Cartesian coordinate system over the area to aid in establishing and maintaining horizontal and vertical controls during excavation. A series of 1 by 1 m excavation units would be used to determine the vertical and horizontal extent of archaeological deposits, features, or structures within construction limits. Once those parameters were defined, mechanical equipment might be used to remove noncultural sediments above those deposits, as appropriate for the nature and depth of the deposits. Following the removal of noncultural sediments, any cultural deposits, features, or structures encountered during mechanical trenching would be examined using methods discussed in detail in the project field manual (Boyer and Moore 2000) and summarized in the field methods chapter of this report. Were deposits containing few artifacts and no features encountered, samples of the deposits would be systematically excavated to obtain adequate samples of artifacts and other materials.

If extensive cultural deposits, features, or structures were encountered in the east turnout, the area within construction limits would be scraped following the completion of excavation to ensure that human burials or other features that might not have been found using more conventional excavation techniques would be located, or it would be demonstrated that no other significant remains were present. Contingency plans for the discovery of human remains during conventional excavation or post-excavation scraping were presented in the original treatment plan. Should human remains be encountered during mechanical trenching or hand excavation, all work in their vicinity would be halted and the Pueblo of Tesuque, the Santa Fe County Sheriff's Department, the NMDOT, the Historic Preservation Division (HPD), and the Bureau of Indian Affairs (BIA) would be notified. Treatment of the remains would be in accordance with a plan developed and presented during earlier investigative phases (Boyer 2003; Boyer et al. 2003; Lakatos et al. 2003), and previously approved by the Pueblo of Tesuque, NMDOT, HPD, and the BIA.

North Turnout

Because an archaeological site (LA 390) was already known to exist at the north turnout, a pedestrian survey was unnecessary for that area. Instead, investigations began with an exploratory phase entailing preliminary examination of the area within the construction zone and an evaluation of the results of that examination. This study began with the imposition of a Cartesian coordinate system across the site to establish and maintain vertical and horizontal proveniencing. Within the turnout location itself, a series of auger tests was used to determine whether subsurface cultural deposits or features were present and, if so, to define their horizontal and vertical extent. If augering encountered no evidence of subsurface cultural deposits, features, or structures in this area, one or more mechanically excavated trenches would be used to verify those results and to expose natural sediment and soil strata. Profiles of at least one side of each mechanically excavated trench would be drawn, documenting the strata and the presence or absence of cultural materials. If no cultural deposits, features, or structures were encountered during mechanical trenching, no further investigations would be conducted in this part of LA 390.

If auger tests in the part of LA 390 within the turnout revealed the presence of subsurface cultural materials, a series of hand-excavated 1 by 1 m excavation units would be used to determine or confirm the horizontal extent of the materials and associated cultural strata or deposits. Once the horizontal and vertical extent of deposits containing archaeological materials were defined, mechanical equipment might be used to remove noncultural sediments above those materials. Following the removal of noncultural sediments, any cultural deposits, features, or structures encountered during augering or mechanical trenching would be examined using methods discussed in the project field manual (Boyer and Moore 2000) and summarized in the field methods chapter of this report.

Because it was impossible to predict what sorts of cultural deposits or features might be found in this part of LA 390, contingency plans were made to deal with deposits containing few to many artifacts, cultural features, and structures. Deposits containing few artifacts and few or no features would be examined by systematically excavating a sample of the deposits to obtain enough cultural materials to provide data on site temporality and how the study area was used. In the eventuality that numerous features or rich cultural deposits were found, excavation would be more extensive. All cultural features or structures found in the turnout area would be excavated by hand. Large features covering less than 30 sq m would be completely excavated; those larger than 30 sq m would be sampled and 25–75 percent excavated to ensure the acquisition of an adequate sample of artifacts and other cultural materials. Excavation procedures for structures were designed to recover the maximum amount of information while allowing sampling by appropriate horizontal and vertical provenience units. Consequently, while structures are completely excavated when present, their fill deposits are usually sampled to recover artifacts and other cultural materials contained therein. Decisions regarding sampling of structural fill are dependent on its nature. If human burials were encountered during excavation, the same procedures outlined for the east turnout would be implemented. If extensive remains were encountered in this part of LA 390, the completion of hand excavation would be followed by a phase of mechanical scraping within project limits to ensure that no undiscovered human burials or other cultural features remained in that area.

Theoretical Perspectives and Research Questions

Data recovery investigations at prehistoric sites studied during the Santa Fe to Pojoaque Corridor project are intended to contribute to the process of systematically evaluating observations and interpretations made by Fred Wendorf and Eric Reed (1955) some 50 years ago. These observations and interpretations led Wendorf and Reed to propose an alternative chronological and developmental framework for the Northern Rio Grande that differed considerably from the Pecos Classification, the dominant framework for examining Pueblo sites and assemblages, then and now. In our investigations of the prehistoric sites and site components in the project area, we consider the implications of the Wendorf and Reed reconstruction and the results of past research in the Tewa Basin and the Northern Rio Grande.

Though the sites investigated by this study had little potential for addressing the implications and accuracy of Wendorf and Reed's classification, they may provide some data that can be used to supplement such studies. Thus, we present the theoretical framework used for the Santa Fe to Pojoaque Corridor study while at the same time recognizing the limitations of the information recovered from the three sites discussed in this report for assessing that framework.

In Search of Wendorf and Reed

Fred Wendorf and Eric Reed published their "alternative reconstruction" of the prehistoric cultural sequence of the Northern Rio Grande in 1955 (Wendorf and Reed 1955), altering Wendorf's (1954) earlier reconstruction for the same area. They defined the region as bounded approximately by the New Mexico–Colorado border on the north, the Pueblo of Isleta on the south, the Canadian River on the east, and the drainages of the Rio Puerco of the East and the Rio Chama on the west. Regarding the region's prehistory, Wendorf and Reed (1955:133) state,

> Although the Spanish accounts indicated that this area was one of the major centers of Pueblo population in 1540, it seems clear that such conditions were a comparatively recent development in the prehistoric past. Archaeological surveys indicate that during much of the time that the great population and cultural centers of the San Juan and Little Colorado drainages were developing and reaching a climax, the Northern Rio Grande was a peripheral area in both population and cultural development.

Wendorf and Reed's (1955) perception of the peripheral nature of the Northern Rio Grande, relative to the San Juan and Little Colorado regions, led them to the following conclusion (emphasis ours):

> Many of the diagnostic criteria used in chronologically arranging the sites found farther west in New Mexico and Arizona appear late or not at all in the Rio Grande. It is apparent, therefore, that the existing conditions . . . generally employed to categorize the San Juan Anasazi remains in the Four Corners area *could be used in the northern Rio Grande only with considerable modification*. (Wendorf and Reed 1955:133–134)

This conclusion was echoed by Peckham, whose review of the history of Rio Grande archaeology and of differences between archaeology in the Rio Grande and Four Corners regions led him to state (emphasis ours),

> It was a matter of some controversy, and the problem was more than just terminological. The Pecos classification worked moderately well in the San Juan Basin of northwestern New Mexico where ruins were abundant and, with the notable exception of Chaco Canyon, fairly consistently reflected the scheme developed at Pecos. The Rio Grande region just didn't fit. No matter how hard Rio Grande archaeologists tried to adjust their interpretations to the Pecos classification, their field work suggested that prior to Pueblo IV evidence of cultural development…*only occasionally corresponded to that in the west*. (Peckham 1984:275–276)

Wetherington (1968:71; emphasis ours) went a step further, bluntly stating,

> With the archeological revelation of a distinct Anasazi pattern of culture along the Rio Grande, as well as unique enclaves in more peripheral areas, the Pecos Classification has reached the limit of area-wide applicability and *its growing pains have become afflictions of senility*.

With this situation in mind, Wendorf and Reed (1955:134) proposed a chronological framework designed specifically for developments in the prehistory of the Northern Rio Grande. This framework is the core of their alternative reconstruction, which we will call, following Peckham (1984), the Rio Grande Classification. A review of recent synthetic and project-specific literature suggests that the Wendorf and Reed reconstruction has been dealt with in three ways. Some researchers have accepted the reconstruction as is or with some modifications (for instance, Wetherington 1968; McNutt 1969; Skinner et al. 1980; Peckham 1984; Cordell et al. 1994; Post 1996; Crown et al. 1996 [but only for the Pajarito Plateau]).

Other archaeologists have rejected the Rio Grande Classification. Some refer only to the Pecos Classification, with modifications to conform the periods to temporal data from the Rio Grande Valley (for instance, Ellis 1975; Cordell 1978, 1979; Fosberg 1979; Hunter-Anderson 1979a, 1979b; Cordell 1984; Franklin 1992). Cordell and Plog (1978) argue against using normative classifications. Later, however, Cordell (1989; Cordell and Gumerman 1989) proposed an entirely different framework based on a macroregional, pan-Southwest perspective. This framework has not gained acceptance in the region. More recently, Creamer et al. (2002) introduced a series of eight papers from the 2000 Southwest Symposium. Only one of the eight papers (Post 2002) even refers to Wendorf and Reed, although Creamer et al. (2002:12) assert, "Each of these chapters engages the historical legacy of archaeology in the northern Rio Grande."

Finally, some researchers have attempted to correlate the Rio Grande Classification with the Pecos Classification. In these attempts, the Rio Grande Classification is usually identified by reference to the Pecos Classification rather than as a different temporal and developmental framework (for instance, Biella and Chapman 1977a, 1977b; Biella 1979; Quinn 1980; Stuart and Gauthier 1981; Anschuetz 1995; Anschuetz et al. 1997).

By implication, researchers who accept the Rio Grande Classification appear to also accept the notion, posited by Wendorf and Reed, that developments in the Northern Rio Grande were sufficiently different from those in the San Juan Basin and Four Corners regions to justify examining them within a different framework. In contrast, those who reject the Rio Grande Classification appear to reject the same notion. The latter position suggests that developments in the Northern Rio Grande were sufficiently similar to those in regions to the west to warrant examining them all within the same framework. In this position, the Rio Grande is an Anasazi subregion, and developments in the subregion are viewed in light of regional trends. The same position is taken by those researchers who would correlate the Rio Grande Classification with the Pecos Classification. In essence, these researchers also see the Northern Rio Grande as an Anasazi subregion. They appear to be willing to accept some differences in subregional trends, as described by subregional frameworks such as the Rio Grande Classification. At the same time, they attempt to correlate the trends, particularly their timing, with the Pecos Classification, which, by inference, describes and integrates developments across the entire region.

It is apparent, however, that the Rio Grande Classification involves more than a chronological framework to describe local or regional trends. The patterns that Wendorf and Reed observed reflect more than the archaeological trends needed to define chronological sequences. They also reflect regional and intraregional trends in social relations, community organization, architectural structures and features, economy and subsistence strategies, artifact assemblage compositions, and material technologies. As such, the Rio Grande Classification potentially provides the basis for developing testable models of northern New Mexican prehistory. However, the framework, and particularly the archaeological patterns on which it is based, have not been well tested. None of the works cited above present a systematic examination of the observed patterns to determine their validity or assess their relationship to the classification.

Instead, a review of the literature suggests to us that disagreements about the applicability of the reconstruction are more often based on apparently conflicting paradigms. Within these paradigms, data gathered both before and since Wendorf and Reed presented their reconstruction are interpreted to represent different conclusions: "Archaeological knowledge of the past is totally dependent upon the meanings which archaeologists give to observations on the archaeological record" (Binford and Sabloff 1982:149). It seems apparent to us that modifying, rejecting, or ignoring the Rio Grande Classification falls less on purposeful testing of the patterns on which the reconstruction was predicated than on perceived paradigmatic disagreements.

It is certainly true that archaeology as a field of scholarship has undergone significant paradigmatic changes since the mid-1950s. The most profound change was the rejection, beginning in the 1960s, of culture-historical studies in favor of explicitly theoretical and, often, nonhistorical interpretations of data. We see this as the root of the perceived paradigmatic conflict, in that the Rio Grande Classification is clearly culture-historical in nature, and invoking culture-historical causes for patterns in the archaeological record has been seen as nonexplanatory since the beginning of the theoretical revolution. In the Northern Rio Grande, most research since the 1960s has been guided by culture-ecological and processual paradigms.

We would not pretend to denigrate the contributions made by research directed by these or other paradigms. However, we view in the more recent (post-1965) research, including our own (see, for instance, Boyer et al. 1994; contributions in Boyer and Urban n.d.), a usually implicit (but sometimes explicit) accepting as-is or with modifications, rejecting, and even ignoring of the Rio Grande Classification. At the same time we see a noticeable absence in the same research, including our own, of explicit testing of the patterns documented by Wendorf and Reed. We find this a confusing situation.

Those who accept the reconstruction as is or with modifications apparently view it as a viable sequence without considering the implications of this acceptance. Absorbing the interpretations of data and the culture-historical sequence based on one paradigm without explicitly testing the validity of the data or the relationships of the data to the original paradigmatic model is unscientific. Similarly, those who explicitly reject by ignoring or by correlating the reconstruction apparently do so on the basis of paradigmatic disagreement, also without explicitly testing the validity of the data or the relationship of the data to the original model.

This is certainly not to argue that other paradigms should be rejected in favor of a return to a strict culture-historical approach. We would argue, however, that if the archaeological record as it was understood in the mid-1950s was such that Wendorf and Reed saw the need to differentiate the Northern Rio Grande from the San Juan Basin and Four Corners regions, and if explicit testing of the archaeological patterns observed by Wendorf and Reed and fundamental to their reconstruction has not been performed but additional data have been gathered in the 50 years since presentation of their reconstruction, then responsible scholarship should include attempts to examine data gathered before and after publication of the reconstruction.

Examination of these data should focus on determining whether the data patterns observed by Wendorf and Reed are specific to and embedded in their culture-historical paradigm and cannot be verified with the addition of more recent data. If this is the case, then their reconstruction lacks validity, especially in light of the paradigm within which it was defined, because its historical-temporal basis would be invalid. Alternatively, close examination of the data might reveal that their patterning can be verified independently of the paradigm within which they were first observed. If so, then they can be profitably interpreted within the frameworks of other paradigms. In this scenario, we are also concerned with whether the data patterns retain the temporal patterning observed by Wendorf and Reed.

Toward that end, archaeological data recovery efforts at prehistoric sites and components examined by these projects are aimed at testing the Rio Grande Classification by examining the accuracy of the data patterns that Wendorf and Reed observed. It is beyond the scope of any single project to definitively gather, analyze, and interpret all of the data needed for an undertaking of this nature. However, data recovery at the prehistoric sites and components in the project area provides an opportunity to address the validity of the reconstruction, particularly when combined with the results of other studies.

We admit that this approach has a certain culture-historical emphasis, in that we seek to validate or refute the Rio Grande Classification. The classification is, at its heart, the definition of regional chronological periods using patterns of artifact assemblages, architecture and construction techniques, and site structure that were presumed to be normative to the periods they defined. As we noted earlier, however, we are not calling for a return to strictly culture-historical research, nor have our data recovery efforts focused on normative interpretations of data or data patterns. A point made by Binford and Sabloff (1982:147) is well taken:

> When doing culture-historical research, one normally needs only to recover a sufficient sample of artifacts to permit a "cultural" assessment of the remains. This means that no real understanding of internal differentiation or organizational variability among components of a single system will be revealed by carrying out normal, traditional archaeological work.

Rather, we are concerned with validating the data patterns observed by Wendorf and Reed to determine whether those patterns can be profitably used to examine questions other than regional chronology—questions of inter- and intraregional social relationships, community formation and organization, economic strategies, ideological practices, ethnic identities, and other issues. Those issues can and should be addressed using a variety of paradigmatic and theoretical perspectives. The following sections of this chapter present research perspectives for early Pueblo communities and Coalition-Classic period Pueblo economy and sites.

On the surface this is a culture-historical study, in that we seek to verify the chronological patterns defined by Wendorf and Reed. In reality, however, this study goes much deeper because we are also interested in determining *why* the chronological development sequence in the Northern Rio Grande differs from that of other parts of the Pueblo area. Ultimately, we seek to demonstrate that the Northern Rio Grande was not part of what has been referred to as the Eastern Pueblo area and therefore culturally identical with the San Juan region. Rather, we are trying to demonstrate the distinct nature of the Northern Rio Grande that *separates* it from the San Juan region. Instead of a subregion of the Eastern Pueblo area, we see the Northern Rio Grande as a separate and distinct region with a developmental trajectory that parallels, but is not identical to, the region to its west.

Developmental Period Pueblo Communities in the Northern Rio Grande

An important issue for research in the Northern Rio Grande involves understanding prehistoric Pueblo social structure. Archaeologists working in the region discuss and debate the changing natures and levels of Pueblo social structure, including processes and results of community formation and population aggregation (see, for instance, contributions in Wills and Leonard [1994], and Crown et al. [1996]). However, much of this work centers on Coalition and Classic period communities, and definitive research into the nature of Developmental period (and earlier) communities has been lacking (see Adler 1993; Boyer 1994, n.d.).

Understanding the dynamics of Developmental period Pueblo society is critical if we are to address the changes that seem evident between the numerous small pit structures and surface structures at Developmental period sites, the small-to-large pit structure (kiva?) and roomblock Coalition period sites, and the large, compact, aggregated communities of the Classic period. The US 84/285 project area provides an excellent opportunity to explore the structure and dynamics of Developmental period Pueblo society and search for evidence of early Pueblo community structure.

Defining prehistoric communities. Wills and Leonard (1994:xiii) state, "Southwestern archaeologists understand 'community' to mean a residential group whose members interact with one another on some regular basis." This broad definition, they argue, has led to two perspectives. In one, individual sites are studied as single communities. In the second, individual sites are grouped into political communities defined by intersettlement mechanisms for making social or economic decisions. They go on to state, in archaeologically practical terms, "Although political communities are conceived of as socioeconomic systems, they are generally recognized by spatial clusterings of sites" (Wills and Leonard 1994:xiv). Following Breternitz and Doyel (1987), Wills and Leonard suggest that within these clusters of contemporaneous sites, there should be a hierarchy of sites with different functions within a community. However, they observe that clear-cut evidence of functional site hierarchies has been hard to come by, particularly in terms of artifact assemblages, and as a consequence archaeologists have tended to focus on architectural forms and features thought to represent communal facilities (Wills and Leonard 1994:xiv).

Following Johnson's (1982, 1983) scalar stress model of community decision-making structure, Kintigh (1994) describes two community forms: nonaggregated and aggregated. The difference between the two lies not in residential proximity but in the size of the community in number of households and the consequent level of community decision-making structure. Smaller, nonaggregated communities should consist of no more than about 6–14 households and be characterized by consensus decision making. Above this number of households, consensus decision making is unwieldy, and these larger aggregated communities are characterized by decision-making structures involving leadership. The development of such higher-level community structure should be accompanied, Kintigh (1994:137–138) argues, by clusters of sites and types of communal architecture. One might presume, then, that nonaggregated communities may not be easily distinguished by site clusters and should not have communal architecture, though Kintigh (1994) does not make these characterizations.

Adler (1994:99) defines communities as "the consistently highest level of integrative organization on the social landscape" and "the most consistent resource access institution on the local level." He then argues that we must distinguish between communities and settlements. Settlements are "spatially identified cluster(s) of habitation features" (Adler 1994:99) that can consist of single or multiple households (Adler 1993:337). Settlements are internally integrated by "low-level" integrative facilities: "The term 'low-level' . . . refer[s] to those facilities that serve to integrate only a portion of a community" (Adler 1993:335; also discussed by Adler and Wilshusen [1990:135]). In contrast, "high level facilities are utilized for social activities involving larger groups and are often used to integrate one or more communities" (Adler 1993:335; also discussed by Adler and Wilshusen 1990:135).

There appears to be a correlation between Kintigh's nonaggregated communities and Adler's settlements. Nonaggregated communities are small, generally consist of fewer than 14 households, and are characterized by low-level consensus decision making. Settlements are characterized by low-level integrative facilities which are, cross-culturally, most common in population groups of 4–12 households (Adler 1993:338). These facilities are usually used for residential and ritual integrative activities. There is correspondence in the sizes of these two types of household groups, and they are characterized by low-level integrative and group decision-making activities and facilities. We see, then, that a presumption that nonaggregated communities are not necessarily spatially clustered and do not have communal facilities is probably false. Adler describes settlements of this type as spatially defined and as having integrative facilities.

If nonaggregated communities can be correlated with settlements, then Kintigh's aggregated communities may be correlated with Adler's communities. Remember that aggregation, in Kintigh's terms, does not necessarily reflect residential proximity. Instead, *aggregation* refers to community integration through formal "higher-level" (Kintigh's term) decision-making structure involving leadership. Whatever form this structure takes, it "probably requires a substantial population aggregate for its persistence" (Kintigh 1994:133), although Kintigh (1994:133) also states, "Communities composed of substantially more than six households must have some higher-level decision-making structure." In Adler's model, communities are the highest level of consistent integration of settlements. Integration is accomplished through "high-level" (Adler's term) facilities, which are likely to be used almost exclusively for ritual integrative activities and rarely for residential activities (Adler 1993). Adler (1993:336) states that ritually specialized facilities appear when a community surpasses about 200 individuals. If we arbitrarily assume a range of 5–10 individuals in a household, Adler's figures translate to communities of 20–40 households, substantially more than Kintigh's maximum figure of 14 households in nonaggregated communities. Thus, we see a possible size correlation between Kintigh's aggregated community and Adler's community, and a correlation between the need for high-level decision making and the presence of high-level community integration facilities.

