Loving Lakes and Dunes:
Research Design and Data Recovery Plan for Eight Archaeological Sites on NM 128, Eddy County, New Mexico

OAS Staff

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Loving Lakes and Dunes: Research Design and Data Recovery Plan for Eight Archaeological Sites on NM 128, Eddy County, New Mexico

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Administrative Summary

This data recovery plan was prepared by the Office of Archaeological Studies (OAS), Museum of New Mexico, at the request of the New Mexico Department of Transportation (NMDOT). It provides a cultural-historical, theoretical, and methodological context for the archaeological investigation of portions of eight archaeological sites: LA 113042, LA 129214, LA 129216, LA 129217, LA 129218, LA 129220, LA 129222, and LA 129300. These sites overlap with proposed highway improvements to NM 128, between Loving and Jal, Eddy County, New Mexico. Improvements include both new alignments and the rehabilitation of abandoned highway easements. LA 129220 is on state trust land, while all of the other sites are on federal land administered by the Bureau of Land Management (BLM), Carlsbad Field Office.

NM 128 originates at its junction with NM 31 southeast of Carlsbad and northeast of Loving, New Mexico. The highway continues east to Jal, New Mexico, and then into Texas. This two-lane highway with minimal shoulders passes through a number of salt lakes at its west end. Over the course of the project the highway rises gently toward the Livingston Ridge, northeast of the highway. After passing the WIPP site, the highway enters Los Medaños, or the dunes. The east end of the project is located among high coppice dunes.

The NMDOT is preparing to improve and reroute the highway in three phases: (1) the westernmost 10.7 miles; (2) the Jal end; and (3) the connecting segment. This data recovery plan covers archaeological sites that will be affected by the first phase of highway improvements. Archaeological surveys in advance of the proposed highway modifications were conducted by TRC Companies, Inc. (Turnbow et al. 2000), under contract to Marron and Associates, Inc.; and by SWCA, Inc., Environmental Consultants (Railey et al. 2006). A survey of a pipeline corridor by Western Cultural Resource Management also overlaps the area of the highway modifications (Gibson 1996). A total of twelve sites overlapped with this phase of the proposed highway construction, but four of the sites (LA 129215, LA 129219, LA 129221, and LA 129223) were determined ineligible for inclusion in the *National Register of Historic Places* and therefore are not considered for data recovery. The eligibility of one site at the west end of the project (LA 129216) and one at the east end (LA 129217) was not determined. LA 129216 and LA 129217 are included in this data recovery plan and will be investigated with a phased testing-data recovery approach.

LA 129220 is the only site on state trust land and is the only one with no evidence of an extensive prehistoric component. The site consists of a mid-twentieth-century nonresidential ranch complex with a windmill, stock tanks, corrals, and an artifact scatter. A veneer of later historic trash is present, but no prehistoric artifacts or features were noted during the survey. The portion of the site to the north of the existing highway, which includes only a railroad-tie corral, will be affected by construction. This site has been fully recorded, and treatment within this data recovery effort will be limited to a confirmation of the survey observations and archival research to provide a historical context for the site. No excavation or collection will be undertaken.

All of the other sites are on BLM land and have prehistoric components defined by scatters of burned caliche and artifacts. In addition to these basic characteristics, LA 113042 covers 109,111 sq m and includes 27 features. Of these, 17 are ash-stained midden deposits, 9 are distinct concentrations of burned caliche, 1 is a burned caliche and ash concentration, and 1 is an ash stain. Temporally diagnostic artifacts are limited to pottery spanning A.D. 500–1300, but the nature and extent of nonpottery artifacts and features argue for the presence of Archaic components as well. Approximately 37,000 sq m of the site area overlap with the highway construction zone, including four of the features. Four additional features are adjacent to the project limits.

LA 129214 covers 81,058 sq m and includes 34 features within the burned caliche and artifact scatter. This site is 250 m from LA 113042 in a similar geomorphic setting. Of the features, 23 are ash-stained midden deposits, 1 is a burned caliche midden (without ash), 4 are burned caliche and fire-cracked rock concentrations, and 1 is a rock alignment that could be a roomblock or a consequence of modern land modification. Cuts through midden deposits suggest depths exceeding 0.5 m in some areas, and the extensive middens are expected to include internal features and structures. Temporally diagnostic artifacts include a piece of flaked aqua bottle glass (post-A.D. 1800) and Formative pottery (A.D. 500–1300). Although no temporally diagnostic projectile points were observed on survey, the relative abundance of flaked stone suggests that occupation began within the Archaic period. Approximately 16,000 sq m of the site area overlap with the project limits, including 17 features.