Archaeological evidence: Defining Pueblo community structure in the Taos Valley. Using his model of community structure and facilities, Adler (1993) examined excavated Late Developmental period sites in the Taos Valley for evidence pointing to community organization:

> Because from early on in the prehistoric sequence, the Anasazi of the northern Rio Grande appear to have inhabited dispersed settlements that were parts of larger, scattered communities, we should expect some form of integrative facility during the Developmental phase. (Adler 1993:336)

Based on ethnographic data from dispersed agricultural groups similar to those residing in the Taos area prior to A.D. 1200, as well as archaeological investigations of dispersed

> Anasazi settlement systems elsewhere in the Southwest, it is likely that each pit structure settlement was integrated into a larger, local community and that several such communities may have existed in the Taos area during this time. (Adler 1993:337)

Adler's review of published data revealed that about 25 percent of excavated pit structures had floor features identified as sipapus, features that are commonly assigned a ritual function by archaeologists (Adler 1993:338). Adler argues that if these features were associated with ritual activity, then structures containing them may be assumed to have had different functions than structures without them. Since the excavated pit structures with sipapus have no other "ritually significant" features that distinguish them from pit structures without sipapus, Adler classifies the pit structures with sipapus as low-level integrative facilities, which is to say that they probably served as habitations and part-time integrative facilities. His figures suggest that 25–30 percent of Developmental period pit structures contained ritually associated features and, therefore, probably served as integrative spaces (Adler 1993:338).

The implications of Adler's argument for Developmental period sites are two-fold. First, "the pre-AD 1200 Anasazi in the Taos area did not lack social integrative facilities. Certain of the early pit structures were utilized for a range of ritually integrative and domestic activities 'since' early general-use integrative pit structures probably did double duty as domestic structures, but as is borne out by a cross-cultural perspective, it is not unusual for domiciles to serve as ritual and social integrative spaces" (Adler 1993:341–342). Adler is arguing that the presence of ritually associated features in some pit structures points to the use of these structures as low-level part-time social integrative facilities and that, since such facilities are characteristic of communities or portions of communities ("settlements") having some minimal internal integration, they are evidence of low-level community integration during the Developmental period. Although his argument may run afoul of Wills and Leonard's (1994:xiv–xv) concern over tautological identification of communities and integrative features, in this case Adler's perspective provides important corroboration for Boyer's (1994) identification of two Developmental period communities in the Taos area based on architectural and artifact patterns.

Boyer's (n.d.) review of published data from the Taos Valley shows that sipapus occur in about 19 percent of excavated pit structures, a slightly lower ratio than Adler's. Further, those pit structures are divided between two communities occupying the north and south parts of the valley. The two pit structures with sipapus in the northern community are nonremodeled houses; that is, they were built, occupied, and abandoned. This is also true of two pit structures in the southern community. However, two other pit structures in the southern community had a sipapu in association with one of the two floors identified in each structure. At one site, the sipapu was associated with the upper floor; no sipapu was found in the lower floor. At the other site, the sipapu was associated with the lower floor, but no sipapu was found in the upper floor. This suggests a change in the functions of both pit structures. If Adler's model is correct, one pit structure was used as an integrative facility before but not after its remodeling, while the other pit structure was used as an integrative facility after but not before its remodeling. Interestingly, these two sites, which are across a small arroyo from one other, are the only two pit structures in the southern community that have yielded evidence of substantial remodeling. Although we do not know whether these structures were contemporaneous, their proximity to one another and their similar remodeling episodes begs the question: were the two pit structures related in some way so that during remodeling their ritually associated features and functions were exchanged? Obviously, we cannot answer this question, but the possibility is tantalizing. If Adler's model is correct, we may see that, at least in some cases, these low-level integrative facilities were treated differently than other pit structures (Boyer et al. 1994).

Boyer's (n.d.) review also suggests that some pit structures were treated differently than others in terms of abandonment and postabandonment processes. Importantly, these are the sites whose pit structures contained sipapus. In addition, the structure of some sites indicate that Adler is incorrect when he contends that "specialized ritual facilities that served as integrative spaces for entire communities" were not present in the Taos Valley during the Developmental period (Adler 1993:341). Evidence that includes differential site complexity, presence of substantial surface structures, pit structure remodeling or replacement, and presence of storage vessels points to "the development of facilities integrating larger portions of communities than those integrated by single pithouses with sipapus. Further, in the possible evidence of remodeling and integrative functional replacement of structures . . . we may see the development of relatively long-term use of specific locations for community integrative activities (Boyer n.d.:118).

The second implication of Adler's argument for Developmental period sites is that "the archaeological record does not indicate the construction of specialized ritual facilities that served as integrative spaces for entire communities during the pre–AD 1220 period in the Taos area" (Adler 1993:341). In this regard, examination of published data on two sites, one in the north community (LA 9204 [Loose 1974]) and the other in the south community (TA 47 [Green 1976]), reveals several similarities. First, they are the only excavated locales in their respective communities that contain multiroom adobe surface structures in association with multiple pit structures. Second, some evidence suggests the serial replacement of these domestic/ritual structural complexes through time, as one set of features fell out of use and was replaced by another. While other locales of this nature may exist in these communities, the fact that neither academic or contract-based studies have identified them may be telling—sites containing this combination of structures and related features are not common in the region.

The dearth of hearths in surface rooms probably precludes their use for habitation, with one exception in each case. Rather, the presence of cists and ceramic jars instead suggests that these rooms were used for storage. Finally, a later large pit structure at one site (TA-47) has a sipapu, while there is evidence that later features at the other site (LA 9204) are associated with a circular adobe floor. This does not, of course, clearly identify the adobe floor as a ritual feature (nor are sipapus clearly identified as such), but the feature's description as a large, bounded, prepared surface suggests an open public area whose function was certainly different from other extramural activity areas and that was not replicated at other, similar sites (see Adler and Wilshusen 1990:135). In turn, this suggests that the activities that took place there were not common to all Developmental period sites.

Taken together, these patterns indicate that the two sites functioned in ways not common to Developmental period sites, even those with sipapus. We may suggest that these sites served as integrative facilities for communities or portions of communities larger than those served by single pit structures with sipapus. This is not to suggest that either site included "ritually-specialized facilities" (Adler's term), since the artifact assemblages recovered from them do not differ significantly from other Developmental period sites. However, Adler seems to argue not for a complete dichotomy between low-level generalized and high-level specialized integrative facilities but for a continuum between one and the other:

> As the size of communities increased, we should expect both an increase in the number of smaller, generalized integrative facilities and the addition of larger, ritually specialized facilities, the latter appearing when community populations surpassed 200 individuals. Additionally, if the size of use-groups associated with the smaller integrative facilities increased through time, we should see an increase in the average size of this class of general-use facility. (Adler 1993:336)

Thus, although Adler may not see evidence of Developmental period ritually specialized facilities used to integrate entire communities, we may, at two sites in different communities, see evidence of the development of facilities integrating larger parts of communities than did single pit structures with sipapus. Further, in the possible evidence of remodeling and integrative functional replacement of structures, we may see the development of relatively long-term use of specific locations for community integrative activities. This is in keeping with expectations for the establishment of communities on frontiers. In a diachronic view of the colonization gradient of frontier settlement (Casagrande et al. 1964), some locations begin as dispersed settlements and, for a variety of reasons, move through the various levels of community establishment and stability. The relatively lengthy use of a specific location as a community facility points to a degree of community stability not seen at single pit structure sites with short occupations, no remodeling, and no reoccupations. The latter are indicative of considerable mobility among frontier households, while the former may represent focal points for communities or portions of communities of mobile households.

In this regard, the presence of adobe surface structures that were probably used for storage rather than habitation is interesting. Boyer (1994) observes that internal storage features are not common in Taos-area Developmental period pit structures. On the other hand, since Taos Gray sherds far outnumber painted sherds at these sites, and since Taos Gray vessels are usually jars, it is possible that ceramic jars were the most common storage feature at single pit structure sites (Boyer 1994:462). This is consistent with fairly mobile households prepared to move their stored goods with them but hard to reconcile with the long-term food storage needs being addressed at later large pueblos, where households are thought to have occupied suites of 2–25 rooms, depending on the size and makeup of the household. Most of these rooms were storage rooms (Holschlag 1975; Lowell 1991; Lightfoot 1992). Thus, we may speculate that the number of ceramic jars found at Developmental period sites would not accommodate the long-term food storage needs of the households occupying those sites. If so, then perhaps the surface structures at Developmental period sites represent storage facilities for multiple households. This would suggest that these sites served to integrate communities or parts of communities through more than decision-making and ritual/social activities.

Ethnographic evidence: population and community organization at Picuris Pueblo. In 1965, Bernard Siegel reported on his observations of changing social organization at Picuris Pueblo, a small Tiwa-speaking community in north-central New Mexico (Siegel 1965; also Siegel 1959). The community was apparently quite large in the sixteenth and seventeenth centuries (see Schroeder 1974 for a historical overview). However, its population began to drop following the Pueblo Revolt of 1680, the reoccupation of New Mexico by the Spaniards in the 1690s, and self-imposed exile at El Cuartelejo, in what would become western Kansas, between 1696 and 1706. From an estimated and probably somewhat exaggerated high of 2,000–3,000 residents before the 1680 revolt, only about 360 Picuris returned from Kansas in 1706. In the 1700s the population fluctuated between a high of about 400 in 1744 to a low of 212 in 1788 and climbed back to 320 by 1821. By the mid-1800s, however, population had dropped to 143 in 1860, and into the 120s in the 1870s. Between 1890 and 1940, the population stayed between about 90 and 110. Since then, the population of the Picuris community has climbed slightly, although the number of residents is not as high as the number of enrolled tribal members. As an example, Schroeder (1974) records the population in 1974 as 164, while Brown (1974) states that the population in that year was only 75. Siegel (1965:199) summarizes the impact of continued population decrease as follows: "It is not surprising that one should find, in relation to these events, much evidence of sharply reduced organizational efficiency in social life and a corresponding increase in the abandonment or curtailment of fundamental institutionalized activities." Siegel then describes several aspects of mid-late twentieth century Picuris community structure that reflect decreasing population:

> 1. Complexity of community socio-religious organization decreased. Specifically, fewer kivas (Adler's "integrative facilities") were in use through time, apparently because fewer people were involved in kiva activities and because kinship in the smaller community became more integrated (Siegel 1965:200, 202). Associated with this situation was a dramatic decrease in the number and kind of ritual ceremonies performed (compare Parsons [1939:216–222] with Siegel [1965:202]).
>
> 2. Decreased complexity also involved lessened importance and authority placed on community leadership and its structural hierarchy. Specifically, the authority of the cacique ("highest ranking priest-head"; Siegel's term) eroded, and the community council, which had consisted of elder mem-

bers of the kivas, was changed to include all male household heads, even those who were young and relatively inexperienced in community affairs (Siegel 1965:200, 202). Associated with this situation was a significant lack of division and factionalism within the Picuris community, particularly when compared to the much larger and more complex community at Taos Pueblo (compare Siegel [1965:204–205] with Katz [1974]).

Brown (1974; see also Brown 1999) reports the same changes in twentieth-century Picuris community structure, but he ascribes them to changing economic forces and strategies, particularly the impact of wage labor and national government welfare programs and the attendant loss of subsistence agricultural and foraging strategies. By reconstructing Picuris community organization before 1900 using archaeological and ethnohistorical data, Brown is able to contrast late nineteenth-century and late twentieth-century community structure. With regard to decreasing complexity in socioreligious structure as observed by Siegel (1965), Brown (1974:334–335) notes that late nineteenth-century Picuris was characterized by a significant degree of ritual specialization. This was evident in the presence of directional moiety groups and several "ceremonial groups" (Brown's term; kiva and interkiva sodalities), their facilities (kivas), and their activities throughout the year. After about 1910, membership in the ceremonial groups began to decrease, and the groups finally dissolved as young men left the village and older men died (which resulted in population decrease, despite Brown's objections). Interestingly, as the kiva groups dissolved, "ownership" (Brown's term) of the facilities, which had been vested in the members of each group, passed to the community as a whole. The number of kivas in use decreased through time, as did the number and variety of rituals (Parsons 1939; Siegel 1965; Brown 1974, 1999).

With regard to changing community structural authority and hierarchy, Brown (1974:335–336) argues that pre-1900 Picuris had a relatively complex authority structure with both sacred and secular hierarchies (although secular authority—the governor and his officers—was legitimized by sacred authorities). As the community decreased in size during the 1900s, authority became vested in a council of household heads rather than in the heads of kiva groups. Finally, the cacique died and was not replaced. Instead, community authority passed from the sacred head (cacique) to the secular head (governor). This diminished the division between sacred and secular authority. Although it may appear that this marked the end of sacred authority at Picuris, we should note that the governor was still selected by the council, as he had been in the past; and the governor acquired responsibility for the community's ritual features and structures.

In addition to these aspects of community structure, Brown (1974) also observed two other changes at Picuris. First, he points out, "Law and order, which was maintained through such traditional sanctions as fines, community work, public whippings, and banishment, is now possible only with the assistance of federal and state law enforcement agencies" (Brown 1974:320). Second, he records a significant change in settlement and land use:

> In 1900, two places of residence were maintained by many households, a house within the pueblo occupied during the winter months and a second house in the fields occupied during the farming season. This settlement pattern, compact for the winter and dispersed for the summer, reflected the economic activities of the community. With a shift in emphasis from subsistence farming and hunting to wage work in the 1930s, many of the summer houses were abandoned and only the residences were maintained. With the growing importance of the welfare programs since 1948, the few summer houses which were occupied between 1930 and 1948 have been abandoned also and are used only for storage today. (Brown 1974:331–332)

In contrast to Brown's assertion that these changes were the result of shifting economic forces and strategies, Katz (1974) ascribes the same aspects of community organization at Taos Pueblo to responses to population density and frequency of interaction within the village. Concerning sanctions used to maintain order in the community, Katz describes them as parts of a community-wide posture of restraint:

> Any personal assertiveness is disapproved; unanimity in government decisions is assumed. A Taos who distinguishes himself in any way, in dress, speech, accumulation of wealth, or who seeks prestigious positions within the pueblo, earns disapproval and become the subject of sanctions such as gossip, accusations of witchcraft, whipping, vandalism of his property, or "accidental" death. (Katz 1974:309)

Another series of mechanisms for coping with crowded conditions at Taos involves using different ways to maintain personal privacy, including residing on land outside the village:

> One other way that the Taos use the space outside the wall is by retreating to their summer houses. Traditionally, there have always been a few one-room houses which were used by some Taos families for several weeks in the summer when their agricultural activities demanded a large part of their time. These houses were located within the pueblo land, but most were outside the wall. In the past fifty years, however, more and more Taos have used the land to build summer houses. Frequently these houses would be built with a large number of more spacious rooms than existed in their residences within the wall. In the past ten years, it has become increasingly popular for some Taos to use these "summer" residences throughout the year, although they never relinquish their ownership in their original residences. (Katz 1974:312–313)

The residents of Taos were subjected to the same sorts of external forces impacting their economic-subsistence strategies as the residents of Picuris during the twentieth century. How, then, do we rectify Brown's observations that community sanctions against inappropriate behavior and the use of summer houses both decreased at Picuris during the same years that Katz argues they were firmly in place and, in the case of summer houses, became more prevalent at Taos? The obvious answer is that the population of Picuris declined during this time, while that of Taos did not (see Bodine 1979). Population density at Picuris would also have declined, as would frequency of personal interaction. Consequently, social mechanisms used to cope with relatively high population density fell into disuse through time.

Implications of defining simple Pueblo communities. Both Siegel (1965) and Brown (1974) see the changes evident in Picuris community structure since about 1900 as symptomatic of the "disorganization" (Siegel's term) of traditional Picuris society. In this view, the features of the larger, more complex form of the pre-1900 Picuris community, including large, multistory buildings in the village (like Taos), summer houses near fields, subsistence agricultural and foraging economic strategies, a directional moiety structure, multiple kivas with several kiva and interkiva societies, numerous ritual activities throughout the year organized and maintained by the different societies, a community council consisting of the elder members of the kiva societies and a cacique, secular community officers selected by the council, and community mechanisms for enforcing appropriate behavior were the norm. Consequently, the changes since 1900 represent the lamentable disintegration of normal, traditional Picuris society and community structure.

An alternative view is that the changes observed by Siegel and Brown reflect only the disintegration of the most complex forms of Picuris social and community structure, and that they reflect reversion to simpler social structural forms. This view is supported by a significant statement made by Brown: "In spite of these dramatic changes, the residents of Picuris continue to speak their own language, along with Spanish and English, and are able to maintain an identity independent of their Spanish-American neighbors and an orientation separate from the surrounding dominant Anglo-American culture" (Brown 1974:320).

That is, while students of Picuris see in the twentieth-century changes the disintegration of the Picuris community, the Picuris have maintained their language and their cultural orientation (a point also made by Siegel [1965:204]), two factors that distinguish them from their Euroamerican neighbors. In other words, the Picuris community has changed dramatically in size, architecture, settlement pattern, ritual complexity, and social structure but has maintained its identity. This suggests that cultural identity is not as strongly tied to specific community and social structural forms as anthropologists might expect.

More significantly for this discussion, it reveals that Pueblo communities can have much simpler structural forms than we might expect based on the forms of historic and modern pueblo communities. If we take the view that as Picuris's population declined, the community maintained its identity while reverting to simpler and simpler forms (see Hegmon et al. [1998] and Nelson [1999] for archaeological examples of the same argument from the Mimbres region), then the Picuris example provides us with several possible characteristics of simpler Pueblo community forms. In turn, those characteristics can be expected to be revealed archaeologically.

The most significant characteristic is that the communities will be small and relatively simple and unorganized in form, particularly when compared to larger, more complex communities. When we consider the Picuris example in combination with the conclusions drawn by Kintigh (1994) and Adler (1993), also from ethnographic data, we should expect to see this situation reflected in the following ways:

1. Simple communities should have relatively dispersed settlement patterns. Both Siegel and Brown point out that twentieth-century residence at Picuris changed from mostly matrilocal and patrilocal to neolocal, and that the practice of building houses directly adjoining those of family members has been replaced by the building of new, unadjoined houses within the village.

2. Archaeologists consistently refer to communities as spatial clusters of sites (Breternitz and Doyel 1987; Adler 1993; Wills and Leonard 1994). That is, communities are characterized by relative residential proximity; the actual measure of proximity and, thus, the spatial size of a community is conditioned by the degree of sedentism, the economic and population stability of the households comprising the community, and the structure and integration of the community. Even so, it should be possible to identify clusters or concentrations of sites comprising a community.

3. For the Developmental period, we may expect to see clusters of pit structure sites. The geographical definition of such clusters may be difficult to ascertain. However, following Adler's (1994:99) assertion that communities reflect "consistent resource access . . . on a local level," we can expect that sites in clusters representing communities will have similar suites of structural, feature, and artifact characteristics (Boyer 1994).

4. Simple communities should show a relative lack of standardization in community form (placement of residential and other sites) and size (number of contemporaneous residential and other sites). We should expect that there will be large clusters of sites or structures and small clusters of sites or structures. Bearing in mind Kintigh's (1994) and Adler's (1994) apparent limits on community sizes, we can expect simple communities to consist of fewer than 14 contemporaneous residential structures. Assessment of these conditions requires chronometric establishment of contemporaneity.

5. Simple communities should contain relatively few integrative facilities, simply because the communities contain relatively few people that need to be integrated. Archaeologically, we should expect to see few facilities that we would define as kivas (by presence of features or suites of features and by evidence of differential treatment during use and abandonment) relative to the number of associated, contemporaneous, residential structures or sites.

6. Further, simple communities should show a relative lack of standardization in the presence and form of ritual features and structures associated with community integrative facilities. In the terms of Rappaport (1979) and Buikstra et al. (1998), standardization in these features and structures should be related to the kind of information contained by them and the kind of messaging used to access and convey that information.

7. Simple communities should show little evidence of intracommunity hierarchical authority or ritual specialization. This is related to the expectation, mentioned earlier, of finding relatively few integrative facilities in a simple com-

munity. Also, we should expect to see few examples of "high-level integrative facilities" (Adler's term) that served full-time ritual and integrative functions and may have integrated multiple communities.

8. Simple communities should show little or no evidence of intercommunity integration or hierarchical authority. This is related to the absence of high-level integrative facilities. However, as Boyer (n.d.) suggests, repeated or long-term use of certain locations, including feature and structural remodeling or replacement as well as relatively high numbers of noncontemporaneous residential and other sites or structures, may indicate the growth of communities and community centers and the development of high-level integrative facilities. In effect, evidence of repeated or long-term use of specific locations may show that the location, itself, was an established community center and functioned as a high-level integrative facility.

Studying Pueblo Communities in the Tewa Basin

The preceding discussion of the identification of Pueblo communities suggests a series of questions concerning the US 84/285 project-area sites.

Pueblo Research Issue 1: Do the project-area Developmental period sites represent spatial clusters or parts of spatial clusters of sites?

This is an important issue for defining Developmental period Pueblo communities and points to the significance of the project-area sites. At these sites we have the opportunity to explore two sides of this issue. Comparing the results of other survey and excavation projects in the southern Tewa Basin will provide data on site distributions. These data can be used to determine whether the project-area sites represent communities or parts of communities. At the same time, we can use architectural and artifact data obtained from excavation to define and assess similarities and differences between the project-area sites and those examined by others in nearby areas. If survey and excavation data point to spatial distributions representing site clustering, and if clustering of architectural and artifact data can be defined, we will see evidence of community organization during the Developmental period.

Pueblo Research Issue 2: Do the project-area Developmental period sites provide evidence of integrated access to resources?

Adler (1994:99) describes the community as "the most consistent resource access institution on the local level." This is strongly related to the excavational aspect of Pueblo Research Issue 1. Specifically, if project-area sites were parts of communities that functioned, at least in part, to integrate access to resources, we should expect to see significant similarities in access to and use of local and regional resources within site clusters, and differences between site clusters. We may also expect to see significant differences in access to and use of local and regional resources between the project-area site clusters and those in nearby project areas, if there are actual differences in the availability of specific resources. Examples of resource access include raw materials for chipped stone and ground stone tools, while examples of resource use include the kinds of tools made from these materials, the extent of expedient versus purposeful tool manufacture and use, and the extent of tool reuse and recycling. Raw material for ceramic manufacture is another example, as is the use of local and regional faunal and floral resources.

Pueblo Research Issue 3: Do project-area Developmental period sites show evidence of community integration?

Several questions are involved here. First, do some sites show evidence of low-level integrative use? Adler's (1993) research suggests that this should be seen primarily in the presence of pit structure features recorded as sipapus, and that these features should not be common at contemporaneous structures or sites in the same community. If more than one contemporaneous structure in a community contains sipapus, we may be seeing evidence of multiple subcommunity groups or the sequential use of different integrative facilities through time. Accurate chronometric dates are critical in this regard.