LA 129216 covers 11,094 sq m and includes nine features. The features consist of seven burned caliche concentrations and two burned caliche concentrations with fire-cracked rock. No pottery was noted, but a single Type 2-B arrow point suggests that the occupation span includes A.D. 750–1300. Approximately 1,789 sq m of the site area overlaps with the project area, and although none of the identified features falls within the project limits, two burned caliche concentration features are adjacent to it. This site may or may not be eligible for inclusion in the NRHP. Investigation will be phased to determine eligibility prior to pursuing full data recovery.

LA 129217 covers about 9,927 sq m of blowouts with cultural material interspersed with coppice dunes. The site boundary is less than 25 m from the boundary of the adjacent site of LA 129218. Eight features were defined on survey, including one midden, four burned caliche concentrations, three scatters of burned caliche, and a pit with ashy fill. The only potentially temporally diagnostic artifacts were two dart points. The complete point is stylistically ambiguous but resembles the Bulverde type, with an estimated date of 3000–2500 B.C. A point fragment is also stylistically ambiguous, with similarities to types within the Archaic through early Formative date range. Project limits include 5,975 sq m of the site area and four features. This site may or may not be eligible for inclusion in the NRHP. Investigation will be phased to determine eligibility prior to pursuing full data recovery.

LA 129218 is immediately adjacent to LA 129217, and their archaeological content should be interpreted in concert. Cultural materials fall within a 12,738 sq m area and are exposed in blowouts between coppice dunes. Seven features were defined based on survey observations. These features consisted of two middens, three burned caliche concentrations, and two burned caliche scatters. No pottery was noted. A single dart point suggests but is not diagnostic of Middle Archaic styles. A total of 6,384 sq m of LA 129218 fall within the project limits, including six features.

LA 129222 covers about 14,386 sq m and is relatively unobscured by dune formation. Features consist of three concentrations of burned caliche—two articulated and one somewhat dispersed. One articulated concentration is associated with ash-stained soil. A single temporally diagnostic sherd (Chupadero Black-on-white) documents occupation within the A.D. 1150–1450 period, but earlier components are likely as well. A total of 6,353 sq m of the site extend within the project limits, not including any of the features noted on survey.

LA 129300 covers about 16,625 sq m. Fifteen features were observed during survey. Six of these are described as middens with ash, one midden lacks ash-stained soil, and there are eight concentrations of burned caliche. A single fragmentary dart point is reminiscent of Late Archaic through early Formative styles, while pottery types span the A.D. 500–1375 period. The pottery is associated with three of the middens and one burned caliche concentration. A total of 7,700 sq m of the site fall within the project limits, but this includes only three features.

Observations during survey indicate that the project area sites span Archaic through protohistoric Native American occupations and mid-twentieth-century historic ranching. The Native American occupations include the transition from foraging to mixed foraging and horticultural subsistence adaptations, and the geographic range of the sites may include contrasts between adaptations to different floral resource zones. The sites themselves include palimpsests where deflation has commingled materials from disparate time horizons, while other site areas and features appear to have both vertical and horizontal integrity. Dune development has obscured considerable areas of some site surfaces. Although no artifactual evidence of Paleoindian occupation was found, excavators in this part of New Mexico must always be on the alert for occupations from that early part of the sequence.

The investigative foci of the prehistoric research include regional questions of chronology, cultural affiliation, and adaptation. The project area sites will contribute to our understanding of Archaic adaptations in the playa-desert environment, and changing resource emphases are expected both across the project area and through time. Formative period components in the project area lie within common definitions of the Jornada Mogollon. However, the adjacent subregional cultural-historical frameworks of the Guadalupe Mountains–Brantley area (Katz and Katz 1985a) and the Eastern Extension (Corley 1965/1970; Leslie 1979) contrast with the agricultural adaptation of Jornada Mogollon west of the Guadalupe Mountains. The Formative record of the project area will help assess levels of agricultural reliance and determine whether a Mogollon designation for the regional culture is warranted. At the subregional level, the record will help evaluate which of the two adjacent culture historical sequences is appropriate for the project area. Embedded in both the Archaic and Formative studies are questions of broad regional interactions with the southern Plains, the Trans-Pecos, and Southwestern populations.