Do some sites show evidence of higher-level integrative use? Specifically, based on the earlier discussion of sites with increased architectural and site structural complexity, do sites that have surface structures contain evidence of a level of community integration above that served by a single pit structure with a sipapu? Do these sites show evidence of both domestic and ritual use? Do the artifact assemblages from these sites differ from other site assemblages in terms of activities represented? Are there intrasite differences in architecture, features, or artifacts that suggest functional differences? And, is there structural and artifact evidence that surface structures at these sites were used as community storage locations (storage cists, bins, buried jars, high frequencies of jar sherds)? How many rooms are present, how many have hearths, and how many have internal storage features? How do the rooms-with-hearths/rooms-without-hearths ratios compare with studies of sizes of households and architectural suites at larger pueblos (Holschlag 1975; Lowell 1991; Lightfoot 1992)?

Finally, are integrative facilities distinguishable by differences in treatment both during and after use? We may expect that structures serving as integrative facilities were more likely to have been remodeled or replaced on-site or nearby, and that they are less likely to have been systematically cleaned and stripped of usable materials at the time of abandonment than those structures that were apparently used only as domiciles.

Taken together, data obtained in pursuit of answers to these questions will be useful in defining Developmental period communities by providing data on several aspects of community structure. They will also be valuable in examining the level of community integration during the Developmental period. Understanding Developmental period communities, including their size, level of integration, and nature of integration, is critical to accurately examining post–Developmental period communities in the region. For instance, the transition from dispersed pit structures to small pueblos has been characterized as a process of population aggregation (Crown and Kohler 1994; Crown et al. 1996). However, if the dispersed pit structures were actually integral parts of communities, then the transition from a community of, say, 12 households living in pit structures to 3 households occupying a 10-room pueblo could represent, in a certain sense, population fragmentation. If the 3 households in the 10-room pueblo actually continue to be part of a larger community comprised of several small pueblos, then we have a potentially significant change in community integration and structure. Why do some households decide to congregate at a single location? If remodeling and structure replacement at integrative sites show relatively long-term use of a specific location for these activities, do the locations of small pueblos containing integrative features reflect the locations of earlier pit structure–community integrative facilities? Does the number of households congregated in a small pueblo replicate the number of households formerly contained by a small pit structure community? Does population congregation represent fragmentation of an earlier community or formalization of earlier integrative relationships? In order to begin to answer these questions we must understand the nature of Developmental period communities, their size, and their level of integration. These issues are a primary research focus at the project-area sites.

Examining Coalition and Classic Period Components

The prehistoric occupation of the southern Tewa Basin did not end with the conclusion of the Late Developmental period, despite the fact that no residential sites from the Coalition or Classic periods were identified in our project areas. While the villages occupied during these later periods are located outside project limits, the residents of those communities created and used many other sites in the region, including some that occurred as components on sites examined by this study. The later time periods are usually represented on our sites by a few Coalition or Classic period sherds, but in a few cases more substantial features were also identified. Two patterns of use are suggested for these components. Either they functioned as parts of the more extensive farming systems of the Coalition and Classic periods, or they represent specialized tasks that were not related to farming but required resources that might not be commonly found adjacent to villages.

Most of the Coalition and Classic period components seem to have functioned as parts of the farming system—primarily as temporary structures used while tending fields. Our examination of components related to use of the project area by Coalition and Classic period farmers mostly centers on the question of what comprises field structures and where some of the related fields were.

The presence of certain types of features is generally a good indication that an area was used for farming at some point in the past. Devices used to regulate and control the delivery of water to crops or to counter some of the environmental problems encountered by farmers are usually the most visible indicators of fields. They may include (but are not restricted to) canals and ditches, erosion-control devices like checkdams and contour terraces, and field areas defined by rock-bordered grids, both with and without gravel mulch.

Luckily, identification of prehistoric fields in the absence of definitive features is not an impossible task. For example, a low-frequency artifact scatter adjacent to a prehistoric canal segment near Pot Creek Pueblo in the Taos area—LA 71190—was thought to be a field (Moore and Levine 1994). Pollen transects obtained from this site yielded samples that contained high enough concentrations of corn pollen to substantiate its use as a corn field. A similar function was proposed for a moderate-frequency artifact scatter next to a seventeenth-century farmstead near Pecos Pueblo (Moore 2003b). Pollen samples obtained from a transect across this site (LA 76138) again yielded corn pollen in concentrations indicative of use as a corn field.

Since these earlier studies were successful in defining the location of fields in the absence of farming features, similar methods were applied to several sites in the Santa Fe to Pojoaque Corridor study, including LA 145398. Subsurface pollen transects were obtained from areas suspected to have functioned as fields because of their proximity to suspected temporary field structures or farming features. This sampling strategy was followed to help define the nature of suspected farming-related features and to help determine where some of the fields used during the prehistoric occupation of the region might have been. As such, this study was ancillary to the investigation of Coalition and Classic period farming structures, and no separate set of research issues was generated for it.

Conclusions

Admittedly, the data recovery plans developed for the prehistoric sites and components investigated during the Pojoaque South and Santa Fe to Pojoaque Corridor projects are ambitious, and some aspects of these plans may require data that were not available from our sites for successful consideration of test implications. Indeed, none of the research questions generated for the larger-scale study can be examined in any detail using the data provided by the three sites in this study. These research issues were designed for the examination of larger sites containing excavated residential structures and sizable artifact assemblages, and neither of these conditions applies to the sites examined here. However, these three small sites may provide some information that can aid in the examination of those larger issues. As such, they are ancillary to the larger study, but important in their own right in that they can provide some information on how and when they were used and, by extension, how they fit into the settlement and subsistence systems of which they were part. While few data that can be used to study community structure will be available from these sites, their structure, location, and artifact content may help in our examination of Wendorf and Reed's (1955) reconstruction of Northern Rio Grande prehistory.

Data Recovery at LA 390

Jeffrey L. Boyer

LA 390 measures 125 m east-west by 90 m north-south (Fig. 3) and encompasses about 0.9 ha (2.2 acres). It is on the south side of the north Pueblo of Tesuque Grant boundary fence, and it is bounded on the east by a narrow strip of land (15 m wide) with very few surface artifacts that separated LA 390 from LA 391. The distribution of surface artifacts makes it clear that the north edge of LA 390 has been impacted by construction and maintenance of an access road running along the north side of the boundary fence. It is also clear that only a small part of the site was so impacted. Immediately north and northwest of LA 390 are the sites investigated by the OAS as LA 740 and LA 750 (Moore [2003c]; Lakatos and Montoya [n.d.] provide histories of the identifications of those sites).

Data recovery investigations at LA 390 were limited to a 150 sq m area on the north side of the site, or only about 1.7 percent of the recorded site area (Fig. 3). Differential distribution of surface artifacts at the site points to several small (less than 20 m in diameter), tightly clustered, artifact concentrations in the eastern half of the site, and at least two larger, loosely clustered concentrations in its western half (Fig. 3). The larger concentrations correspond approximately to those recorded at the site in 1999 and thought to represent possible structural areas (Boyer and Lakatos 2000). All of these concentrations are surrounded by a scatter of artifacts.

Surface artifacts at LA 390 consist primarily of prehistoric ceramic and chipped stone artifacts (Fig. 3). The artifacts shown in Figure 3 reflect in-field identification rather than analysis. Most sherds on the site's surface are from plain gray vessels, although some corrugated sherds are also present. Temporally diagnostic ceramic types include Red Mesa Black-on-white, Kwahe'e Black-on-white (the most common type), Santa Fe Black-on-white, Biscuit A and B, Glaze A, and sherds from the Tewa Polychrome and White Mountain Red Ware series. These types indicate that the principal component at LA 390 dates to the Late Developmental period (ca. AD 900 to 1200) and that the site also includes less substantial Coalition period (ca. AD 1200 to 1350) and Classic period (ca. AD 1350–1600) components. It may be of interest, in this regard, that while gray ware and Kwahe'e Black-on-white sherds occur across the site, the Coalition- and Classic-period sherds are found primarily along the south side of the site. On the one hand, the ceramic types point to persistence in use of this particular place over a considerable length of time, at least three and a half and perhaps as many as six centuries. On the other hand, the distribution of later sherds, assuming that they approximately mirror the distribution of subsurface materials and associated features, may indicate that later occupations of LA 390 were placed on the perimeter of the older component. Further, there are far fewer sherds dating to the Coalition and Classic periods than those dating to the Developmental period, at least on the site's surface, suggesting that the later occupations were less intensive, shorter in duration, or both, than the Developmental period occupation.

Based on observations of surface artifacts, chipped stone materials at LA 390 are dominated by Pedernal chert. Other materials include generic cherts, quartzite, and obsidians from the Polvadera and other Jemez sources. In addition to the sherds and chipped stone artifacts, a fragment of a vesicular basalt metate was observed, as was a fragment of tabular schist with a flaked edge. Because previous excavations at nearby sites revealed that large (greater than 10 cm in diameter) cobbles and rocks are not common in the natural sediments and soils in this area (see strata descriptions later in this chapter), the locations of such cobbles and rocks were noted during site mapping. At least two concentrations of cobbles may represent locations of features associated with the site's various components.

Field Methods and Results

Before archaeological investigations at LA 390 began, the US 84/285 Tesuque north turnout area

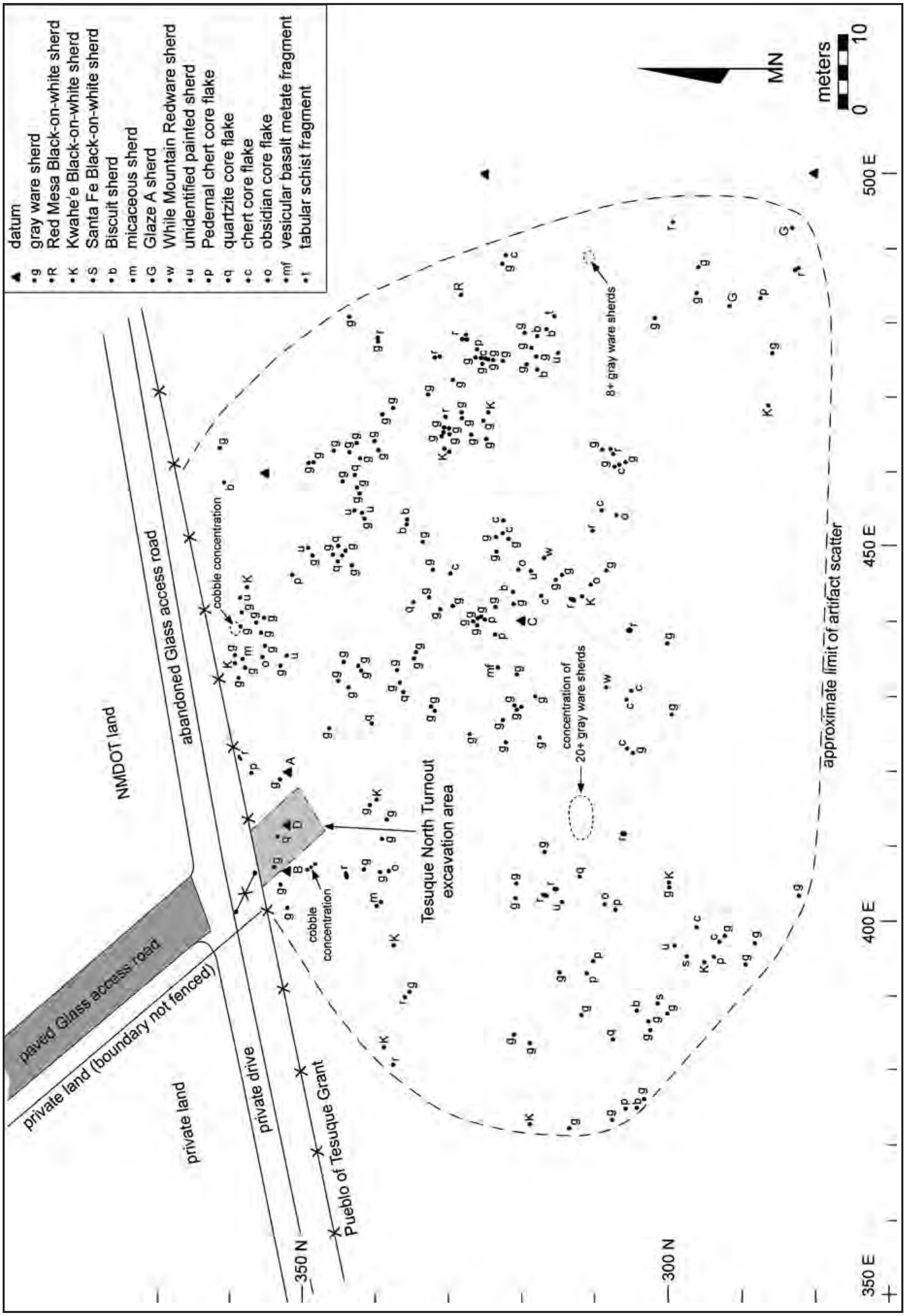

Figure 3. Plan of LA 390.

was staked by the NMDOT. Using existing datum locations at LA 391, the Cartesian grid established for investigations at nearby sites was extended to LA 390. Use of the same grid for horizontal and vertical controls allows the results of site mapping and excavations at the seven sites near the north Pueblo of Tesuque Grant boundary to be integrated for comprehensive examination of the development and use of this prehistoric site complex.

Following the data recovery plan prepared for the US 84/285 Tesuque east and north turnouts (Boyer 2004), exploratory investigations within the north turnout area consisted of a series of hand-excavated auger tests placed at 2 m intervals along the 352N and 412E grid lines (Fig. 4). Fill from each auger test was screened through 1/4-inch mesh. No artifacts were recovered from the 11 auger tests, and the tests did not reveal evidence of subsurface deposits or features. However, charcoal flecks were found between 40 and 50 cm below modern ground surface (bmgs) in 348N/412E, between 80 and 90 cm bmgs in 354N/412E, at 1.0 m bmgs in 350N/412E, and between 1.3 and 1.4 m bmgs in 352N/408E, 348N/412E, and 354N/412E. Based on these results, the decision was made to mechanically excavate a trench across the north turnout area to determine whether the charcoal flecks were natural or cultural in origin.

Prior to mechanical excavation, in order to determine whether artifacts were present in the topsoil that were not visible on the modern ground surface, a series of 1 by 1 m grid units was excavated along the 352N and 412E grid lines (Fig. 4). A single 10 cm level was excavated in each unit, and the fill was screened through 1/4-inch mesh. The 13 units yielded 12 artifacts, including 8 pieces of chipped stone and 4 sherds. No evidence of cultural deposits, features, or structures was encountered in the excavation units.

Stratigraphy

Following hand excavations, a single trench was mechanically excavated across the length of the turnout area (Fig. 4). The trench was 12 m long, 1 m wide, and 1.75 to 1.8 m deep. Figure 5 shows a profile of a representative portion of the northeast wall of the trench. The trench revealed a simple sequence of alluvial sediment and the formation of a single, modern soil horizon. Five strata were defined.

Stratum 1 is the modern topsoil (A horizon). It consists of strong, medium-coarse, blocky, silty clay, dark yellowish-brown (10YR4/4, moist), containing less than 5 percent (estimated) well-rounded fine sand and no gravels. It averages 12 cm thick, and its lower boundary is clear and wavy. Roots from surface grasses are very common. Clay films are not present. As discussed earlier, a few artifacts were recovered from the upper 10 cm of this stratum.

Stratum 2 is identified as the modern B horizon, although it is not appreciably different from Stratum 1. It also consists of strong, medium-coarse, blocky, dark yellowish-brown (10YR4/4, moist), silty clay containing less than 5 percent (estimated) subrounded fine sand and no gravels. It averages 23 cm thick, and its lower boundary is clear to gradual and wavy. Roots from surface grasses are very common. Clay films are not present. No cultural materials or charcoal were observed in this stratum.

Stratum 3 is the C horizon on which the soil comprised of Strata 1 and 2 is forming. It consists of a thick deposit of weak, medium, subangular-blocky, silty clay loam, light yellowish-brown (10YR6/4, dry), containing less than 2 percent (estimated) subrounded very fine sand and no gravels. Its clay content increases with depth, probably due to translocation. The stratum averages 85 cm thick. Its lower boundary is identified as abrupt and irregular-discontinuous because it was disturbed by alluvial channeling during early stages of deposition (Fig. 5). Very fine root pores are common, particularly in the upper portion of the stratum. Clay films are not present. Stratum 3 probably originated as mixed colluvium and alluvium. No cultural materials were observed. Charcoal flecks are occasionally present but are not likely cultural in terms of their deposition in the stratum.

Stratum 4 is a C horizon from an old soil whose A and B horizons were removed, probably by an alluvial event that also scoured the top of Stratum 4. It consists of structureless, soft, light yellowish-brown (10YR6/4, dry) loam containing less than 2 percent (estimated) subrounded very fine sand and no gravels. Because it was seen at the bottom of the backhoe trench (Fig. 5),

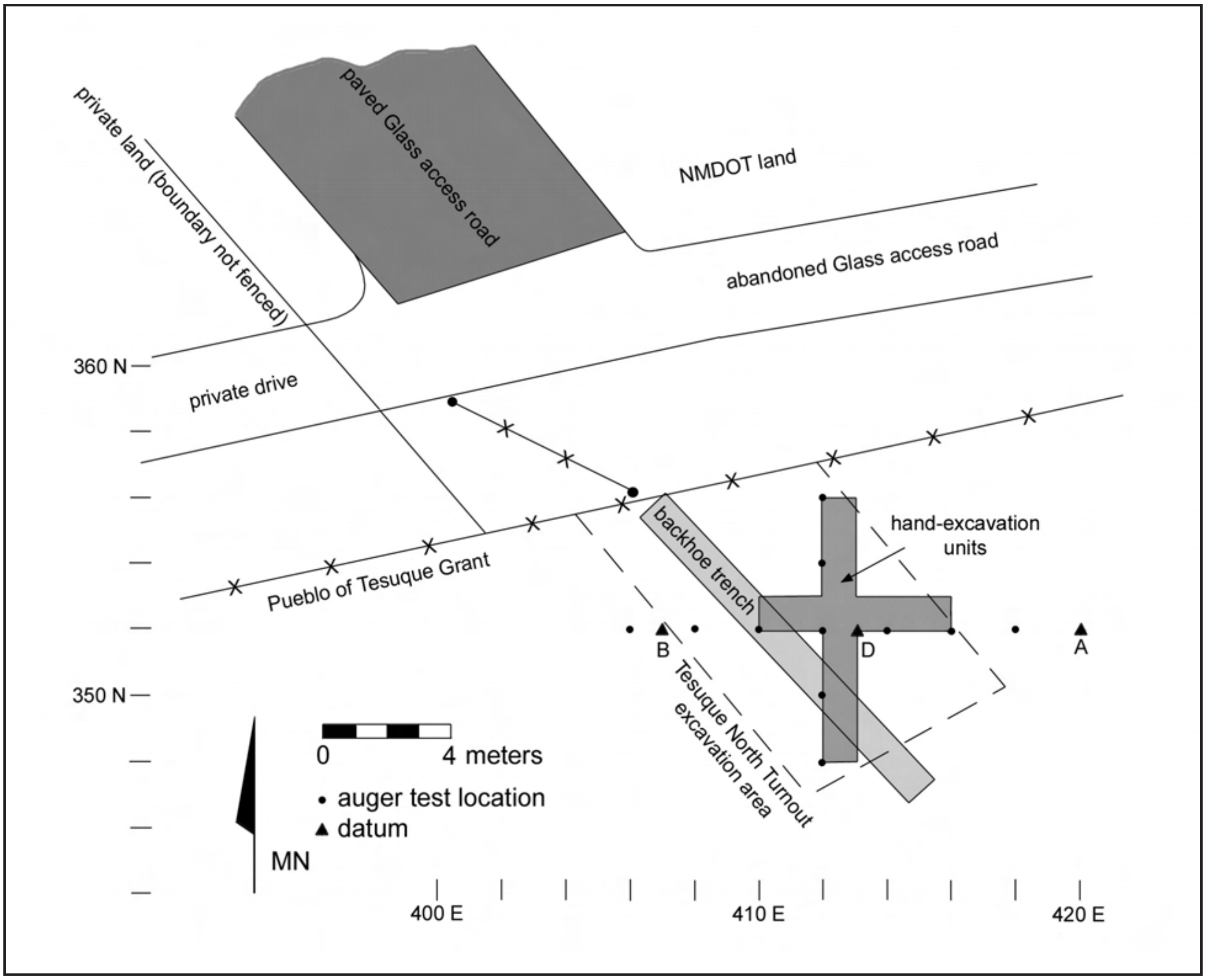

Figure 4. Excavation areas at LA 390.