Recovery of archaeological information relevant to the research problems poses a number of challenges. The sites are extremely large, and they have been subject to both deflation and dune encroachment that has blurred and obscured the nature of the archaeological record. Field work strategy includes intensive excavation of known features and surfaces, sampling to find (or confirm the absence of) additional features and surfaces, trenching, blading, and geomorphic investigations to provide stratigraphic and environmental contexts for the features and surfaces. Stratigraphic differentiation and dating of individual components will be emphasized wherever possible to help interpret palimpsests that appear to dominate blowout areas between dunes. Recovery will include high-precision screening in selected contexts to support inferences of function and exchange.

NMDOT Project No. TPM)-128(7), CN 3279
OAS/MNM Project No. 41.833
NMCRIS Activity No. 99600

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Introduction

This data recovery plan was prepared by the Office of Archaeological Studies (OAS), Museum of New Mexico, at the request of the New Mexico Department of Transportation (NMDOT). It provides a cultural-historical, theoretical, and methodological context for the archaeological investigation of portions of eight archaeological sites: LA 113042, LA 129214, LA 129216, LA 129217, LA 129218, LA 129220, LA 129222, and LA 129300 (see Appendix 1 for legal descriptions and UTM coordinates). These sites overlap with proposed highway improvements to NM 128, between Loving and Jal, Eddy County, New Mexico. Improvements include both new alignments and the rehabilitation of abandoned highway easements. LA 129220 is on state trust land, while all of the other sites are on federal land administered by the Bureau of Land Management (BLM), Carlsbad Field Office.

NM 128 originates at its junction with NM 31 southeast of Carlsbad and northeast of Loving, New Mexico. The highway continues east to Jal, New Mexico, and then into Texas. This two-lane highway with minimal shoulders passes through a number of salt lakes at its west end. Over the course of the project the highway rises gently toward the Livingston Ridge, northeast of the highway. After passing the WIPP site, the highway enters Los Medaños, or the dunes. The east end of the project is located among high coppice dunes.

The NMDOT is preparing to improve and reroute the highway in three phases: (1) the westernmost 10.7 miles; (2) the Jal end; and (3) the connecting segment. During the Phase 1 survey, 12 archaeological sites were identified (Table 1). Four of them were determined to be ineligible for the *National Register of Historic Places* (NRHP), six sites were eligible, and two were undetermined. This data recovery plan addresses the eight sites that are or may be eligible and that will be affected by the first phase of improvements. Table 1 summarizes areas of overlap of the proposed project and the recorded boundaries of the archaeological sites. Redesign is possible prior to the initiation of data recovery excavations, and excavations will be limited to the most conservative area of potential effect when excavations actually begin.

The US Geological Survey (USGS) 7.5′ quadrangle maps encompassing the project area are Loving, Remuda Basin, and Los Medaños (Fig. 1). The proposed project consists of a new alignment of portions NM 128 from the intersection of NM 31 and NM 128 at Milepost 0 to Milepost 10.7 (Fig. 2). The proposed alignment runs along the existing NM 128 to Milepost 0.55, arches north to avoid the salt lakes in the area, and then reconnects with the existing NM 128 at Milepost 5.8. It leaves the existing road again at Milepost 9.1 and reconnects at Milepost 10.5. The highway improvements are within Sections 32, 33, 34, 35, and 36, T 22S, R 29E; Sections 4 and 5, T 23S, R 29E; Section 31, T 22S, R 30E; Sections 1, 2, 3, 4, 5, 6 and 12, T 23S, R 30E; and Section 7, T 23S, R 31E. Universal Transverse Mercator (UTM) grid coordinates for the beginning of project (BOP), at Milepost 0, are Zone 13, [redacted] For the end of project (EOP), at Milepost 10.7, they are Zone 13, [redacted] (NAD 1983).

Table 1. Sites potentially affected by project

Site (east to west)	Area of Site within Project (sq m)*	Total Area of Site (sq m)	Eligible for *National Register*?
LA 129217	5975	9927	not determined
LA 129218	6384	12,738	yes
LA 129221	1130		no
LA 129220	5251	14,359	yes
LA 129219	46		no
LA 129222	6353	14,836	yes
LA 129223	7961		no
LA 129300	7700	16,625	yes
LA 129215	1626		no
LA 113042	37,047	109,111	yes
LA 129214	16,714	81,058	yes
LA 129216	1789	11,094	not determined

* Includes areas within old and new rights-of-way combined (no pavement)