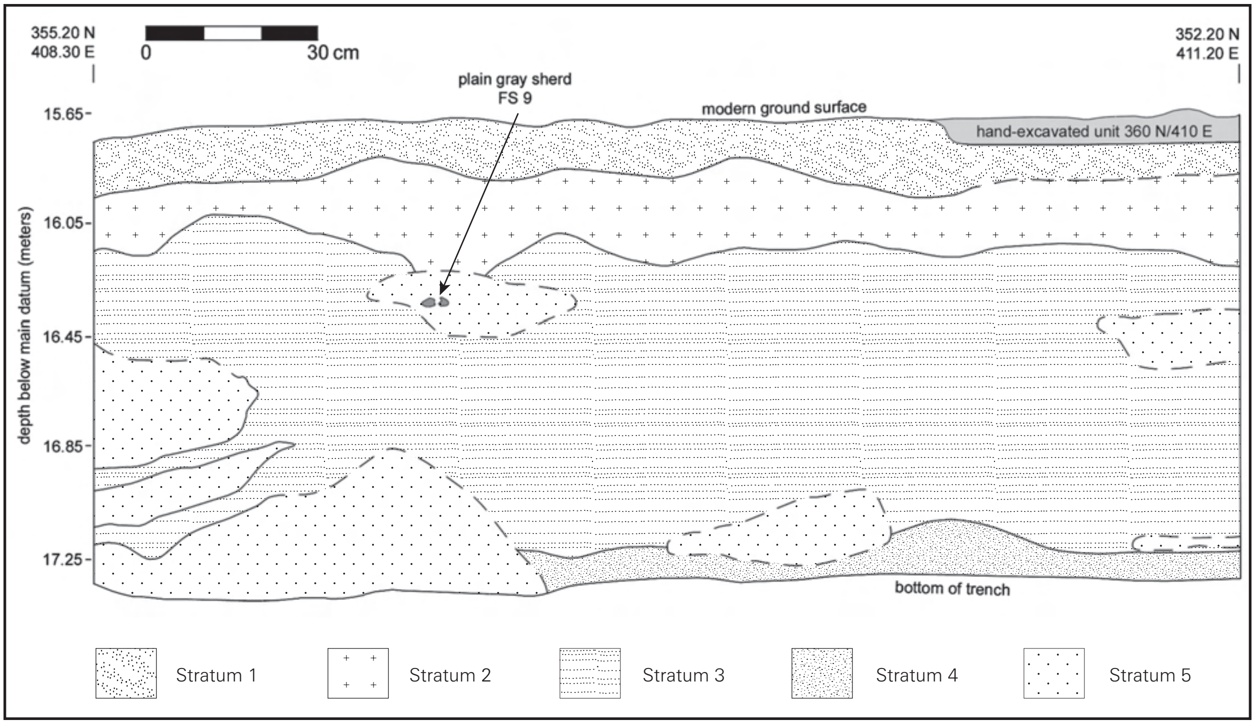

Figure 5. Profile of the northwest wall of the mechanically excavated trench at LA 390.

its thickness and the characteristics of its lower boundary are unknown. Stratum 4 probably originated as mixed colluvium and alluvium.

Stratum 5 consists of the sand and gravel fill of several alluvial channels (Fig. 5). In general, sands and gravels each make up about half of this stratum. Sands are coarse to very coarse and subrounded. Gravels range from granules to pebbles and are usually oblate. These alluvial sediments are generally very poorly sorted, attesting to the relatively high energy involved in their deposition. Horizontal bedding is generally thin to medium, and both thin and thick laminae are present in some lenses.

At the northwest end of the trench and the profile, a large channel was revealed at the bottom of the trench (Fig. 5). This channel resulted from an alluvial episode or event that cut through the lower part of Stratum 3 during its deposition and into the top of Stratum 4. Stratum 3 material was later deposited over this large channel, probably by colluvial and alluvial processes. A shallow depression was still present, however, since a smaller channel cut into the Stratum 3 material, almost to the top of the large channel. The smaller channel then filled with Stratum 5 sands and gravels. This process was repeated a second time, leaving a third, smaller channel that also filled with Stratum 5 sands and gravels.

Four other small channels occur at different elevations within Stratum 3, pointing to other alluvial events that disrupted deposition of Stratum 3 and created channels that filled with Stratum 5 sands and gravels. One of those channels contained a broken gray ware sherd (Fig. 5), which was collected. Considering the nature of the sediments and soils revealed in the backhoe trench profile, this sherd probably washed down from LA 391, which is immediately upslope from LA 390. Since LA 391 dates to the Late Developmental period, the deposition of Stratum 3 and the formation of the A and B horizons represented by Strata 1 and 2 reflect considerable time depth. However, the Strata 1 and 2 soil is poorly formed, probably reflecting thin vegetative growth in the site area and the consequential lack of organic material and relatively high instability of the developing ground surface.

Cultural Materials

Sixteen artifacts were recovered during the investigation of LA 390, including eight sherds and nine pieces of chipped stone.

Ceramic Artifacts

None of the sherds recovered during this study are of types that can be used to provide specific information on the age of the site. All eight specimens are body sherds from plain gray ware jars. Five of the sherds fit together, indicating that they are from the same vessel. The same temper, granite with abundant mica, was in all eight sherds. None of the sherds exhibit any polish on their interior or exterior surfaces. Five sherds fit together, all of which exhibit sooting on their interior and exterior surfaces. The other three sherds do not.

Chipped Stone Artifacts

The small chipped stone assemblage is dominated by quartzite—six of nine specimens (66.7 percent) fall into this material category, including five core flakes and one piece of angular debris. The three remaining specimens are a quartzitic sandstone core flake, a massive quartz core flake, and a chert core flake (11.1 percent apiece). All of the materials identified in this small assemblage are locally available in gravel deposits along intermittent streams. Four specimens (three quartzite and one quartzitic sandstone) retain some cortical coverage, and in each case that cortex is waterworn. The presence of this type of mechanical weathering indicates that the nodules from which these pieces of debitage were struck were obtained from gravel deposits found at a distance from their original sources, substantiating the previous statement concerning local availability. None of these artifacts show any signs of informal tool use.

Only two of the flakes in this assemblage (one quartzite and one chert) are whole; the others are fragments. The whole flakes are the only specimens that retain their striking platforms, and in both cases they are simple types that suggest removal from cores (cortical and multifacet platforms). The other specimens are medial (n = 3, 33.3 percent), distal (n = 2, 22.2 percent), and lateral (n = 1, 11.1 percent) fragments. Two medial fragments and one distal fragment were broken during removal from cores, while the three remaining specimens have nondiagnostic breaks that could have occurred at or after the time of removal.

Conclusions

Testing and data recovery investigations conducted in 2000, 2001, and 2003 at LA 391, immediately east of LA 390, revealed over 20 features, including human burials, hearths, and trash-filled pits, all associated with a thick stratum containing ash, charcoal, and artifacts (Boyer and Lakatos 2000; Boyer et al. 2001, 2003; Akins et al. 2003; Akins and Lakatos 2004). Data recovery investigations at LA 750, immediately northwest of LA 390, revealed a dispersed scatter of ceramic and chipped stone artifacts and one hearth, while investigations at LA 740 revealed a dispersed artifact scatter (Moore 2003c). Testing and data recovery investigations at LA 111326, southeast of LA 390, revealed a hearth near a ceramic and chipped stone artifact concentration, an extensive charcoal-bearing deposit, and another possible hearth near a second artifact concentration (Boyer and Lakatos 2000; S. Lakatos, pers. comm., 2004). In sum, the results of testing and data recovery investigations at the sites near LA 390 suggested that this site was likely to contain intact subsurface deposits, features, and structures. Consequently, like nearby sites, LA 390 had the potential to provide information relevant to research issues relating to prehistoric sites in the US 84/285 project areas (see Boyer and Lakatos 2000; Boyer 2003; Lakatos and Moore 2003; Moore et al. 2002; Boyer et al. 2003).

Investigations in the US 84/285 Tesuque north turnout area within LA 390, however, recovered few artifacts and revealed no evidence of cultural deposits, features, or structures in the part of the site that was investigated. Although characterization of natural sediments and soil in the turnout area provides information that should be useful for understanding natural and cultural deposits and features at nearby sites, the part of LA 390 in the north turnout area has no additional archaeological data potential. Since the north turnout area involved less than 2 percent of the site area, and given its location near the apparent northern edge of the surface artifact scatter, the results of data recovery investigations should not be seen as representative of the data potential of LA 390 as a whole.

Data Recovery at LA 111326

Jeffrey L. Boyer

LA 111326 is a large, multicomponent site on the west side of US 84/285 within the Pueblo of Tesuque Grant (Fig. 1). Surface artifacts are present only outside the existing right-of-way fence (Fig. 6), and the configuration of the site suggests that an unknown portion of the site was removed during highway construction in the 1930s or 1960s.

LA 111326 measures about 108 m long by 52 m wide and encompasses about 0.5 ha (1.2 acre). Within that area are two large surface concentrations of ceramic and chipped stone artifacts (Fig. 6). The larger, southern concentration is an irregularly shaped area about 22.2 m long by 14 m wide, encompassing about 257 sq m. Most of the artifacts in this concentration are associated with an area of shallow erosion (Hohmann et al. 1998:45), which indicates that more artifacts are present in the modern topsoil, and perhaps below it, than are evident on the modern ground surface. This possibility is perhaps supported by the similar configuration of the smaller, northern concentration, an elliptical area on the modern ground surface about 12.6 m long by 8.1 m wide and encompassing about 84 sq m. Surrounding the two concentrations is a sparse scatter of surface artifacts.

Ceramic types observed at LA 111326 include Kwahe'e Black-on-white (the most common painted type), Santa Fe Black-on-white, Biscuit A and B, types in the Tewa Polychrome series, and plain and corrugated gray wares. These types point to occupational components dating to the Late Developmental, Coalition, Classic, and perhaps historic periods (Boyer and Lakatos 2000). The principal component dates to the Late Developmental period (ca. AD 900 to 1200), like most of the sites in the immediate vicinity.

Chipped stone materials observed at LA 111326 include Pedernal and other cherts, quartzite, and obsidian from one or more of the Jemez sources. Hohmann et al. (1998:24) mention a sandstone metate fragment at the site; that artifact was not recorded during OAS investigations (Boyer and Lakatos 2000).

OAS investigations were conducted within the existing highway right-of-way in an area measuring 53 m long by 4 m wide (212 sq m), comprising about 4.2 percent of the recorded site area (Fig. 6).

Testing Field Methods and Results

During testing investigations at LA 111326 in October 1999, a primary site datum was established. The datum, assigned grid coordinates 500N/500E and the arbitrary elevation of 10 m below main datum (mbd), was used to maintain horizontal and vertical controls during testing and data recovery investigations at the site. A Cartesian grid oriented to magnetic north was then extended across the site (Fig. 6).

Three excavation methods were used during testing at LA 111326 (Boyer and Lakatos 2000). To examine the portion of the site within the existing highway right-of-way adjacent to the two artifact concentrations, two transects of auger tests were excavated by hand within the right-of-way, parallel to the right-of-way fence. Since the auger tests were not oriented to the site grid, the tests in each transect were assigned consecutive numbers from northwest to southeast. Within each transect, auger tests were placed at 4 m intervals. The two transects were 2 m apart, and their auger tests were offset from each other by 2 m. Fill from each test was screened through 1/4-inch mesh.

Of the 25 auger tests in the two transects, 11 yielded scattered charcoal flecks at depths between 10 and 60 cm below the modern ground surface, typically between 10 and 40 cm below the modern ground surface (Fig. 6). This is the upper portion of Stratum 2 at the site. With one exception, these tests were in the site area just northeast of the two artifact concentrations. Two auger tests in Transect 1 (Auger Tests 3 and 9) revealed deposits of dark, charcoal-stained sediment between 10 and 40 cm below the modern ground surface (Fig. 6). Auger Test 3 was imme-

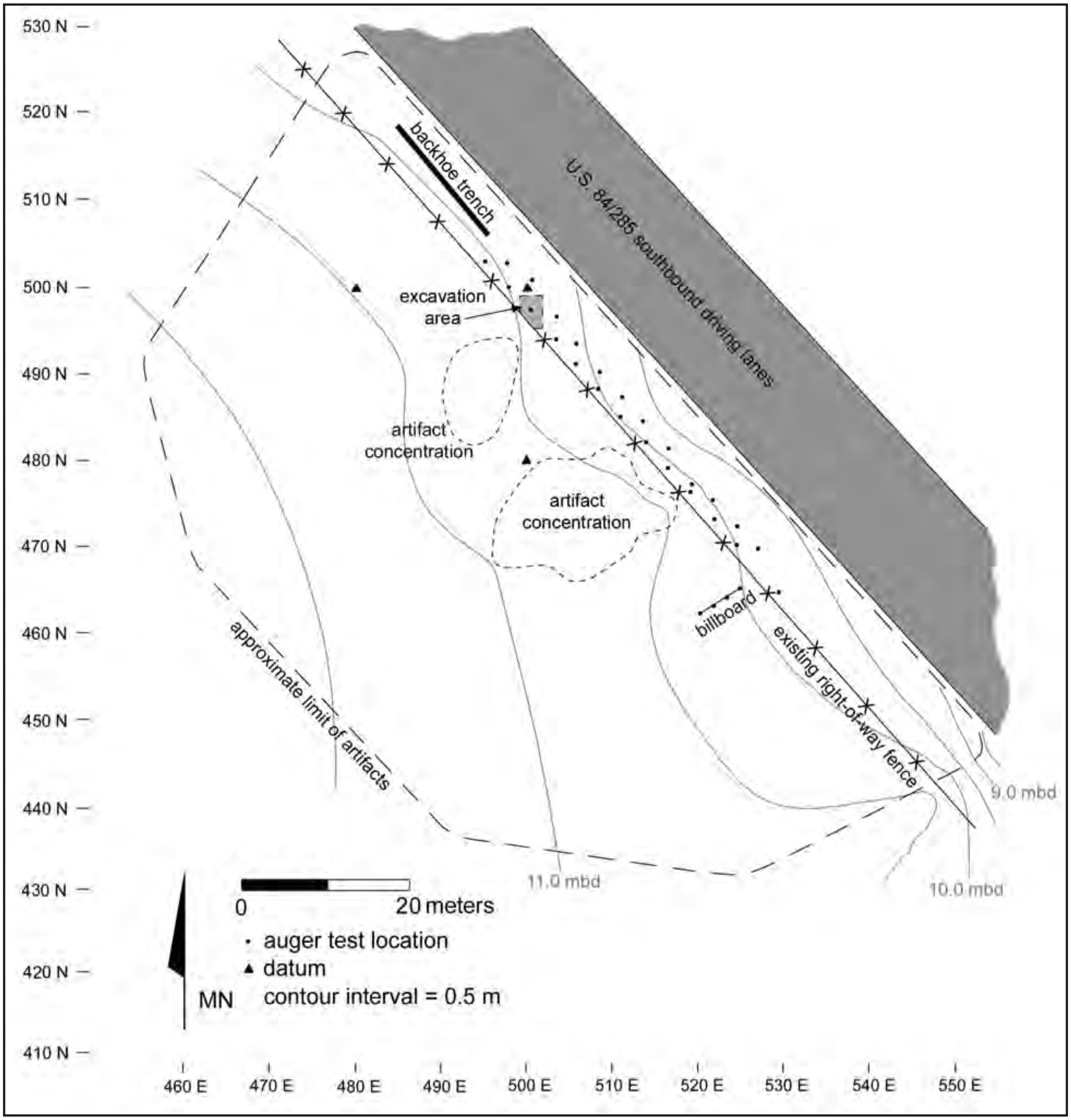

Figure 6. Plan of LA 111326.

diately northeast of northern artifact concentration; Auger Test 9 was immediately northeast of the southern concentration.

To determine the source(s) of the scattered charcoal encountered in auger tests, one trench was mechanically excavated parallel to the existing right-of-way fence, within the right-of-way (Fig. 6). The trench was 15.0 m long, 0.65 m wide, and a maximum of 1.4 m deep. No intact subsurface artifact-bearing deposits, features, or structures were identified; scattered charcoal flecks were observed in the exposed natural strata, but their source was not evident. Examination of soil and sediment strata at nearby LA 390 showed that charcoal flecks are present in natural sediments at that site and are probably natural in origin. This may also be the case at LA 111326, although charcoal was more common in those auger tests nearest the artifact concentrations.

To identify the nature of the charcoal-stained deposits encountered in Auger Tests 3 and 9 of Transect 1, two adjacent 1 by 1 m grid units encompassing Auger Test 3 were selected for hand excavation (Boyer and Lakatos 2000:32). Both units were excavated in 10 cm levels, and their fill was screened through 1/4-inch mesh. Grid Unit 497N/500E was excavated to 40 cm below the modern ground surface. One sherd, the only artifact recovered during investigations at LA 111326, was found in Level 2. This unit also revealed that the charcoal-stained deposit was the fill of a large thermal feature, designated Feature 1. Grid Unit 496N/500E was then excavated to 30 cm below the modern ground surface to define the southern extent of the feature. These units suggest that the deposit encountered at a similar depth in Auger Test 9 also reflects the presence of a thermal feature.

Stratigraphy

Test excavations at LA 111326 revealed that the site's stratigraphy is comprised of two sediment layers.

Stratum 1 is a thin (less than 10 cm), compacted layer of redeposited material associated with highway construction and use of the highway shoulder for access to a nearby billboard. It is pale brown (10 YR 6/3, dry) and consists of silty sand containing coarse sands and gravels. Modern trash is present. Stratum 1 is probably not present outside the right-of-way.

Stratum 2 is a thick, moderately consolidated layer of very pale brown (10 YR 7/4, wet) clay loam containing scattered flecks of charcoal and some gravels. A single sherd was recovered from the uppermost level of this stratum. Stratum 2 is probably composed of mixed colluvial and alluvial sediments. Testing investigations did not define evidence of modern or older soil formation, although such evidence is probably present at LA 111326, as it is at nearby sites.

Data Recovery Field Methods and Results

When the OAS returned to LA 111326 in July 2000, the grid units excavated during testing were relocated, and backfill material was removed. A group of nine 1 by 1 m grid units surrounding the test pits were excavated by hand to confirm the size of Feature 1, determine whether other features were present near Feature 1, and recover artifacts in the vicinity of the feature (Fig. 7). Grid Unit 498N/501E was excavated in one 10 cm level, and its fill was screened through 1/4-inch mesh. Since no artifacts were recovered, mirroring the results of the two testing units, the remaining eight units were stripped to 30 cm below the modern ground surface, the depth of Feature 1; their fill was not screened. No other features were encountered, and no other artifacts were recovered, although over half of the units contained modern trash in their upper 10 cm (Stratum 1).

When the horizontal extent of Feature 1 was confirmed (compare Boyer and Lakatos [2000:32] with Fig. 8), the feature fill north of the 497N grid line was excavated by internal stratigraphic layers and screened through 1/8-inch mesh. The resulting profile was drawn (Fig. 8), and the remaining fill was removed and screened. A plan view and cross section were drawn, and the feature was photographed and recorded. Four samples of the feature fill were collected for flotation processing and analysis.

Feature 1

Feature 1 was a large thermal feature measuring 1.4 m long by 1.1 m wide, with a maximum depth of 26 cm (Fig. 8). The feature was constructed by excavating a shallow basin into natural sediments (Stratum 2). Its nearly vertical sides were not lined with mud or rocks. The bottom of the south half of Feature 1, which was relatively flat (Fig. 8), was covered with burned cobbles. None of the cobbles were fire-cracked, suggesting that heat in the feature was not high enough to crack the cobbles and that the feature was not reused. This conclusion is perhaps supported by the fact that only two small portions of the feature's side and rim were oxidized (Fig. 8). They could not be sampled for archaeomagnetic dating.

The bottom of the north half of Feature 1 was more basin-shaped than the south half (Fig. 8) and was not covered with cobbles. This may indicate that the feature's halves were used differently, although that possibility cannot be confirmed. The fill of Feature 1 was identified as Stratum 3, a very dark gray (10 YR 3/1, wet) silty loam containing a few small gravels and abundant small pieces of charcoal.

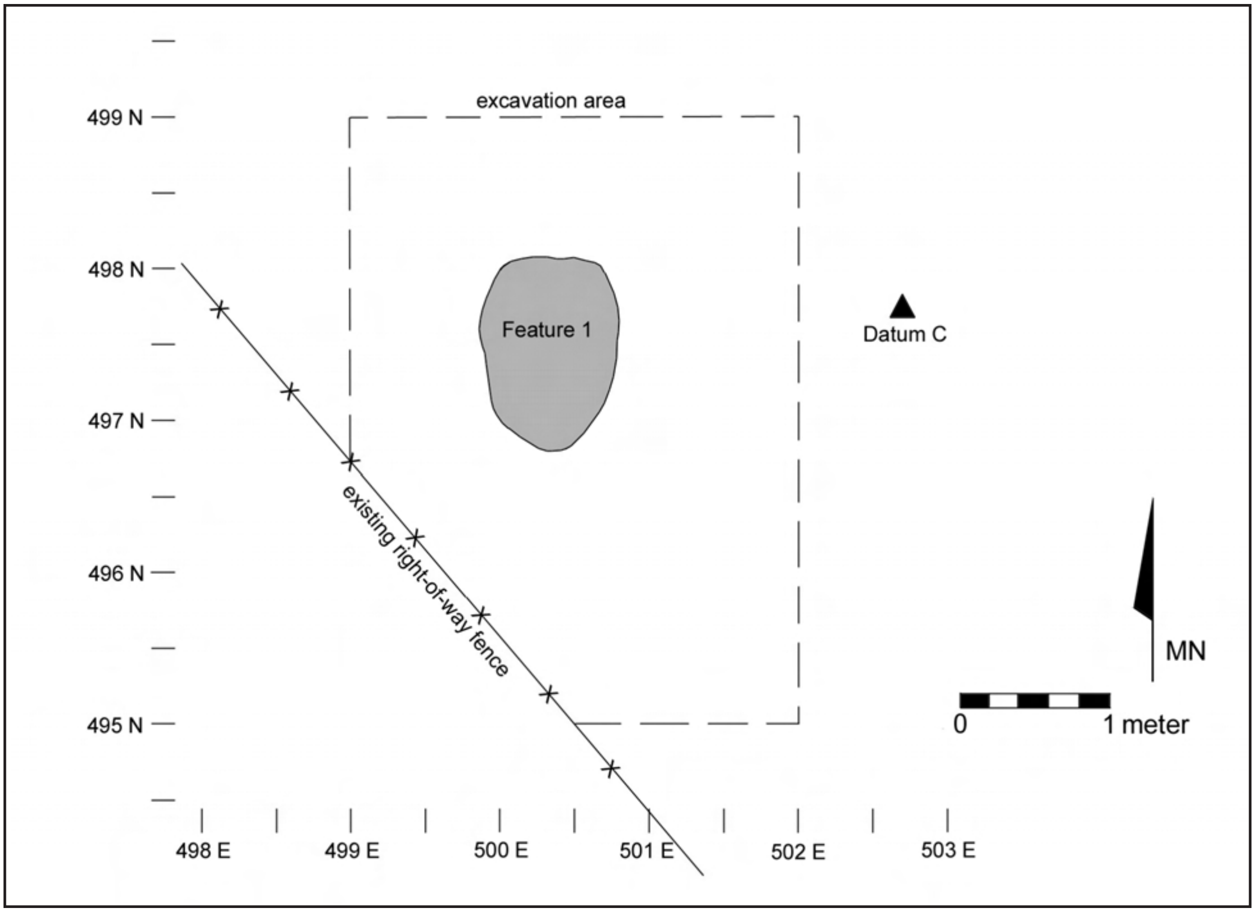

Figure 7. Excavation area at LA 111326.

Cultural Materials

One sherd from a plain gray ware vessel was recovered from Level 2 (10 to 20 cm) in Grid Unit 497N/500E. Level 2 was the upper part of Stratum 2 in that unit. No artifacts were recovered from samples of the Feature 1 fill.

Table 2 lists wood charcoal taxa recovered from flotation processing and analysis of samples obtained from the fill of Feature 1. Over one-third of the material is juniper (*Juniperus* sp.), all of which came from one sample in the south half of the feature. A single piece of piñon (*Pinus edulis*) was present in a sample from the north half of the feature. The remaining charcoal, over one-half of that recovered from the feature and found in three samples, is saltbush or greasewood (*Atriplex/Sarcobatus*). It was apparently the dominant fuelwood used in the feature.

Table 3 lists the noncharcoal plant remains recovered from flotation samples from the feature fill, in frequencies standardized for sample sizes. Those remains listed as noncultural, principally *Chenopodium* seeds, are unburned and were probably introduced into the feature fill by natural processes after the feature's abandonment. Of the cultural remains, the most prominent, although not abundant, are burned fragments of saltbush (*Atriplex canescens*) fruit. Given the dominance of saltbush charcoal in the feature, it is likely that the fruit came from wood burned in the feature. Saltbush produces fruit in the late summer and early fall, suggesting the feature was used at that time of year.

Conclusions

Testing and data recovery investigations at LA 111326 revealed one thermal feature, not unlike those encountered nearby at LA 750 (Moore 2003c) and LA 391 (Boyer et al. 2001; Akins et al.

Figure 8. Plan and profiles, Feature 1, LA 111326.

Table 2. Wood charcoal taxa in flotation samples, Feature 1, LA 111326

Taxon No. of pieces Weight (g)	FS 3, South ½	FS 5, North ½	FS 7, North ½	Total Weight (g)	 Percent by Weight
Conifers					
Juniperus sp.	5	-	-	0.7	38.9
	0.7	-	-		
Pinus edulis	-	-	1	0.1	5.6
	-	-	0.1		
Total conifer	5	-	1	0.8	44.4
	0.7	-	0.1		
Nonconifers					
Atriplex/Sarcobatus	15	20	19	1	55.6
	0.28	0.33	0.39		
Total	0.98	0.33	0.49		

Table 3. Other plant taxa in flotation samples, Feature 1, LA 111326

Taxon	FS 3, South ½	FS 5, North ½	FS 7, North ½	FS 8, Bottom
Noncultural*				
Annuals:				
Chenopodium	-	62.3	-	-
Grasses:				
Sporobolus	-	-	-	0.4
Other:				
Salvia	-	0.6	-	-
Cultural*				
Annuals:				
Cheno-am	-	-	-	0.4
Grasses:				
Sporobolus	0.7	-	-	0.9
Other:				
Salvia	-	0.6	0.9	-
Unknown	-	0.6 pp*	-	-
Perennials:				
Atriplex canescens	1.5 fruits	-	-	0.9 fruits

* Noncultural remains are not charred. Cultural remains are charred unless indicated otherwise. Plant remains are seeds unless indicated otherwise.
pp = plant part

2003). The feature was probably used once during the late summer or early fall, when saltbush, the principal fuelwood used in the feature, produces its fruit. Variation in the shape of the feature's bottom and in the distribution of cobbles within the feature suggest variation in use of its north and south halves, a possibility that cannot be confirmed on the basis of plant remains recovered from the feature fill. Only one artifact, a plain gray ware sherd, was recovered during investigations at the site. It was not directly associated with Feature 1 but came from a level above the feature. No date can be inferred for the feature, and on the basis of these investigations it cannot be associated with one or more of the site's temporal components.

The results of testing and data recovery at LA 111326 do show that the site is likely to contain other intact subsurface features—another one may have been revealed during auger testing—as well as subsurface deposits and, perhaps, structural remains, probably associated with the artifact concentrations. Consequently, like nearby sites, LA 111326 has the potential to provide information relevant to research issues identified for prehistoric sites in the US 84/285 project areas (Boyer and Lakatos 2000; Boyer 2003; Lakatos and Moore 2003; Moore et al. 2002; Boyer et al. 2003).

Investigations at LA 111326 in 2000 were halted at the direction of the NMDOT before the possible feature revealed by Auger Test 9 in Transect 1 could be examined. Because of the site's information potential, including that portion within the existing highway right-of-way, additional investigations at the site may be necessary before future land-disturbing activities within or outside of the existing right-of-way.

Data Recovery at LA 145398

James L. Moore

Before this study, no archaeological sites were recorded where LA 145398 was identified, though Hohmann et al. (1998) found three isolated occurrences (IOs 217–219) in the same general vicinity during their survey of the Santa Fe to Pojoaque Corridor for the NMDOT. These artifacts were probably associated with LA 145398. IO 217 contained 13 Tesuque gray jar sherds, probably from the same vessel, and 4 chert flakes. A quartzite core tool and 3 gray ware sherds were found at IO 218, and IO 219 was an isolated Red Mesa Black-on-white sherd. IO 217 appears to have been in the vicinity of a possible structure defined during the present study (Structure 2), and it was outside construction limits. Neither of the other two isolated occurrences were definitely relocated, but both appear to have been part of the general scatter noted at LA 145398 outside the east turnout location.

The current study consisted of two levels of investigation at LA 145398—initial survey and preliminary testing—followed by a data recovery study within the east turnout. The survey began with a pedestrian examination of the east turnout, the boundaries of which were staked prior to our study by the NMDOT. Several ceramic and chipped stone artifacts were found within the east turnout during survey, indicating the presence of a previously unrecorded archaeological site. Our examination of the general turnout location was then expanded to allow us to define the limits of the site and record any visible associated cultural features. Subsurface investigations, confined to the area inside the staked limits of the turnout, were used to help determine whether potentially significant cultural features or deposits existed there. Though the survey recorded several features considered capable of yielding important information on the prehistoric occupation of the Tesuque Valley, they were all outside the turnout location.

Three areas of modern disturbance were identified at LA 145398. An abandoned unimproved dirt road parallels the existing US 84/285 right-of-way in this area, directly adjacent to and east of the right-of-way fence. This modern feature, which appears as a drainage on the east side of the US 84/285 right-of-way in Figure 9, ran through the southwest part of the turnout. A low berm at the south end of LA 145398, about 10 m from the south edge of the turnout, seems to have been built to slow erosion on the abandoned road. The third disturbance was less extensive. It consisted of the former location of a billboard hung on three round wooden posts that were cut off flush with the current ground surface (Fig. 9).

The Survey of LA 145398

Initial examination of the east turnout revealed a low-density artifact scatter. A more intensive study identified several related features, and this area was defined as an archaeological site and assigned the number LA 145398. The area encompassed by LA 145398 measures 130 m north-south by 60 m east-west and covers about 7,800 sq m (0.78 ha). The site is bordered on the north by an arroyo that is tributary to the Rio Tesuque, on the east by an alignment of junipers, on the south by an artificial berm, and on the west by the US 84/285 right-of-way (Fig. 9). The Rio Tesuque Valley opens out in this area and is bordered on the west by the Rio Tesuque and on the east by rough broken lands.

The survey identified at least two temporal components at LA 145398 and perhaps as many as four. Component 1 includes two possible structures and several possibly associated features. Structure 1 is a rectangular arrangement of cobble alignments measuring 2.75 by 2.4 m that seems to be the remains of a foundation for a single-room structure (Fig. 10). Structure 2 is a 3 by 1 m concentration of cobbles that could represent the remains of a surface structure, though this is uncertain (Fig. 9). Features associated with this component include three small cobble clusters (Features 1–3), a possible cobble alignment (Feature 4), a charcoal stain (Feature 5), and a scatter of ceramic and chipped stone artifacts.

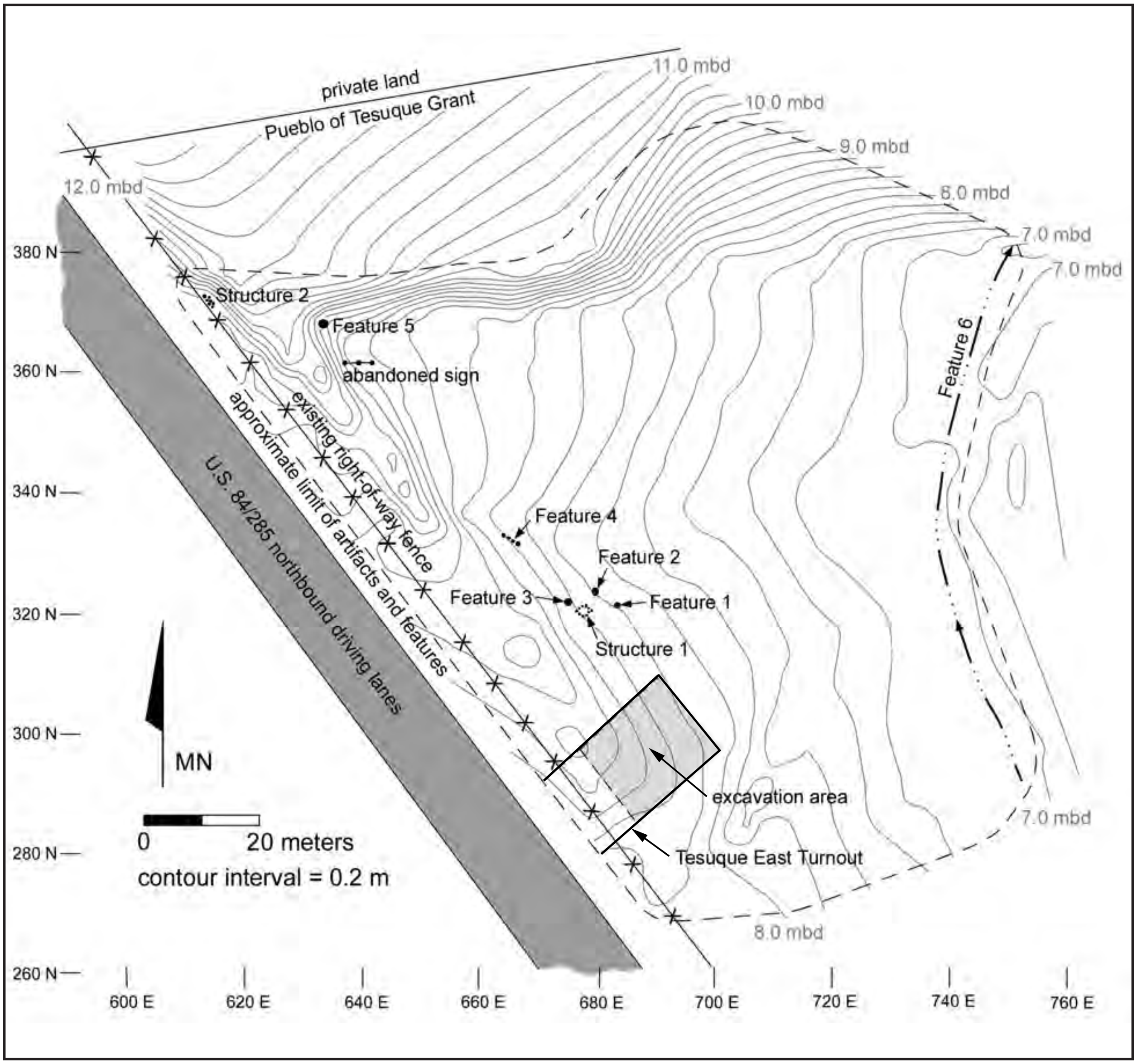

Figure 9. Plan of LA 145398.

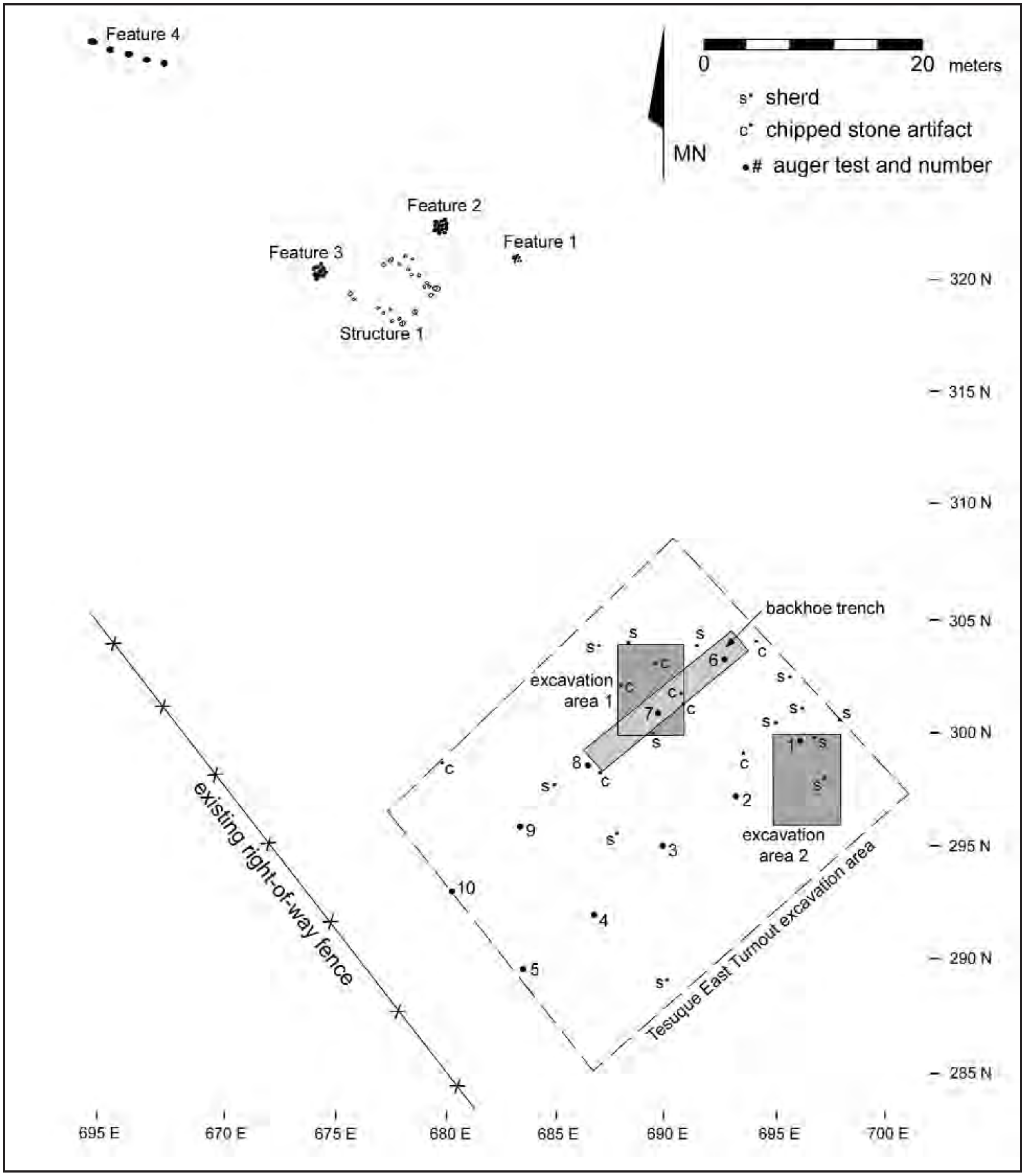

Figure 10. Plan of the part of LA 145398 around the east Tesuque turnout.

Feature 1, a surface cluster of cobbles measuring 0.74 by 0.50 m, is about 3 m east of Structure 1 (Fig. 10). Eight small granite and quartz cobbles, each measuring 5–10 cm in diameter, are visible on the surface of Feature 1. Feature 2 is a slightly larger cluster of rocks about 2 m northeast of Structure 1 (Fig. 10). There are 25+ granite and quartzite cobbles visible on the surface of Feature 2, and these cobbles were somewhat larger than those in Feature 1, ranging between 5 and 20 cm in diameter. Feature 3, about 1.5 m west of Structure 1, is another cluster of rocks measuring 0.9 by 0.8 m (Fig. 10). At least 15 granite cobbles 5–20 cm in diameter are visible on the surface.

The function of these rock clusters is uncertain. While they could represent the remains of hearths, none of the visible elements showed any evidence of burning, and no associated charcoal or ash was noted. The rock clusters were more likely associated with farming use of the area, perhaps representing small field markers or stockpiles of cobbles removed from cultivated plots. If the rock clusters functioned in this way, their association with Component 1 becomes questionable, as is discussed later.

Feature 4, an alignment of cobbles measuring 4 by 0.5 m, is about 13 m northwest of Structure 1 (Fig. 10). This alignment could be the remains of another, more ephemeral structure, but this is unlikely. Feature 5 is a small charcoal stain near the top of an arroyo cut at the north edge of LA 145398 (Fig. 9). This stain is 30–40 cm below the current ground surface, and since only a small section was visible, its size could not be determined. Feature 5 may represent a hearth associated with the main occupation of LA 145398, but the depth at which it occurs beneath the modern ground surface could indicate an earlier period of occupation.

Though a scatter of ceramic and chipped stone artifacts covers the entire site area, it is densest in the vicinity of Structure 1 and the east turnout. Several Kwahe'e Black-on-white sherds were noted in these areas, suggesting that the main occupation of LA 145398 occurred during the Late Developmental period. The occurrence of a Santa Fe Black-on-white sherd in a disturbed area south of Structure 2 may indicate an occupation that continued into the early part of the Coalition period. Conversely, it might suggest a later period of use and could be related to the nearby Structure 2, though this is questionable, since no other temporally diagnostic sherds were seen in that part of the site.

The second component consists of a probable canal segment (Feature 6; Fig. 9) that runs along the east boundary of the site and is covered by a fairly dense growth of junipers. This band of junipers is perhaps 15–20 m wide and follows the alignment of the canal segment. Spoil from the construction of this feature occurs in places along its length and is visible as low berms containing gravels and cobbles from subsurface contexts. The stratum that contained the cobbles and gravels was encountered during data recovery and is described later in this chapter. Between the berms is a shallow swale (10–40 cm deep) in which gravels and cobbles only rarely occur. Elsewhere the canal segment is visible as linear deposits of gravels and cobbles adjacent to the shallow swale.

The low-density artifact scatter that comprises most of LA 145398 continues up to the edge of the canal segment, and a few temporally diagnostic sherds were noted in that area. Several pieces of pottery dating to the Classic period occurred in a 10–15 m wide zone west of the canal segment, including two Biscuit A, two Biscuit B, and one Potsui'i Incised sherds. Since no other sherds diagnostic of a Classic period occupation were initially found at LA 145398, this distribution suggested that the canal was a Classic period feature, and by extension the land to the east and west of it was used for farming during the same period. Thus, the rock piles that were initially assigned to the Late Developmental period component because of their proximity to Structure 1 might actually be associated with this later component. Though the canal (Feature 6) runs along the east boundary of LA 145398, a low-density scatter of cultural materials continues past the canal to the east, punctuated in places by occasional large cobbles or small boulders that were obviously out of place and probably represent prehistoric field markers. A few similarly placed large cobbles or small boulders were also noted within the boundaries of LA 145398.

Thus, the first of the two definite components defined at LA 145398 dates to the Late Developmental period and may indicate residential use of this area. If so, then this component was probably contemporaneous with the occupation of LA 388, LA 390, and/or LA 391. One and possibly two small surface structures may have been used during this occupation. While the presence of a pit structure at LA 145398 is also a possibility, no evidence of such was noted during survey or data recovery, so we cannot assume that there was also a subsurface residential structure at this location. The second definite component was an agricultural use represented by the canal segment, a few Classic period sherds, and displaced large cobbles or small boulders that occasionally occur throughout the site area. A Santa Fe Black-on-white sherd may indicate a third component, but this is uncertain. Feature 5 may represent a fourth component, since it occurs below the depth of the structural foundations and rock pile features, but without more detailed study this is uncertain and cannot be assumed.

The possibility that the two potential structures represent fieldhouses associated with Classic period farming use of LA 145398 cannot be ruled out, but this was not considered likely during the initial examination of the site because the Classic period sherds seemed restricted to a fairly narrow zone adjacent to the canal segment, and none were identified in the denser part of the artifact scatter around and south of Structure 1, where the only diagnostic pottery found consisted of Late Developmental period types. At present, this would seem to corroborate our initial impressions—that the main residential occupation was during the Late Developmental period and the Classic period use was essentially restricted to farming.

Testing and Data Recovery at LA 145398

The east turnout was in the densest part of the LA 145398 artifact scatter, and because of this the turnout location required further study before construction could begin. Despite the fact that this was the densest part of the artifact scatter, the turnout contained fewer than 0.1 artifacts per square meter. Thus, we expected to find few or no subsurface deposits or features. A data recovery phase was initiated within the limits of the turnout construction zone without further investigation, because this possibility was covered in the treatment plan (Boyer 2004).

Field Procedures

As discussed in the chapter on data recovery field methods, an EDM was used to establish a subdatum at LA 145398 that tied this site into a Cartesian coordinate system used for a nearby cluster of sites investigated during earlier phases of the Santa Fe to Pojoaque Corridor project. The coordinates for the main subdatum at LA 145398 were 305N/703E. All further mapping of LA 145398 was accomplished with an optical transit and originated at this subdatum.

All artifacts identified on the surface within the turnout were point provenienced and collected. Two parallel auger test transects were excavated, constituting the limited testing phase. The first transect paralleled the south boundary of the turnout at a distance of 4 m, beginning 2 m west of the east edge of the turnout (Fig. 10). The second transect paralleled the first, 5 m to the north. Auger tests were spaced 4 m apart within transects. Most of the auger tests were only able to penetrate 50–70 cm below the surface before they were stopped by a layer of gravels and cobbles. Only two auger tests were able to penetrate this layer (Auger Tests 6 and 7).