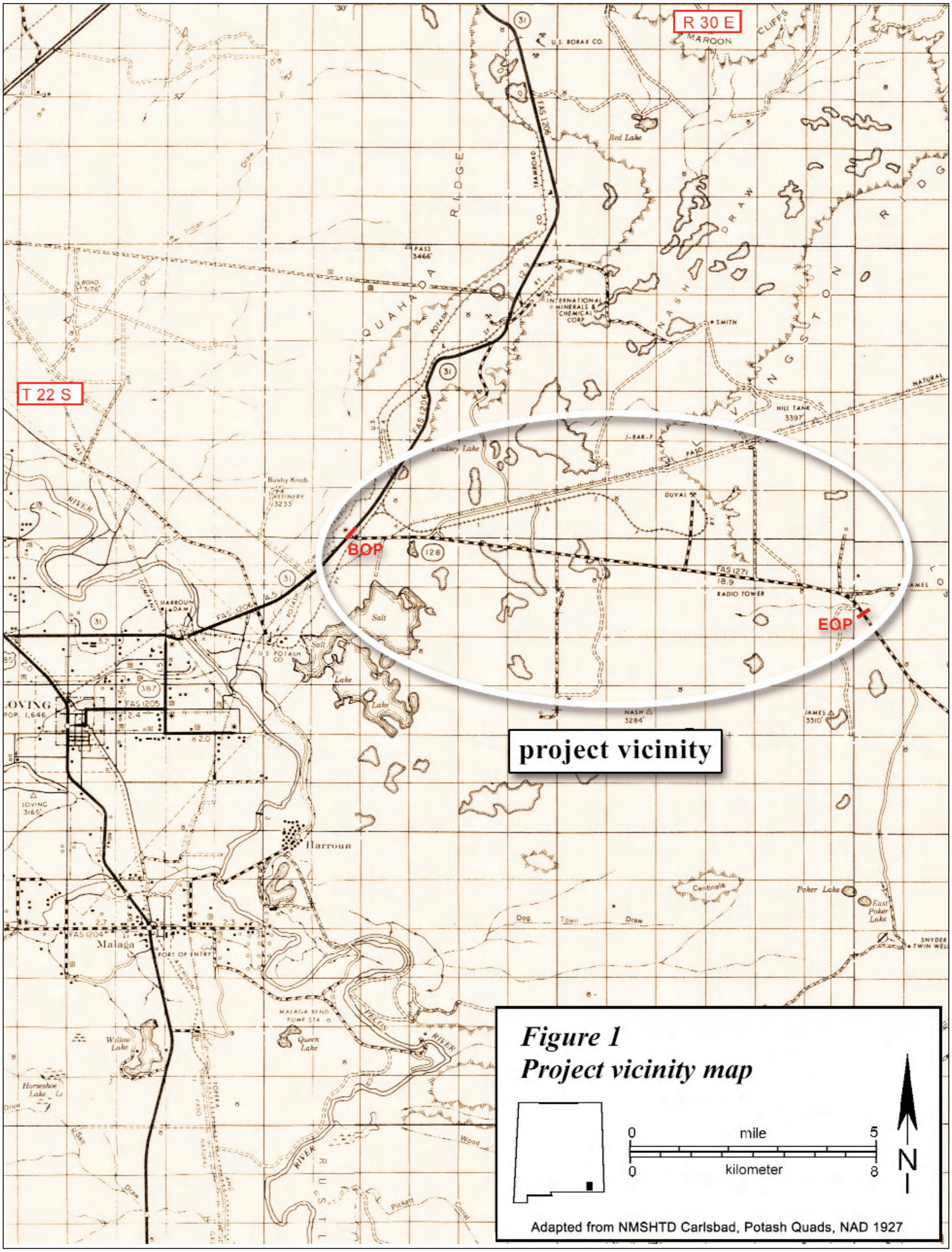

Figure 1
Project vicinity map