The results of auger testing are shown in Table 4. For the most part, the soil layers encountered by augering were fairly consistent across the turnout location, though with some localized variation. In addition to the types of sediments encountered, this suggested a series of alluvial layers that were probably deposited as the arroyo to the north of LA 145398 migrated across this area. Charcoal was noted in the only two auger tests that were able to penetrate the layer of gravels and cobbles about 0.5 m below the surface. In both cases the charcoal was found more than 170 cm below the modern ground surface, and only a few flecks were noted in both instances. The question of whether the charcoal was of cultural or noncultural origin could not be answered with the data available from these small exposures.

Because the initial survey of LA 145398 had suggested that this area served as a field at some time in the past, pollen samples were obtained from five auger holes. Samples of this type have been successfully used in the past to establish

Table 4. Auger tests, LA 145398

Auger Test	Level	Depth (cm)	Contents	Cultural Materials (cm)
1	1	0-62	loamy sand, some pea gravels	none
	2	62-70	fine sand, gravels, and pea gravels	none
2	1	0-35	loamy sand, some pea gravels	none
	2	35-40	gravels	none
	3	40-67	fine sand, gravels, and pea gravels	none
3	1	0-21	loamy sand, some pea gravels	none
	2	21-32	sandy clay loam	none
	3	32-63	fine sand, gravels, and pea gravels	none
4	1	0-25	loamy sand	none
5	1	0-20	loamy sand	none
	2	20-30	pea gravels	none
	3	30-55	sandy clay loam	none
6	1	0-20	loamy sand	none
	2	20-25	loamy sandy clay	none
	3	25-65	fine sand, gravels, and pea gravels	none
	4	65-84	fine sand, many gravels, and pea gravels	none
	5	84-190	silty sand, some pea gravels	charcoal @ 170-190
7	1	0-60	loamy sand	none
	2	60-120	silty sand, many gravels, and pea gravels	none
	3	120-186	silty sand, some pea gravels	charcoal @ 174
8	1	0-10	loamy sand	none
	2	10-35	sandy clay	none
	3	35-58	fine sand, gravels, and pea gravels	none
9	1	0-26	loamy sand	none
	2	26-51	fine sand, pea gravels	none
10	1	0-25	loamy sand	none
	2	25-52	clay	none
	3	52-98	fine sand, pea gravels	none

that certain areas were used as fields (Moore 2003b; Moore and Levine 1994), and similar sampling methods were used at LA 145398. Pollen samples were obtained from Auger Tests 1–3, 6, and 7 at depths of 10–20 cm below the modern ground surface.

Because a number of artifacts were found on the surface of the turnout, and charcoal was noted in two auger tests, a data recovery phase was initiated. Even though the possibility of encountering buried cultural deposits or features was low, a more detailed evaluation of this part of LA 145398 was necessary to demonstrate whether or not such deposits actually existed. Though definite cultural materials were not found below the modern ground surface during augering, the occurrence of artifacts on that surface could indicate the presence of a thin layer of cultural deposits from which the visible artifacts had eroded and been exposed.

With this possibility in mind, two areas were surface stripped to determine whether or not cultural deposits occurred within the turnout. These areas are shown in Figure 10; both encompassed 12 sq m. Excavation Area 1 (EA-1) was between the 300N–304N and 688E–691E grid lines, while Excavation Area 2 (EA-2) was between the 296N–300N and 695E–698E grid lines. Most of the small number of surface artifacts occurred in these areas, and they seemed the most likely places to find subsurface cultural remains. Following the examination of the two excavation areas, a trench was mechanically excavated through EA-1 to confirm our findings and allow a more detailed inspection of the deeper zone, which had produced a few flecks of charcoal during augering, to determine whether or not those materials were of cultural derivation.

Results of Excavation

The loose surface soils were removed from both excavation areas and screened through 1/4-inch mesh hardware cloth to recover all visible artifacts. The surface layer was designated as part of Stratum 1, the uppermost layer of soil at LA 145398. Grid units in EA-1 were excavated to depths of 7.75–11.50 cm below the surface, with an overall mean depth of 10.2 cm. Grid units in EA-2 were excavated to depths of 7.75–11.75 cm below the surface, with an overall mean depth of 8.5 cm. Three pieces of chipped stone were recovered from EA-1, and no artifacts were found in EA-2. Each of the three chipped stone artifacts recovered from EA-1 came from different grid units (contiguous in two cases), and one of the three was only partly buried. These results suggested that cultural materials in the part of LA 145398 included within the turnout were basically restricted to the surface, and no intact cultural deposits or features are present in this area.

As noted above, a deep trench was mechanically excavated to verify these conclusions. Backhoe Trench 1 (BT-1) was excavated parallel to the long axis of the turnout and bisected EA-1 where the few subsurface artifacts were recovered, extending through two of the grid units that yielded subsurface chipped stone artifacts. The trench, 3 m long by 0.75 m wide by 2.2 m deep, encountered no cultural deposits, features, or structures.

Stratigraphy at LA 145398

Four soil strata were defined in the south wall profile of BT-1 at LA 145398 (Fig. 11). Stratum 1 is a 50–60 cm thick layer of loamy clayey sand, corresponding to the upper layer of loamy sand containing some pea gravels found in most of the auger tests. These materials appear to have been deposited by low-energy alluvial activity. The upper 10–15 cm of Stratum 1 are darker than the rest of this soil layer and represent a modern A soil horizon, with the remainder of the stratum probably representing a B soil horizon. Stratum 2 is a 25–40 cm thick layer of silty sand containing 20–30 percent pea gravels, gravels, cobbles, and small boulders. These materials represent unconsolidated high-energy fluvial deposits. Most of the auger tests failed to penetrate through Stratum 2.

Stratum 3 is a 65–75 cm thick layer of laminated silts, sands, silty sands, and silty clays. Occasional flecks of charcoal were noted throughout most of Stratum 3. Like Stratum 1, these materials were probably deposited by low-energy water flow. Two fairly continuous lenses near the bottom of Stratum 3 (Fig. 11) contained charcoal chunks, flecks, and streaks. A lack of associated artifacts and features indicates that the charcoal in these lenses and throughout the main part of Stratum 3 is of noncultural origin, probably deriving from local wildfires. Stratum 4, of an undetermined thickness, was the deepest layer defined in the trench. This soil layer consists of interbedded silty sands and silty clays containing some pea gravels, and like most of the other strata represents low-energy alluvial deposits.

Cultural Materials

A total of 13 sherds and 10 pieces of chipped stone were collected from the part of LA 145398 within the turnout. Of these, 20 artifacts were collected from the surface and point provenienced, and 3 artifacts, all chipped stone, were recovered from the upper 10 cm of Stratum 1.

Ceramic Artifacts

Most of the sherds collected from LA 145398 are plain wares. This small assemblage is dominated by plain gray jar body and neck sherds (n = 8, 61.5 percent), and there are also two examples each of wide neckbanded wiped and Sapawe Micaceous jar sherds (15.4 percent each). The only decorated sherd in the assemblage is an unidentified mineral-painted Cibolan white ware bowl rim sherd (7.7 percent). The presence of a mineral-painted Cibola white ware sherd in association with neckbanded sherds suggests a Late Developmental period date. However, the two Sapawe Micaceous sherds date to the Classic period. This indicates that Classic period materials are a bit more widespread at LA 145398 than was originally thought but does not negate the idea that the main occupation occurred during the Late Developmental period.

Most of the sherds, including the mineral-painted bowl sherd, showed no evidence of mod-

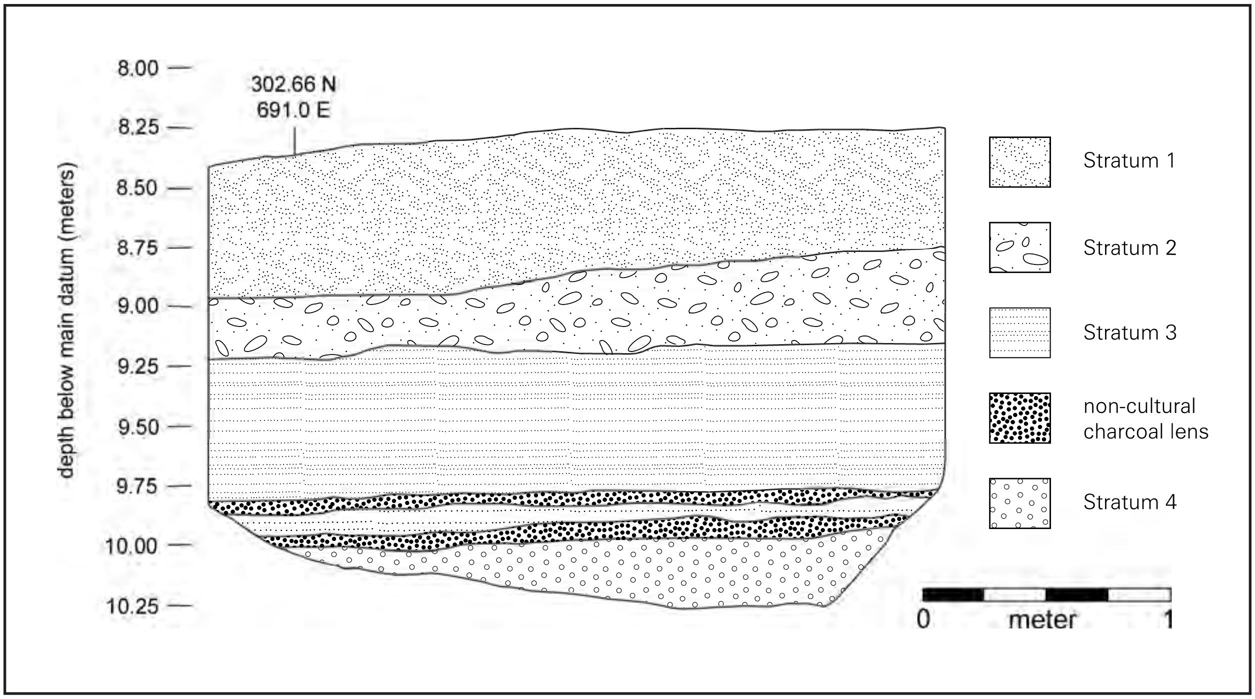

Figure 11. Profile of the south wall in the mechanically excavated trench at LA 145398.

ification. However, several plain ware sherds were sooted, and one was abraded on the interior. The example of interior abrasion is on a sherd from the body of a plain gray jar. Both Sapawe Micaceous sherds are from jar bodies, and both exhibit sooting on their interior and exterior surfaces. Though these sherds were separated by some 5–6 m when found, they probably came from the same jar. One wide neckbanded wiped jar body sherd exhibits sooting on its exterior only. The three vessels represented by these four sherds displayed definite evidence of use and probably functioned as cooking vessels before being broken and discarded.

Chipped Stone Artifacts

Little can be definitively concluded from the small chipped stone assemblage available for study from LA 145398. The assemblage includes one chert core flake (10 percent), two Pedernal chert core flakes (20 percent), one Madera chert core flake (10 percent), three quartzite core flakes (30 percent), one massive quartz core flake (10 percent), and two pieces of massive quartz angular debris (20 percent). This yields a flake to angular debris ratio of 4:1—a bit high for a Pueblo assemblage, but probably accounted for by the variability inherent in small samples.

Four of the flakes are whole (50.0 percent), two are represented by distal fragments (25.0 percent), and two by lateral fragments (20 percent). Three platform types are represented in this assemblage—a quartzite flake has a cortical platform (12.5 percent), a chert flake and a Pedernal chert flake have single-facet platforms (25.0 percent), and three flakes (Pedernal chert, Madera chert, and quartzite) have multifacet platforms (37.5 percent). The two remaining flakes (quartzite and massive quartz) are missing their platforms and had broken during removal from cores (25.0 percent). The existing platforms are all of fairly simple unmodified types and tend to indicate removal from cores rather than tool manufacture.

Half of this small assemblage (n = 5) exhibits varying degrees of the cortical surface that was the original exterior of the nodules from which they were removed. The cortex on all five of these specimens is waterworn, indicating that they were obtained from secondary gravel deposits rather than outcrops. Cortex occurs on single examples of Pedernal chert, Madera chert, and quartzite, and two specimens of massive quartz.

The amount of cortical coverage is 10–50 percent on four specimens, while cortex occurs only on the platform of a quartzite flake.

None of the materials represented in this small assemblage are especially exotic in origin, and all are common in Late Developmental period assemblages from this general area. Madera chert outcrops in the Madera formation, found through much of the general Santa Fe region. Quartzite is probably also from a local deposit, while Pedernal chert and massive quartz were probably obtained from gravel deposits along the Rio Grande to the west of the study area.

Pollen Analysis

A detailed discussion of pollen preparation and analysis techniques, and the results of this analysis, are presented in Appendix 2. Preservation was very good in these samples, and high pollen counts were obtained. All five samples contained fairly high concentrations of corn pollen, indicating that the turnout was part of a corn field sometime in the past. In addition, a single example of a Malvaceae pollen grain was also found. Unfortunately, this specimen was not well preserved and could not be identified to the genus level. While it is possible that the Malvaceae pollen grain represents the cultivation of cotton at LA 145398, this remains uncertain.

Discussion and Conclusions

Some information capable of supplementing the data provided by survey observations was available from excavations at LA 145398 in the east turnout. Perhaps the most important information provided by these limited subsurface investigations concerned the use of this locale for farming. First was the recovery of significant concentrations of corn pollen from all five samples obtained from auger tests. This is fairly conclusive evidence of a corn field in this location. Of equal importance was our findings concerning the nature and location of Stratum 2, which contains a fairly high percentage of gravels, cobbles, and small boulders. This layer of sediments was probably the source of the gravels, cobbles, and small boulders that line both edges of the canal segment and demonstrates the artificial nature of that feature. A natural channel that was incised through Stratum 2 would have removed the rock downstream, not deposited it along its banks, especially considering the depth of Stratum 2 below the modern ground surface. Thus, we must conclude that this feature is of cultural origin and of likely association with the corn pollen found in the auger test samples.

Dating canals is very difficult to accomplish with any accuracy, especially in the absence of excavation. In an examination of historic canals in the Tesuque area, Ellis (1967) assigned dates based on the types of sherds she observed adjacent to canal segments. In many cases, this led to the conclusion that a canal was used from the Developmental period to very nearly the present. This is quite unlikely in light of more recent findings concerning the nature of Late Developmental period farming, which seems to have been a fairly low-intensity activity (Akins 2000). Artifacts found along canals are not always accurate indicators of the period of use of these features, especially in an area that was as heavily occupied for many centuries as the Tewa Basin.

However, the thin veneer of Classic period sherds at LA 145398 may be an important indicator of when the canal was built and used. For the most part, canal irrigation seems to have been heavily used during the Classic and historic periods in the Northern Rio Grande; before those periods, some use of canals is likely but has not been well documented. This may be because canal irrigation was not a focus of the farming system before the period of large-scale population aggregation into extensive multistoried pueblos that archaeologists refer to as the Classic period. Thus, the presence of Classic period sherds across much of LA 145398 argues for the use of this area in the Classic period farming system and suggests that the canal was built and used at that time.

The historic use of canals in the Tesuque area has been examined for Tesuque Pueblo by Ellis (1967) and for the Spanish population by Baxter (1984). Neither of these researchers identified a canal in the vicinity of LA 145398. Indeed, neither provides any indication of the use of drainages tributary to the Rio Tesuque as sources for canals, as was probably the case with the segment identified at LA 145398. Thus we can be reasonably certain that this feature was not used during the historic period.

The main occupation of LA 145398 may have been as a small residential site during the Late Developmental period, though this is unclear without intensive study outside of the turnout limits. A lack of stratified cultural deposits in the area examined may indicate that this site was not actually a residence, despite the presence of one or two possible structures. The scatter of Late Developmental period sherds at LA 145398 could actually be part of the large general halo of cultural materials that surrounds a Late Developmental period community identified in this area, centering on LA 388 and LA 391, and including LA 390, LA 740, LA 750, and LA 3119. Structure 1 could be the remains of a Classic period farming structure, and the features identified around it might also be related to that type of use. Unfortunately, the ephemeral nature of LA 145398 does not lend itself to any definitive conclusions without considerably more intensive investigations than could be conducted during this study.

Since none of the structures or features identified at LA 145398 were within the turnout, we were unable to do any more than describe their surface appearance. This level of documentation is insufficient for assigning a clear date to any of the structures or features identified at LA 145398. The distribution of Classic period sherds seemed clear-cut during fieldwork, and all materials from that component appeared to be restricted to a narrow band adjacent to the canal segment. However, analysis of pottery collected from the surface of the section of LA 145398 within the turnout showed that the Classic period component was more widespread than initially thought, since two Sapawe Micaceous sherds came from the turnout area.

Thus, we are left with two equally likely periods for the main use of this site. There may have been a Late Developmental period residential use of LA 145398, but this is not well supported by our findings. No area seemed to contain the substantial rubbish deposits that would typically be associated with a residential site from the Late Developmental period, and there was no evidence of a pit structure. However, the lack of good surface evidence of these sorts of features does not necessarily mean that no such features are present at the site. During the Santa Fe to Pojoaque Corridor project we repeatedly found that pit structures and middens often lacked strong surface expressions and might be marked by only a few artifacts on the modern ground surface. So, while we cannot definitively substantiate the presence of Late Developmental period residential features at LA 145398, we also cannot reject this possibility.

The second possibility for the main use of LA 145398 is as a corn field during the Classic period. In this scenario, Structure 1 and possibly Structure 2 would have functioned as field structures used for temporary shelter and tool storage by the farmers cultivating their crops in this location. Similar low-density artifact scatters have been identified adjacent to gravel-mulched fields in the Ojo Caliente Valley (Moore in prep. b). Those locations tend to contain fairly low-density scatters of chipped stone and ceramic artifacts, occasionally punctuated by small concentration areas and thermal features. Though no definite field shelters were identified in that study, a feature area on one site that contained a heavy concentration of cobbles, small boulders, fire-altered rock, and chipped stone artifacts may represent the location of one or more temporary field shelters. Similarly, a prehistoric field adjacent to a canal was identified near Pot Creek Pueblo (Moore and Levine 1994). That field was marked by a low-density scatter of ceramic and chipped stone artifacts, and its use was confirmed by the presence of corn pollen in numerous soil samples taken from shallow subsurface contexts. A second nearby site contained the remains of a temporary field shelter represented by rows of cobbles, and a small concentration of artifacts marked an associated midden (Boyer et al. 1994), very like the structure of LA 145398.

Thus, we are left with two equally likely possibilities for the function and dating of the main use of LA 145398, and the data collected during this project are insufficient to choose between them. As noted earlier, two other temporal components are possible for LA 145398, but neither represents a significant use of this area. The presence of one Coalition period sherd on the surface is difficult to address, because it could have reached this location in many ways. Perhaps all this artifact tells us is that the general site area was used during the Coalition period as well as during the Late Developmental and Classic periods. A buried hearth near the arroyo edge (Feature 5) is similarly difficult to attribute. While the depth of this feature below the surface is not great, most of the materials related to the Pueblo use are on the modern ground surface or very shallowly buried. Thus, the hearth might represent an earlier, perhaps Archaic period, use of the LA 145398 area. Unfortunately, no artifacts, diagnostic or otherwise, were found in association with this feature, so it is equally likely that it was simply a Pueblo period hearth that got buried when most of the other remains from that occupation(s) at the site did not.

Many more questions were raised by this inquiry than were answered by it. All that can be concluded from this study is that there were probably multiple uses of LA 145398 during the Pueblo occupation of the region, including its use as cornfield. However, there were no significant cultural deposits, features, or structures within the turnout construction zone.

Summary and Conclusions

James L. Moore

Three prehistoric sites are discussed in this report, each representing a minor component of a Late Developmental period community situated at the north boundary of the Pueblo of Tesuque Grant. Two sites (LA 390 and LA 145398) were defined and examined in preparation for the construction of two highway turnouts at the north edge of the Pueblo of Tesuque Grant. The third site (LA 111326), examined as part of an earlier phase of data recovery within the Santa Fe to Pojoaque Corridor, is reported here because of the sparse remains found at that location within the highway right-of-way. Although the areas examined at each of these sites contained no potentially significant structures, features, or deposits, this study does provide some information relevant to the interpretation of the prehistoric Pueblo use of the general project area.

While the small section of LA 390 that was examined contained no intact prehistoric deposits, features, or structural remains, most of this site is outside the turnout area, and that larger part of the site probably contains materials that could add to our knowledge of the prehistoric Pueblo occupation of the southern Tewa Basin. Though there were no good surface indications of structural remains at LA 390, at least one pit structure probably exists at that location. The presence of buried cultural features within the highway right-of-way at LA 111326 suggests that the larger section of that site, which could not be examined during testing or data recovery, might contain other intact buried features and perhaps one or more pit structures. The situation at LA 145398 seems to be the reverse of that at LA 111326. The lack of subsurface deposits in the section of LA 145398 that was examined suggests that there may be little depth to the structural remains identified there and that there may be no pit structure at that location.

Though the main residential occupation of the area in which these sites are located occurred during the Late Developmental period, there is also a thin veneer of Coalition and Classic period materials at all three sites. Our study at LA 145398 may hold a clue to how these sites fit into the later Pueblo settlement systems. The discovery of a canal or ditch segment at LA 145398 and evidence that the zone adjacent to the canal served as a corn field suggest that the post-Developmental period use of this area was probably for farming and other subsistence activities used to provide sustenance for Coalition and Classic period communities in the region. The occupants of those later villages were undoubtedly descended (at least in part) from the residents of the Late Developmental period communities examined during the Santa Fe to Pojoaque Corridor project along US 84/285, and these later uses represent a persistent occupation of the same landscape.

Research Issues

Though little data was recovered during these studies, it can be applied to the research issues and will perhaps add to our knowledge concerning the prehistoric Pueblo occupation of the southern Tewa Basin.

Pueblo Research Issue 1: Do the project-area Developmental period sites represent spatial clusters or parts of spatial clusters of sites?

The three sites investigated during this study appear to have been part of a cluster of sites that formed a Late Developmental period community at the modern north boundary of the Pueblo of Tesuque Grant. The presence of houses at LA 388 and LA 391 coupled with the presumed occurrence of houses at LA 390 and LA 111326 indicate the existence of at least a small community in this area, though the absolute contemporaneity of these sites has yet to be established. The limits of this presumed community are not defined by the extent of these sites, because other small residential complexes related to the occupation of this community probably exist in nearby areas that could not be examined within the context of these studies.

Like nearby LA 740 and LA 750 (Moore 2003c), the Late Developmental period occupation of LA 145398 probably reflects the halo of activities that occurred around the residential core of the community, as represented by LA 388, LA 391, and probably LA 390 and LA 111326. We were unable to adequately define any of those associated activities in our study of the turnout at LA 145398, but the documentation of a Late Developmental period use of LA 145398 does help show how the occupational zone of a community was not bounded by the extent of its residential units, but instead spread over a much larger area beyond the limits of its houses. Indeed, depending on when LA 145398 was used as a corn field, suitable areas at the edges of Late Developmental period communities may have been cultivated, providing direct access to at least part of the farmlands used by the community. Some of those farmlands may have continued in use or been reused during the later Coalition and Classic periods, with a level of intensification represented by the construction of canals.

Pueblo Research Issue 2: Do the project-area Developmental period sites provide evidence of integrated access to resources?

Unfortunately, the data recovered from the three sites examined here was not sufficient to allow a detailed examination of this question, because the scope of this study was simply too small and only included proveniences from one probable community, providing no basis for comparison. However, in the larger context, the small assemblages from these sites might provide data that could amplify the results of analyses for the Santa Fe to Pojoaque Corridor study as a whole. Thus, the data provided by these three sites will be integrated into that larger study, which is something that cannot be done in this venue.

Pueblo Research Issue 3: Do the project-area Developmental period sites show evidence of community integration?

By themselves, the three sites examined during this study provide little evidence of community integration. Combined with more data in a larger study of the Santa Fe to Pojoaque Corridor project, it may help show evidence of community integration. Unfortunately, most of that potential is contained by the unexcavated sections of the sites that lie outside project limits, because no residential or ritual structures were found within the areas that were examined.

Conclusions

In and of themselves, the three sites examined during this study provide little data that can be used to amplify our understanding of the prehistoric Pueblo occupation of the southern Tewa Basin. Perhaps the most important information provided by this study was the documentation of a probable Classic period canal segment and adjacent corn field at LA 145398, though we remain uncertain when the latter was used. When combined with information contributed by the larger Santa Fe to Pojoaque Corridor study, these sites may have some potential to augment and amplify that data base, but this potential is severely limited by the small size of the artifact assemblages recovered from LA 390, LA 111326, and LA 145398.

These investigations are considered to have exhausted the potential of areas within the north and east Tesuque turnouts at LA 390 and LA 145398 to provide information relevant to the prehistory of the southern Tewa Basin. No further investigations are recommended for those areas. However, the section of LA 111326 within the US 84/285 right-of-way may still have some potential for providing information on regional prehistory. Further investigations may be necessary at LA 111326 should land-altering activities be considered for that area. Sections of LA 390, LA 111326, and LA 145398 that lie outside project boundaries were not adequately studied during these investigations and still have the potential to provide relevant information on the prehistoric occupation of the southern Tewa Basin. Further archaeological investigations are warranted at those sites should land-altering activities be planned for the areas that lie outside the limits of the current projects.

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Appendix 2: Intensive Scan Microscopy Pollen Analysis of Five Samples from a Suspected Agricultural Field at LA 145398

Richard G. Holloway, Ph.D.

Five samples were submitted for intensive scan microscopy pollen analysis to Quaternary Services. These samples were collected from a suspected prehistoric agricultural field near LA 145398, a site along US 84/285 on Tesuque Pueblo land (Fig. A2.1), by personnel of the Office of Archaeological Studies. All samples were collected from the same soil stratum during auger tests at depths of 10–20 cm below the modern ground surface. Intensive scan microscopy was requested to determine if this area might have served as a prehistoric agricultural field.

There is a possible Classic period canal segment about 25 m north of the area investigated at the site. There were also several rock piles and isolated large cobbles or small boulders scattered around the area that looked like they might have been field markers.

The site is at the edge of a piñon/juniper forest, but *Pinus edulis* and *Juniperus* do not occur within the site area. The site vegetation was rather typical of northern New Mexico, consisting of mixed grasses (Poaceae), some *Opuntia* sp. (prickly pear cactus), *Artemisia* sp. (sagebrush), *Atriplex* sp. (saltbush), *Salsola kali* (Russian thistle), and likely some *Gutierrezia* sp. (snakeweed).

Methods and Materials

Chemical extraction of pollen samples was conducted at the Palynology Laboratory at Washington State University, using a procedure designed for semiarid southwestern sediments. The method, detailed below, specifically avoids use of such reagents as nitric acid and bleach, which have been demonstrated experimentally to be destructive to pollen grains (Holloway 1981).

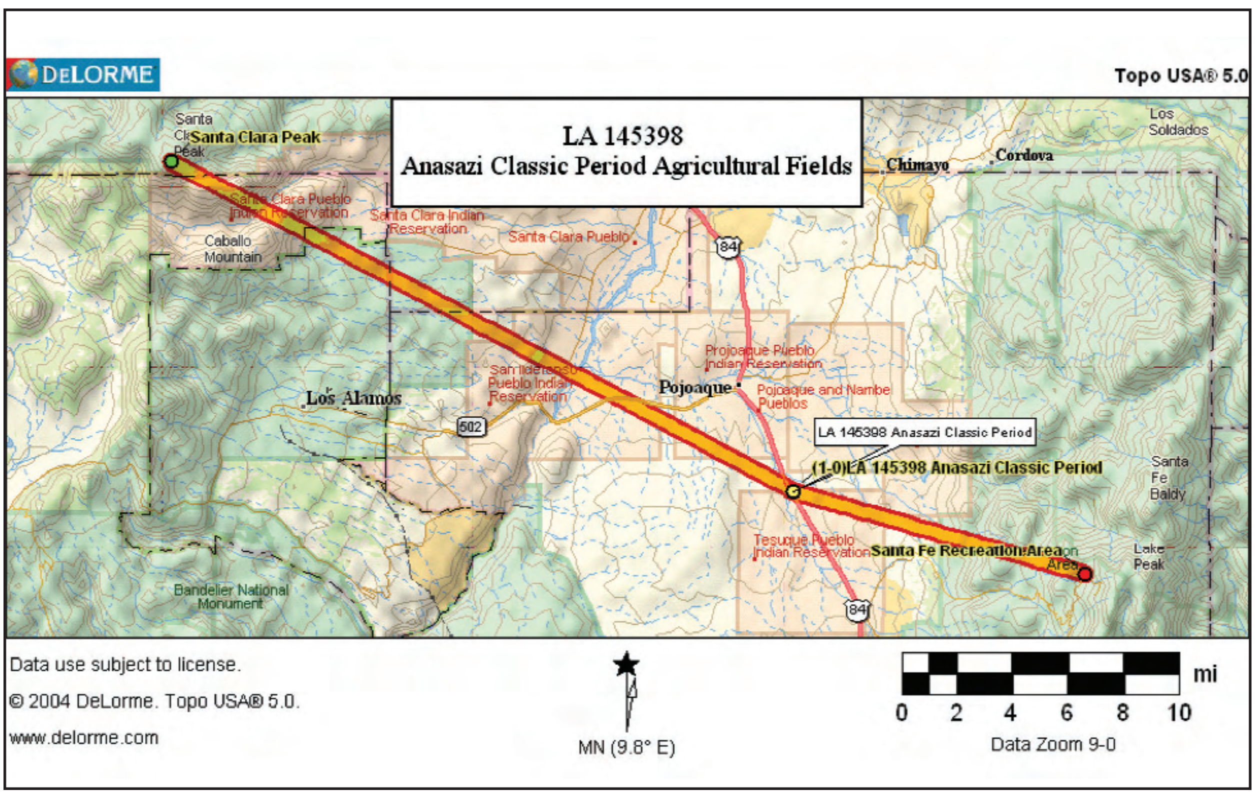

Figure A2.1. Location of LA 145398 showing elevation profile route.

From each pollen sample submitted, 10 ml of soil were subsampled. Prior to chemical extraction, two tablets of concentrated *Lycopodium* spores (Batch 124961, Department of Quaternary Geology, Lund, Sweden, 12,542 ± 500 marker grains per tablet) were added to each subsample. The addition of marker grains permits calculation of pollen concentration values and provides an indicator for accidental destruction of pollen during the laboratory procedure.

The samples were treated with 3-percent hydrochloric acid (HCl) overnight to remove carbonates and release the *Lycopodium* spores from their matrix. After neutralizing the acid with distilled water, the samples were allowed to settle for a period of at least three hours before the supernatant liquid was carefully poured off and discarded. More distilled water was added to the supernatant, and the mixture was swirled and then allowed to settle for 10 seconds. The liquid was then carefully poured off and saved in a second beaker. This procedure was repeated three times to ensure that all pollen would be freed from the matrix that remained in the original beaker. The sand and small rocks remaining in the beaker were then discarded. All of the saved, suspended fine fraction was decanted through a screen with openings of 150µ. All material passing through the screen was concentrated using centrifugation mesh screen into a second beaker. This procedure, repeated at least three times, removed lighter materials, including pollen grains, from the heavier fractions.

The fine fraction was treated with concentrated (48-percent) hydrofluoric acid (HF) overnight to remove silicates. After the acid had been neutralized with distilled water, the samples were treated with a concentrated wash of HCl. This procedure removed any potential fluorosilicates that often form during the HF process. The HCl wash was repeated several times until the solution remained clear after centrifugation. The samples were then washed twice in distilled water.

The residues were then rinsed in a 1-percent solution of potassium hydroxide (KOH) for less than one minute, which is effective in removing the majority of the unwanted alkaline soluble humates. This also makes the following acetolysis treatment more effective by reducing the quantity of organic material being acted upon. The samples were dehydrated in glacial acetic acid in preparation for acetolysis. Acetolysis solution (acetic anhydride: concentrated sulfuric acid in 9:1 ratio) following Erdtman (1960), was added to each sample. Centrifuge tubes containing the solution were heated in a boiling water bath for eight minutes and cooled for another eight minutes before centrifugation and removal of the acetolysis solution with glacial acetic acid followed by distilled water. Centrifugation at 2,000 rpm for 90 seconds dramatically reduced the size of the sample, yet (from periodic examination of the residue) did not remove fossil palynomorphs.

Heavy-density separation ensued using zinc bromide ($ZnBr_2$), with a specific gravity of 2.00, to remove much of the remaining detritus from the sample pollen. After 10 minutes of centrifugation at 2,000 rpm, the light fraction was removed and diluted with 95-percent ethanol (ETOH) in a ratio of distilled water (10:1) and then concentrated by centrifugation. The samples were then washed repeatedly in distilled water until neutral. This was followed by a wash with concentrated HCl, which is essential to remove the remaining dissolved materials that are not water soluble. Next, the samples were washed with distilled water. That process was repeated until the solution was clear.

Although all of the previous procedures will effectively remove most of the unwanted matrix materials, none of these actions seem to have much effect on charcoal, which is inert. Unfortunately, we have yet to discover any procedure that will effectively remove charcoal from pollen samples without harming either the fossil pollen or removing some of it as well.

The residues were rinsed in ETOH stained with safranin-O, rinsed twice with ETOH, and transferred to 1-dram vials with ETOH. The samples were mixed with a small quantity of glycerine and allowed to stand overnight for evaporation of the remaining ETOH. The storage vials were capped and returned to the OAS at the completion of the project.

A drop of the polliniferous residue was mounted on a microscope slide for examination under an 18 by 18 mm cover slip sealed with fingernail polish. The slide was examined using 200x or 100x magnification under an aus-Jena Laboval 4 compound microscope. Occasionally, pollen grains were examined using either 400x or

1,000x oil immersion to obtain a positive identification to the family or genus level.

Abbreviated microscopy was performed on each sample in which either 20 percent of the slide (approximately four transects at 200x magnification) or a minimum of 50 marker grains were counted. If warranted, full counts were conducted by counting to a minimum of 200 fossil grains. Regardless of which method was used, the uncounted portion of each slide was completely scanned at a magnification of 100x for larger grains of cultivated plants such as *Zea mays* and *Cucurbita,* two types of cactus (*Platyopuntia* and *Cylindropuntia*), and other large pollen types such as members of the Malvaceae and Nyctaginaceae families.

For those samples warranting full microscopy, a minimum of 200 pollen grains per sample were counted as suggested by Barkley (1934), which allows the analyst to inventory the most common taxa present in the sample. All transects were counted completely (Brookes and Thomas 1967), resulting in various numbers of grains counted beyond 200. Pollen taxa encountered on the uncounted portion of the slide during the low-magnification scan are tabulated separately.

Total pollen concentration values were computed for all taxa. In addition, the percentage of indeterminate pollen was also computed. Statistically, pollen concentration values provide a more reliable estimate of species composition within the assemblage. Traditionally, results have been presented by relative frequencies (percentages) where the abundance of each taxon is expressed in relation to the total pollen sum (200+ grains) per sample. With this method, rare pollen types tend to constitute less than 1 percent of the total assemblage. Pollen concentration values provide a more precise measurement of the abundance of even these rare types. The pollen data are reported here as pollen concentration values using the following formula:

The following example should clarify this approach. Taxon X may be represented by a total of 10 grains (1 percent) in a sample consisting of 1,000 grains, and by 100 grains (1 percent) in a second sample consisting of 10,000 grains. Taxon X is 1 percent of each sample, but the difference in actual occurrence of the taxon is obscured when pollen frequencies are used. *Pollen concentration values* is preferred because it accentuates the variability between samples in the occurrence of the taxon. The variability, therefore, is more readily interpretable when comparing cultural activity to noncultural distribution of the pollen rain.

Variability in pollen concentration values can also be attributed to deterioration of the grains through natural processes. In his study of sediment samples collected from a rockshelter, Hall (1981) developed the "1,000 grains/g" rule to assess the degree of pollen destruction. This approach has been used by many palynologists working in other contexts as a guide to determine the degree of preservation of a pollen assemblage and, ultimately, to aid in the selection of samples to be examined in greater detail. According to Hall (1981), a pollen concentration value below 1,000 grains/gm indicates that forces of degradation may have severely altered the original assemblage. However, a pollen concentration value of fewer than 1,000 grains/g can also indicate the restriction of the natural pollen rain. Samples from pit structures or floors within enclosed rooms, for example, often yield pollen concentration values below 1,000 grains/g.

Pollen degradation also modifies the pollen assemblage because pollen grains of different taxa degrade at variable rates (Holloway 1981, 1989; Bryant and Holloway 1983). Some taxa are more resistant to deterioration than others and remain in assemblages after other types have deteriorated completely. Many commonly occurring taxa degrade beyond recognition in only a short time. For example, most (ca. 70 percent) angiosperm pollen has either tricolpate (three furrows) or tricolporate (three furrows each with pores) morphology. Because surfaces erode rather easily, once deteriorated, these grains tend to resemble each other and are not readily distinguishable. Other pollen types (e.g., cheno-am) are so distinctive that they remain identifiable even when almost completely degraded.

Pollen grains were identified to the lowest taxonomic level whenever possible. The majority of these identifications conformed to existing levels of taxonomy with a few exceptions. For example, cheno-am, an artificial, pollen-morphological category, includes pollen of the family Chenopodiaceae (goosefoot) and the genus *Amaranthus* (pigweed), which are indistinguish-

$$PC = \frac{K * \Sigma_p}{\Sigma_L * S}$$

where:

PC = pollen concentration

K = *Lycopodium* spores added

Σ_p = fossil pollen counted

Σ_L = *Lycopodium* spores counted

S = sediment weight

able from each other (Martin 1963). All members are wind pollinated (anemophilous) and produce very large quantities of pollen. In many sediment samples from the American Southwest, this taxon often dominates the assemblage.

Pollen of the Asteraceae (sunflower) family was divided into four groups. The high-spine and low-spine groups were identified on the basis of spine length. High-spine Asteraceae contains those grains with spine lengths greater than or equal to 2.5µ, while the low-spine group have spines shorter than 2.5µ (Bryant 1969; Martin 1963). *Artemisia* pollen is identifiable to the genus level because of its unique morphology of a double tectum in the mesocopial (between furrows) region of the pollen grain. Pollen grains of the Liguliflorae are also distinguished by their fenestrate morphology. Grains of this type are restricted to the tribe Cichoreae, which includes such genera as *Taraxacum* (dandelion) and *Lactuca* (lettuce).

Pollen of the Poaceae (grass) family are generally indistinguishable below the family level, with the single exception of *Zea mays*, identifiable by its large size (ca. 80µ), relatively large pore annulus, and the internal morphology of the exine. All members of the family contain a single pore, are spherical, and have simple wall architecture. Identification of noncorn pollen is dependent on the presence of the single pore. Only complete or fragmented grains containing this pore were tabulated as Poaceae.

Clumps of four or more pollen grains (anther fragments) were tabulated as single grains to avoid skewing the counts. Clumps of pollen grains (anther fragments) from archaeological contexts are interpreted as evidence of the presence of flowers at the sampling locale (Bohrer 1981). This enables the analyst to infer possible human behavior.

Finally, pollen grains in the final stages of disintegration but retaining identifiable features such as furrows, pores, complex wall architecture, or a combination of these attributes were assigned to the indeterminate category. The potential exists to miss counting pollen grains without identifiable characteristics. For example, a grain that is so severely deteriorated that no distinguishing features exist closely resembles many spores. Pollen grains and spores are similar in size and are composed of the same material (sporopollenin). So that spores are not counted as deteriorated pollen, only those grains containing identifiable pollen characteristics are assigned to the indeterminate category. Thus, the indeterminate category contains a minimum estimate of degradation for any assemblage. If the percentage of indeterminate pollen is between 10 and 20 percent, relatively poor preservation of the assemblage is indicated, whereas indeterminate pollen in excess of 20 percent indicates severe deterioration of the assemblage.

In those samples where the total pollen concentration values are approximately at or below 1,000 grains/g, and the percentage of indeterminate pollen is 20 percent or greater, counting was terminated at the completion of the abbreviated microscopy phase. In some cases, the assemblage was so deteriorated that only a small number of taxa remained. Statistically, the concentration value may have exceeded 1,000 grains/gm, but if species diversity was low (generally these samples contained only pine, cheno-am, Asteraceae, and indeterminate category), counting was also terminated after abbreviated microscopy even if the pollen concentration value slightly exceeded 1,000 grains/g.

Results

Five samples were submitted from various locations within a suspected agricultural field at LA 145398. The samples were taken on average between 10 and 20 cm below the present ground surface. Table A2.1 contains the raw pollen counts and calculated pollen concentration values of these samples. All samples contained very high pollen counts and excellent preservation. The results of individual sample analyses are presented below by FS number.