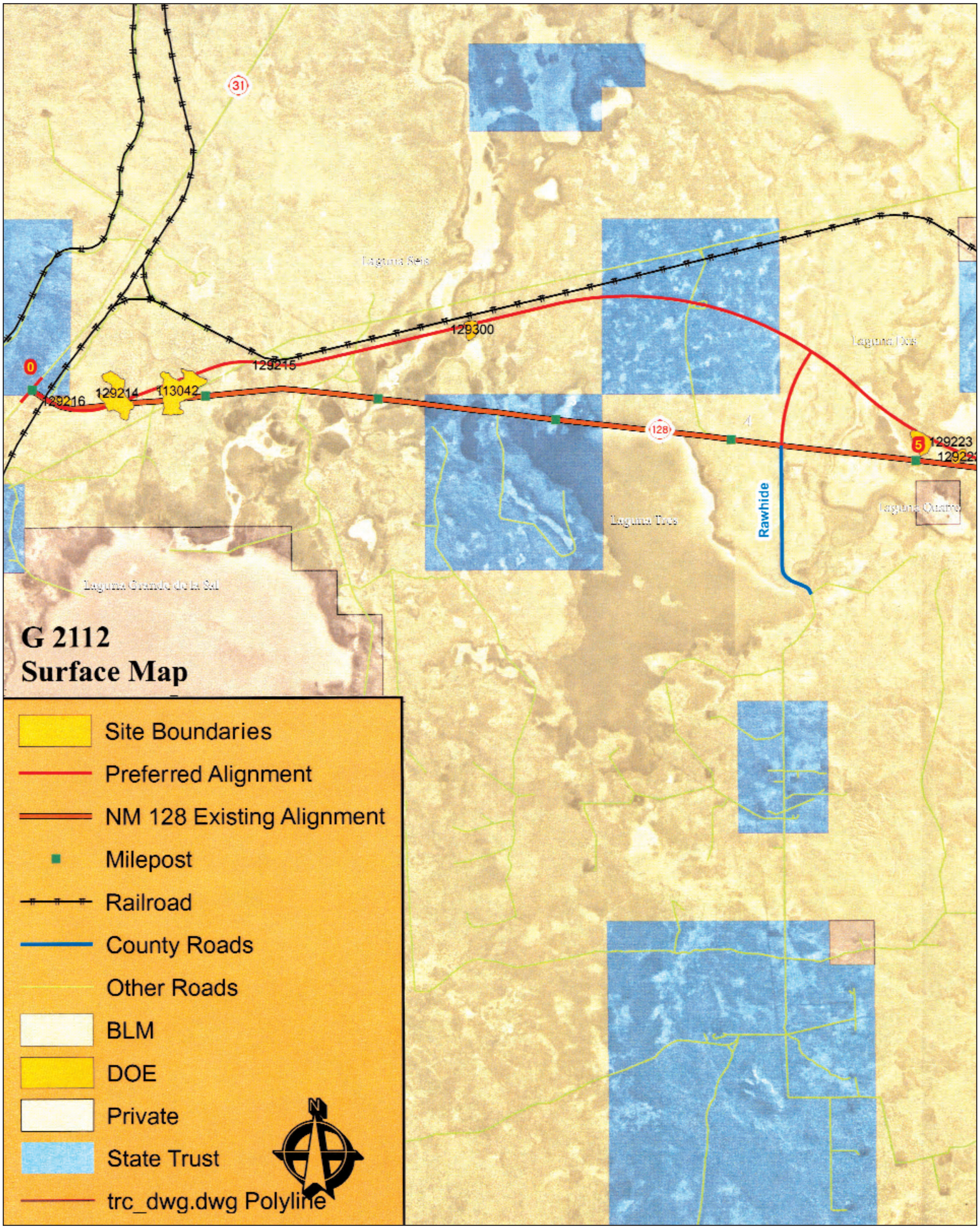

Figure 2. Project map.

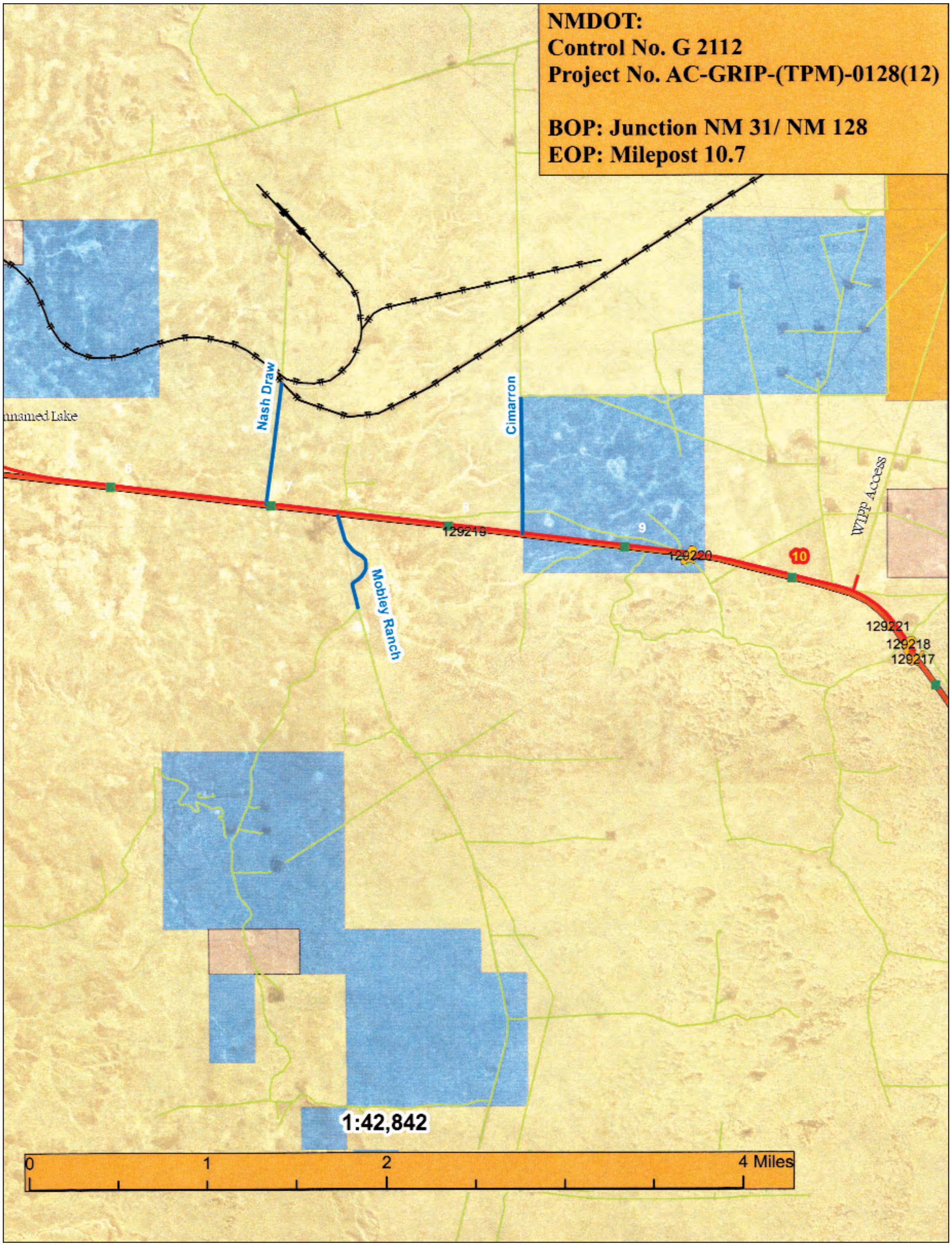

Figure 2 (continued)

Natural Environment

Regge N. Wiseman

Physiography and Geology

The project is in the Mescalero Plains east of the Pecos River and east of Carlsbad, Eddy County, New Mexico. The beginning of the project (BOP) is 7 km east of the river and immediately east of the south end of Quahada Ridge, which is composed of various gravels, sands, silts, and muds of the Cenozoic era Gatuna formation (Powers and Holt 1993). The BOP is on a dissected remnant of the Mescalero Plains, which consists of a group of low sand hills and ridges of Quaternary alluvial and bolson deposits (Dane and Bachman 1965). The elevation at the BOP is 922 m (3,025 ft) above mean sea level. LA 129216, LA 129214, and LA 113042 are on the upper surface and ridges of this remnant.

Three km east of the BOP, the project alignment drops down into a playa-filled basin at an elevation of 906 m (2,973 ft). These playas receive the discharge of Nash Draw, a relatively short, northeast-to-southwest trending channel that drains the southwest slope of Livingston Ridge. Prior to the modern ponding of heavily mineralized waters from nearby potash mines, the Rustler formation (Permian) was exposed in the bottom of this basin. LA 129300 is on a low remnant of this formation that projects southward between two of the playas. At this point, the highway alignment skirts the north edge of the basin.

Approximately 9 km east of the BOP, the highway alignment begins its ascent out of the basin, working its way through the broken topography of the southwest slope of Livingston Ridge. Various units of the Rustler formation, including "anhydrite, red silty shales, and magnesian limestone" (Lucas and Anderson 1993), may be exposed on this slope. Livingston ridge itself is capped by a continuation of the Quaternary alluvial and bolson deposits mentioned earlier. LA 129222 is on the first piece of high ground along the east edge of the basin at an elevation of 915 m (3,000 ft).

East of LA 129222, the alignment steadily gains elevation over a distance of 2.4 km until it tops out on Livingston Ridge at an elevation of 993 m (3,260 ft). Here sits LA 129220, a mid-twentieth-century ranch complex. The turnoff to the Waste Isolation Pilot Project (WIPP) is 1.2 km east of this site.

The two easternmost archaeological sites, LA 129217 and LA 129218, lie within the 1000-feet EOP zone. Both sites are among parabolic dunes near the edge of Livingston Ridge. This dune field marks the first occurrence of the prehistorically important shin oak vegetation encountered during this project and is part of a complex whose relationship to the sand sheets further north has yet to be established (Hall 2002 and pers. comm.).