Table A2.1. Raw pollen counts and concentration values, LA 145398

Bag No.	Level (cm bgs)	Elevation (ft)	*Pinus*	*Pinus ponderosa*	*Pinus edulis*	*Picea*	*Abies*	*Quercus*	*Carya*	*Salix*	*Rosaceae*	*Eriogonum*
Raw Counts												
FS 1	10-20	6180	133	91	1	1	-	-	-	-	-	-
FS 2	10-20	6180	240	173	10	2	2	1	-	-	-	-
FS 3	10-20	6180	332	153	7	2	9	-	-	1	2	2
FS 4	10-20	6180	321	169	3	3	4	1	1	-	-	-
FS 5	10-20	6180	225	148	9	4	3	1	-	1	-	-
Concentration Values												
FS 1	10-20	6180	2471	1691	19	19	-	-	-	-	-	-
FS 2	10-20	6180	3649	2630	152	30	30	15	-	-	-	-
FS 3	10-20	6180	6406	2952	135	39	174	-	-	19	39	39
FS 4	10-20	6180	6655	3503	62	62	83	21	21	-	-	-
FS 5	10-20	6180	3738	2459	150	66	50	17	-	17	-	-

Table A2.1. Raw pollen counts and concentration values, LA 145398 (continued)

Bag No.	Poaceae	Cheno-am	Cheno-am af.	High-spine Asteraceae	Low-spine Asteraceae	*Artemisia*	Cactaceae	*Cylindropuntia*	*Ephedra*	Indeterminate	Malvaceae
Raw Counts											
FS 1	3	163	-	15	14	11	-	2	6	7	-
FS 2	9	158	-	18	23	6	-	1	2	9	1
FS 3	11	217	2	16	28	9	-	-	3	10	-
FS 4	9	314	3	21	34	11	4	-	7	17	-
FS 5	13	268	3	23	37	14	-	-	3	10	-
Concentration Values											
FS 1	56	3029	-	279	260	204	-	37	111	130	-
FS 2	137	2402	-	274	350	91	-	15	30	137	15
FS 3	212	4187	39	309	540	174	-	-	58	193	-
FS 4	187	6509	62	435	705	228	83	-	145	352	-
FS 5	216	4452	50	382	615	233	-	-	50	166	-

Table A2.1. Raw pollen counts and concentration values, LA 145398 (continued)

Bag No.	Sphaeralceae	*Zea mays*	Sum	Total	Markers	% Indeterminate	Transects	Total Transects	Markers/ Slide	Markers/ Slide #2	Total Markers	*Lycopodium* Added	Volume
Raw Counts													
FS 1	-	-	447	8306	135	1.57	4	28	945	-	945	25084	10
FS 2	4	-	659	10018	165	1.37	4	28	1155	1350	2505	25084	10
FS 3	4	2	810	15629	130	1.23	4	24	780	985	1765	25084	10
FS 4	4	-	926	19197	121	1.84	4	28	847	877.5	1724.5	25084	10
FS 5	2	-	764	12692	151	1.31	4	28	1057	1777.5	2834.5	25084	10
Concentration Values													
FS 1	-	-	447	8306	135	1.57	4	28	945	-	945	25084	10
FS 2	61	-	659	10018	165	1.37	4	28	1155	1350	2505	25084	10
FS 3	77	39	810	15629	130	1.23	4	24	780	985	1765	25084	10
FS 4	83	-	926	19197	121	1.84	4	28	847	877.5	1724.5	25084	10
FS 5	33	-	764	12692	151	1.31	4	28	1057	1777.5	2834.5	25084	10

Table A2.1 (continued). Intensive scan microscopy, total numbers of grains on all slides

Bag No.	*Zea mays*	Sphaeralcea	Onagraceae	*Cylindropuntia*	Platyopuntia	Cactaceae	Cheno-am af.	Rosaceae	Eriogonum	Polygonum	Juglans	Carya
Raw Counts												
FS 1	6	-	1	3	-	-	2	-	-	-	1	-
FS 2	20	1	1	2	-	1	3	-	-	-	-	-
FS 3	32	1	1	3	-	1	4	2	2	-	-	-
FS 4	28	-	-	-	-	4	5	-	-	1	-	2
FS 5	31	1	-	2	2	-	5	-	-	-	1	-
Concentration Values												
FS 1	15.93	-	2.65	7.96	-	-	5.31	-	-	-	2.65	-
FS 2	20.03	5.01	1	2	-	1	3	-	-	-	-	-
FS 3	45.48	7.11	1.42	4.26	-	1.42	5.68	2.84	2.84	-	-	-
FS 4	40.73	5.82	-	-	-	5.82	7.27	-	-	1.45	-	2.91
FS 5	27.43	2.65	-	1.77	1.77	-	4.42	-	-	-	0.88	-

Table A2.1 (continued). Intensive scan microscopy, total number of grains on all slides

Bag No.	*Typha latifolia*	*Picea*	*Abies*	*Pseudotsuga*	*Quercus*	*Salix*	Large Grass	Liguliflorae	Maximum Estimated Potential Concentration	Trilete Spores
Raw Counts										
FS 1	-	3	3	-	-	-	-	-	2.6544	-
FS 2	-	36	21	-	-	-	-	-	1.0014	-
FS 3	-	46	31	4	-	1	2	-	1.4212	1
FS 4	1	57	31	-	2	-	-	-	1.4546	1
FS 5	-	76	30	3	2	1	-	1	0.885	1
Concentration Values										
FS 1	-	7.96	7.96	-	-	-	-	-	2.6544	-
FS 2	-	36.05	21.03	-	-	-	-	-	1.0014	-
FS 3	-	65.37	44.06	5.68	-	1.42	2.84	-	1.4212	1.42
FS 4	1.45	82.91	45.09	-	2.91	-	-	-	1.4546	1.45
FS 5	-	67.26	26.55	2.65	1.77	0.88	-	0.88	0.885	0.88

FS 1

The FS 1 assemblage contained a total pollen concentration value of 8,306 grains/ml and was based on a pollen sum of 447 grains. *Pinus ponderosa* type (1,691 grains/ml) was present in moderate to high amounts along with a trace of *Pinus edulis* type and *Picea* (19 grains/ml each) pollen. Cheno-am (3,029 grains/ml) was high, along with high amounts of Poaceae (56 grains/ml), high-spine (279 grains/ml) and low-spine (260 grains/ml) Asteraceae, and *Artemisia* (204 grains/ml). *Ephedra* (111 grains/ml) and *Cylindropuntia* (37 grains/ml) were high. *Zea mays* (15.93 grains/ml), Onagraceae, *Juglans*, (2.65 grains/ml each) and *Abies* (7.96 grains/ml) were also present in the low-magnification scan of the slide.

FS 2

FS 2 contained a total pollen concentration value of 10,018 grains/ml and was based on a pollen sum of 659 grains. *Pinus ponderosa* type (2,630 grains/ml) was present in high amounts, along with a small amount of *Pinus edulis* type (152 grains/ml), *Picea* and *Abies* (30 grains/ml each), and *Quercus* (15 grains/ml) pollen. Cheno-am (2,402 grains/ml) was high, along with high amounts of Poaceae (137 grains/ml), high-spine (274 grains/ml) and low-spine (350 grains/ml) Asteraceae, and *Artemisia* (91 grains/ml). *Ephedra* (30 grains/ml) was moderate to low, with small amounts of *Cylindropuntia* and Malvaceae (15 grains/ml each) and *Sphaeralcea* (61 grains/ml). In the intensive scan microscopy, *Zea mays* (20.03 grains/ml), Onagraceae and Cactaceae (1 grain/ml each), and cheno-am clumps (3/ml) were also present. The concentration values of *Picea (*36.05 grains/ml*) and Abies* (21.03 grains/ml) increased slightly.

FS 3

The FS 3 assemblage contained a total pollen concentration value of 15,629 grains/ml and was based on a pollen sum of 810 grains. *Pinus ponderosa* type (2,952 grains/ml) was present in high amounts, along with a small amount of *Pinus edulis* type (135 grains/ml), *Picea* (39 grains/ml), and *Abies* (174 grains/ml). *Salix* (19 grains/ml) and small amounts of Rosaceae and *Eriogonum* (39 grains/ml each) were also present. Cheno-am (4,187 grains/ml) was very high, along with high amounts of Poaceae (212 grains/ml), high-spine (309 grains/ml) and low-spine (540 grains/ml) Asteraceae, and *Artemisia* (174 grains/ml). A high number of cheno-am pollen clumps (39/ml) were also present. *Ephedra* (58 grains/ml) was moderate to low, as were *Zea mays* (39 grains/ml) and *Sphaeralcea* (77 grains/ml). In the intensive scan microscopy, *Zea mays* increased to 45.48 grains/ml), while *Sphaeralcea* decreased to only 1.42 grains/ml). Onagraceae (1 grain/ml), *Cylindropuntia* (4.26 grains/ml), and Cactaceae (1.42 grain/ml) were present, while Rosaceae and *Eriogonum* decreased to 2.84 grains/ml each. The adjusted pollen concentration values of *Picea (*65.37 grains/ml*)* increased, while *Abies* (44.06 grains/ml) decreased. *Pseudotsuga* (5.68 grains/ml) was also present, along with some type of large grass (2.84 grains/ml).

FS 4

FS 4 contained a total pollen concentration value of 19,197 grains/ml and was based on a pollen sum of 926 grains. *Pinus ponderosa* type (3,503 grains/ml) was present in high amounts, along with a trace amount of *Pinus edulis* type (62 grains/ml), *Picea* (62 grains/ml), *Quercus* and *Carya* (21 grains/ml each), and *Abies* (83 grains/ml). Cheno-am (6,509 grains/ml) was very high, along with high amounts of Poaceae (187 grains/ml), high-spine (435 grains/ml) and low-spine (705 grains/ml) Asteraceae, and *Artemisia* (228 grains/ml). A high number of cheno-am pollen clumps (62/ml) were also present. *Ephedra* (145 grains/ml) was high, as were Cactaceae and *Sphaeralcea* (83 grains/ml each). In the intensive scan microscopy, *Zea mays* was present (40.73 grains/ml), while *Sphaeralcea* decreased to only 5.82 grains/ml. Cactaceae (5.82 grain/ml) was present in addition to small amounts of *Polygonum* and *Typha latifolia* (1.45 grains/ml each), and a smaller amount of *Carya* (2.91 grains/ml). The adjusted pollen concentration values of *Picea (*82.91 grains/ml*)* increased, while *Abies* (45.09 grains/ml) decreased.

FS 5

The FS 5 assemblage contained a total pollen concentration value of 12,692 grains/ml and was based on a pollen sum of 764 grains. *Pinus ponderosa* type (2,459 grains/ml) was present in high amounts, along with a small amount of *Pinus edulis* type (150 grains/ml), *Picea* (66 grains/ml), *Quercus* and *Salix* (17 grains/ml each), and *Abies* (50 grains/ml). Cheno-am (4,452 grains/ml) was very high, along with high amounts of Poaceae (216 grains/ml), high-spine (382 grains/ml) and low-spine (615 grains/ml) Asteraceae, and *Artemisia* (233 grains/ml). A high number of cheno-am pollen clumps (50/ml) were also present. *Ephedra* (50 grains/ml) was moderate, as was *Sphaeralcea* (33 grains/ml). In the intensive scan microscopy, *Zea mays* was present (27.43 grains/ml), while *Sphaeralcea* decreased to only 0.88 grains/ml. *Cylindropuntia* and *Platyopuntia* were both present in small amounts (1.77 grains/ml). *Juglans* and Liguliflorae (0.88 grains/ml each), and *Pseudotsuga* (2.65 grains/ml) were also present. The adjusted pollen concentration value of *Picea* (67.26 grains/ml) increased slightly, while *Abies* (26.55 grains/ml) decreased.

Discussion

The pollen assemblages were extremely well preserved and contained exceptionally high pollen counts. Pollen sums of between 450 and 926 grains/ml were obtained from counting only four transects of the slides. The arboreal component was unusually large and was dominated by *Pinus ponderosa* type and secondarily by *Picea*, *Abies*, and *Pinus edulis* types. Small amounts of *Pseudotsuga*, *Quercus*, *Carya*, *Salix*, and *Juglans* were also intermittently present. The presence of conifer pollen, consisting of *Pinus*, *Picea*, *Abies*, and *Pseudotsuga*, is most likely the result of long-distance transport. These conifer taxa are generally found at higher elevations than that of LA 145398, although *Pinus edulis* was seen along the margins of this site. Conifers produce pollen in structures termed strobili, which in *Pinus ponderosa* occur at terminal branch ends in clusters of 8–10+. Each strobilus in *Pinus ponderosa* produces in excess of 1 million pollen grains. The other taxa produce fewer pollen grains per strobilus, but still produce an extremely large quantity of pollen. Thus, it is not surprising to find large pollen concentration values for these arboreal taxa in areas where they are not currently growing.

As indicated in Figure A2.2, higher-elevation areas are fairly close by, within 32 km (20 miles), both east and west of LA 145398. These areas contain extremely favorable habitats for the conifer taxa. Thus, depending on the actual wind direction, large quantities of conifer pollen could be routinely deposited in the lower-elevation area of LA 145398. The vegetational composition of the local site area is described primarily as a desert scrub or desert scrub grassland. This type of community produces a relatively low pollen concentration, and thus the local taxa are easily masked by the presence of arboreal pollen taxa. The site is also at the lower elevation of a large basin, effectively ringed by higher-elevation areas. This type of area is very conducive to the deposition of large quantities of arboreal pollen (Tauber 1965), which may help to explain the extremely high pollen concentration values recovered.

Several other arboreal taxa deserve some discussion. *Carya* was present in only one sample (FS 4), and only two grains were observed on the entire slide. *Carya* is not native to New Mexico but was grown historically in several distant parts of the state. However, this is somewhat unlikely to have been the source of these pollen grains. *Carya*-like pollen was present throughout the Tertiary in large areas of North America, including what is now the Southwest. These grains are virtually indistinguishable from modern *Carya* and are only given generic names because of their extreme age (Frederickson 1985). I suspect that the *Carya* grains observed in these field samples are reworked Tertiary-age grains that have eroded out of the Tertiary sandstones that are so common in this area. This would also explain their very low concentration value and number of grains observed (Frederickson 1985).

Juglans (walnut), a member of the same family as *Carya*, was present in two samples (FS 1 and FS 5). However, *Juglans microcarpa* is known to have been present within New Mexico and Arizona, and its presence was not unexpected. *Juglans* is usually found in slightly more mesic environments along water courses. Several

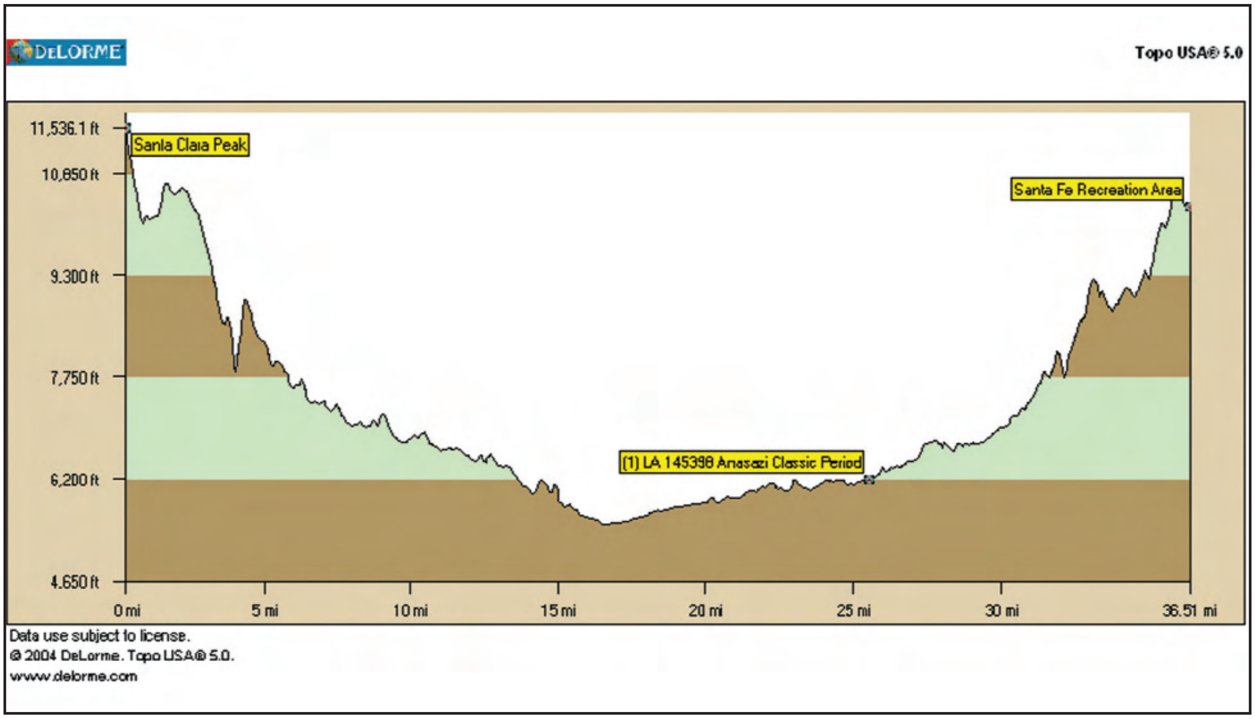

Figure A2.2. Elevational profile from Santa Clara Peak to Santa Fe Recreation Area via LA 145398.

streams in the general site area may have been the source of this pollen taxon. *Salix* likewise requires slightly wetter conditions and may have been growing locally along the same streams.

Quercus is a common understory component of the piñon-juniper forest and/or woodland. Although it is commonly included in the arboreal taxa, it may represent this understory component. Again, its presence was not unexpected.

The pollen assemblages were dominated primarily by cheno-am pollen, pollen of the grasses, and both the high-spine and low-spine types of Asteraceae. This is typical of a desert-scrub vegetational community. The relatively high concentration values of cheno-am may be due to the local abundance of members of the Chenopodiaceae family. The dominant member in the present vegetation is Russian thistle (*Salsola kai*), which was introduced historically from Europe. The high pollen concentration values of cheno-am are likely reflective of the presence of *Atriplex* (saltbush) or one of the other common members of this family. Generally, all members of the Chenopodiaceae family (except *Sarcobatus*) have a virtually identical pollen morphology and thus are grouped under this broad morphological category.

While not containing exceptionally high pollen concentration values, pollen of *Platyopuntia* (prickly pear cactus), *Cylindropuntia* (cholla cactus), and other Cactaceae pollen were consistently present. This probably reflects the local presence of these taxa. Other common members that may have been locally present are Onagraceae, Rosaceae, *Eriogonum*, *Polygonum*, Liguliflorae, *Ephedra*, *Artemisia*, and perhaps *Sphaeralcea*.

A single grain of *Typha latifolia* pollen was found in FS 4. *Typha latifolia* along with other species of this genus is an emergent aquatic plant that normally grows in inundated habitats along stream and/or lake margins. The plant is wind pollinated, and thus the presence of a single grain may represent its presence in the immediate vicinity. Alternatively, the pollen grain may have been brought in via the irrigation system.

Zea mays pollen actually contains somewhat high pollen concentration values for this type of sample. *Zea mays* was recovered from all five samples, but it was only present in the low-magnification scan of the slide from FS 1. Raynor et al. (1972) and Jarosz et al. (2003) have studied the experimental distribution and dispersion of corn pollen within active corn fields. While neither study used pollen concentration values, Jarosz et al. (2003) did estimate the pollen production and airborne pollen concentration values. The importance of these studies was that corn pollen concentrations decreased by a factor of three between 3 and 10 m from the source, and decreased to less than 10 percent at distances greater than 10 m from the cornfield. The pollen concentration values obtained from these five samples ranged from a low of 15.93 grains/ml to a high of 45.78 grains/ml. This strongly argues that *Zea mays* was being grown, perhaps prehistorically, within this area.

The high concentration values of cheno-am also support this contention. Cheno-am pollen was present in percentages ranging from 23 to 36 percent, with an average of 30.6 percent. While not excessive, cheno-am may have been present in the area, since it is commonly a weedy associate of cultivated areas (Fish et al. 1992). The presence of cheno-am pollen clumps from all five samples also argues for the presence of this plant within the immediate area (Bohrer 1981).

The presence of Malvaceae pollen from FS 2 is a bit more problematic. The grain was severely distorted, making a positive identification to the genus level impossible. The grain was definitely not that of *Sphaeralcea*, since it contains more than three pores. It may very well have been from one of the native taxa of this family that are common in New Mexico, such as *Abutilon* or *Malva*. Alternatively, it may have been from *Gossypium* (cotton). Dean (1991) reported on the identification to the genus level of several New Mexico genera of Malvaceae based on the morphology of the spine base. She also reported its presence from some higher-elevation sites within Santa Fe County. Thus, it would make sense that a form of cotton may have been growing within this locale.

Prehistoric agricultural fields were generally not monotypic; rather a number of cultivated varieties were grown together, usually along with Fabaceae (*Phaseolus*) and/or Cucurbitaceae. Phaseolus spp. pollen is insect pollinated and only rarely occurs in archaeological pollen assemblages. Cucurbitaceae pollen is very large and fragile and easily breaks apart. Taken together, the absence of these grains is no great cause for alarm.

To determine if this area was used prehistorically as an agricultural field, intensive scan microscopy (Dean 1998) was requested. The question always arises, when conducting a palynological investigation, whether economic taxa are absent from these assemblages because they are truly not present, or if they are present in such small amounts that they were missed during sampling. This has a direct bearing on the question of the function of these suspected agricultural fields. Intensive scan microscopy utilizes the algebraic function of the pollen concentration value equation (above) to determine the number of marker grains that have to be examined to reach a desired pollen concentration value for any taxa not directly observed in the counts or on the scan of the slide. This is typically 1 grain/ml.

We know how many marker grains were added to the sample, and how large a sample (ml or g) was used. The number of grains for any of the target taxa is one, and we can solve for the unknown number of marker grains as follows:

$$\text{PC (1 grain/ml)} = \frac{((25084)*(1))}{((X)*(10))} = \frac{(25084)}{(10X)}$$

Where:

25,084 = number of *Lycopodium* spores added
1 = number of grains of target taxon *x*
10 = sediment amount

Solving for X, we obtain 2,508.4 as the number of marker grains that need to be counted in order to obtain a pollen concentration value of 1 grain/ml. For the second and any subsequent slides, an average number of marker grains per transect is calculated by counting the numbers of *Lycopodium* markers in 4–6 transects. Then the remainder of the slide is scanned, while tabulating the number of transects examined. This is continued until 2,508 *Lycopodium* marker grains have been counted. In this investigation, counting was shortened. For FS 2–FS 4, we examined only two slides each. While a sufficiently large number of marker grains were present, only one sample (FS 5) actually had a pollen concentration value below 1.0 grains/ml. Only one slide was examined from FS 1 because there was only a minimal amount of residue present, and I was hesitant to use all of this residue. Secondly, a fairly large number of *Zea mays* pollen grains, which were the primary target, had already been tabulated. As indicated in Table 1, the number of *Zea mays* pollen grains tabulated ranged between 6 and 32. Because the primary target taxon was present in these assemblages in such numbers, counting was terminated.

The adjusted pollen concentration values of *Zea mays* ranged from a low of 15.93 grains/ml (FS 1) to a high of 45.48 grains/ml (FS 4). The estimated maximum potential concentration values from these same samples ranged from a high of 2.6544 grains/ml (FS 1) to a low of 0.885 grains/ml (FS 5). Based on the pollen concentration values for *Zea mays* that were recovered and the presence of common weedy associates, I conclude that these areas were likely used as agricultural fields sometime in the past.

Conclusions

The pollen assemblages from these samples were very well preserved and contained extremely high grain counts. The assemblages contained a very high concentration of arboreal pollen types (conifers), which were likely the result of long-distance transport from higher-elevation areas to either the east or west of the site.

The assemblages (excluding the conifer pollen) were consistent with the desert scrub or desert scrub grassland vegetation present in the area today. Cheno-am pollen dominated the nonarboreal component of the assemblages, and members of this family have been associated with cultivated crops as weedy associates and/or invaders in other areas of the Southwest.

The assemblages contained a number of taxa, notably *Platyopuntia*, *Cylindropuntia*, Cactaceae, Onagraceae, Rosaceae, *Eriogonum*, *Polygonum*, *Sphaeralcea*, *Typha latifolia*, and Malvaceae. The occurrence of most of these pollen types was likely due to the presence of these plant types within the field and again are consistent with a desert scrub vegetational component.

Carya, although present in a small amount, was likely eroded out of Tertiary sandstone deposits, which are common in the area. *Juglans*, although fairly rare, was probably locally available. Malvaceae pollen suggest that a member of this family (*Abutilon, Malva*, etc.) was locally present or that cotton (*Gossypium* sp.) was also being cultivated within this field system.

Zea mays pollen was present in fairly high pollen concentration values in all five samples from this field area. Based on the pollen concentration values of *Zea mays*, and the fact that all five samples were taken from the 10–20 cm level below the surface, I conclude that this was probably an agricultural field associated with the Pueblo occupation of LA 145398.

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