Soils

The soils of the project area belong to the thermic, light-colored soils of the warm desertic region (Maker et al. 1978). They include, from west to east, No. 45, Paleorthids-Haplargids; No. 41, Gypsiorthids-Torriorthents-Gypsum; a second expanse of No. 45, Paleorthids-Haplargids; and No. 40, Haplargids-Torripsamments.

Maker et al. (1978) describe No. 45, Paleorthids-Haplargids soils as follows: "Although small and scattered areas of deep soils occur in this association, it is dominated by shallow soils underlain by fractured, strongly cemented or indurated caliche." The majority soils are further characterized as droughty.

Three of the small areas of deeper soils in the No. 45 soils include Typic Camborthids ("loamy fine sand or fine sand surface layers and moderately coarse-textured subsurface layers to a depth of 60 inches or more"), Typic Torripsamments ("sands and loamy fine sands to a depth of five feet or more"), and Paleargids ("loamy fine sand or fine sandy loam surface layers, and sandy clay loam subsoils over indurated caliche at depths of about 20 to 40 inches"). All of these soils have some potential for limited farming under primitive conditions (see Bradfield 1971). Field reconnaissance by a soil scientist would be required to locate the patches of these deeper soils in the vicinity of LA 129216, LA 129214, and LA 113042, at the west end of the project; and LA 129217 and LA 129218 at the east end.

No. 41 soils, Gypsiorthids-Torriorthents-Gypsum, are basically nonfarmable because of high gypsum and/or halite (salt) content and substrates of these materials at shallow depths (0.5 m or less). These soils characterize the basin of which the nearby Salt Lake (south of the west end of the project area) is a part.

The apparent absence of farmable land in these soils in the vicinity of LA 129300 is surprising since the site may have pithouses and therefore may have been occupied by farmers. However, it is possible that the soils in the low areas to the east, south, and west of LA 129300 belong to the No. 45 soils but are now covered with the salts piped in from the nearby potash mines.

No. 40 soils, Haplargids-Torripsamments, are moderately deep to deep soils composed largely of eolian sands accumulated in dunes. Although these soils are characterized by Maker et al. (1978) as supporting varied grass species, creosote, and mesquite, they do not mention the dominance of shin oak communities in this part of southeastern New Mexico.

This brings up the question of the distribution of shin oak before the grazing disturbances of domestic livestock over the last 100 to 120 years. Specifically, did shin oak exist in the vicinity of LA 129217 and LA 129218 when these sites were occupied by prehistoric (and possibly early historic) peoples? Sandy tracts such as these are known to have been farmed by modern Hopis as part of what appears to be an ancient custom (Bradfield 1971).

Vegetation

Marron and Associates (2005), a biological report prepared specifically for this project, describes three vegetation communities in the project area: Plains-Mesa Sand Scrub, Chihuahuan Desert Scrub, and Closed Basin Alkali Riparian. These communities form a patchwork pattern in the lowland parts of the project near the playas in the western half of the project area. Plains-Mesa Sand Scrub and Chihuahuan Desert Scrub dominate the upper part of the western slopes and the top of Livingston Ridge and Los Medaños in the eastern half of the project.

Climate

The climate of the project area is characterized by mild winters and warm summers. The mean January temperature for Carlsbad is 5.5 degrees C (42 F); the mean temperature in July is 27.2 degrees C (81 F) (Wiseman 2003). The average frost-free season in the project area is 220 days. The last killing frost in the spring occurs around March 30, and the first killing frost in the fall occurs after October 30 (Tuan et al. 1973).

The normal annual precipitation is 330 mm (13 in), and the normal summer precipitation (May through September) is 200 mm (8 in) (Weather Bureau, US Department of Commerce 1967). However, these figures are derived from data recorded for 1931 through 1960. Since two notable droughts occurred in the 1930s and mid-1950s, these figures may be somewhat low over the long term. For instance, precipitation records for 1878–1930 for the Roswell area (120 km or 75 mi to the northwest, but still within an edge-of-the-plains environment) documents much wetter times. Between 1878 and 1900, the annual precipitation averaged about 400 mm (16 in), and between 1886 and 1890 the average was 500 mm (20 in) (Wiseman 2001).

Winds are a characteristic aspect of the plains of eastern New Mexico. The predominant wind direction in the project area is from the southeast, and the Gulf of Mexico is the primary source of summer moisture. A wind rose developed for WIPP, a few miles northeast of the project area, indicates that the directional order of winds is first from the southeast, followed by the south-southeast, the south, and the east-southeast. All other directions are minor by comparison. However, the strongest winds (those in excess of 8 m per second) are generated by local convective storms and can come from virtually any direction (Lord and Reynolds 1985: Fig. 3.5).

Surface Water

Surface water in the project area is mainly available in playas or wet-weather ponds. When moisture fell, and especially during the summer monsoons emanating from the Gulf of Mexico, water would have been available in these shallow but often extensive features. In some cases, water would move to playas through short drainages such as Nash Draw. The duration of standing water would have depended on the amount of rainfall, air temperature, degree of cloud cover, and persistence of winds. Thus, water would have been available for periods ranging from a few days to several weeks or even a few months following especially wet seasons.

Springs and seeps are a possible exception. Only one spring has been recorded and tested in the project area. Designated Number 20 for Eddy County (White and Kues 1992), this unnamed spring is near the north shore of Salt Lake in the southwest quarter of Section 4, T 23S, R 29E. This would have been one of the two springs shown on the Remuda Basin USGS topographic map, but we cannot be certain which one it is. The two springs shown on the map are 1000 and 1200 m due south of LA 129214.

While we have no way of knowing the dissolved-solids load of this spring prior to the modern period of potash mining and mine water disposal in playas such as Salt Lake, the specific conductance records for 1940 (11,600 microsiemens) and 1975 (233,000 microsiemens) indicate that the water from this spring is definitely not potable for humans or livestock. These specific conductance values, when converted to TDS values (total dissolved solids), are 8,120 and 163,100 mg per liter, respectively.

According to Tom Morrison of the New Mexico Office of the State Engineer (pers. comm., May 9, 2006), humans today tolerate up 1,500 or as high as 2,000 TDS in their drinking water, depending on what the dissolved solids are and how well the individuals have adapted to them. The water from this spring is not potable by humans today, but the total dissolved solids may well have been lower in the past. The water discharge from the nearby potash mines may have greatly increased the total dissolved solids load of the water from this spring.

Animals

The environment of the project area makes it especially diverse in animal life (Marron and Associates 2005). Mammals include mule deer, coyote, porcupine, gray fox, desert cottontail, jackrabbit, bobcat, badger, two species of skunk, prairie dog, two species of gopher, three species of ground squirrel, three species of woodrat, several species each of rats and mice, and several species of bats. Pronghorn and bison were probably present at one time in the nearby grasslands (Dick-Peddie 1993). Snakes and lizards are numerous in this semiarid landscape. West (1994) lists 164 species of birds in the area.

Regional Culture History

Susana R. Katz and Paul Katz

This summary of the culture history of "the Pecos Country" (Fig. 3) is reproduced here by permission of Paul Katz. It is excerpted and adapted from "Prehistory of the Pecos Country, Southeast New Mexico," a section in *The Archaeological Record of Southern New Mexico*, prepared for the New Mexico Historic Preservation Division (Katz and Katz 2001).

Southeastern New Mexico's archaeologists are well aware of the shortcomings of the ceramic and projectile point typologies currently in use. These systems persist simply for lack of modern, authoritative, practical replacements or revisions. The need for better regional typologies is universally acknowledged (e.g., Mariah Associates 1987).

The classification system presented here uses chronological/developmental periods subdivided into phases. "Period," as used here, is comparable to "culture," as used by the Archeological Records Management Section (ARMS), i.e., extensive units of time and space with considerable variety in content. The periods are Paleoindian, Archaic, Formative, and Proto/Ethnohistoric. Our Paleoindian and Archaic periods are analogous to ARMS cultures of the same name. "Formative" subsumes the ARMS Mogollon and Anasazi cultures; Proto/Ethnohistoric includes the ARMS Apache and Plains cultures. We are omitting the few Casas Grandes and Navajo entries.

Smaller units, period and phase, are hardly ever identified in ARMS records, let alone recorded. This is understandable given the brief, surface-only nature of the survey work and the paucity of diagnostic surface artifacts. Thus, the ARMS data employed here equate to the level of "culture."

The subdivisions of some chronological periods, especially the Paleoindian and Archaic, might be considered subperiods rather than phases as defined by Willey and Phillips (1958). Their temporal extent is much too broad and their cultural content too imprecise for them to be considered phases.

The need for improved chronological control and for a region-wide cultural classification system was a priority in the interviews and discussions that preceded this overview. This sequence is a response to that need. It should not be taken as chronological or culture historical truth; however; it is a springboard for further research. We expect this sequence to expedite intra- and extra-regional identifications and interpretations, to provide insights into the relationships between localities, to highlight the strengths and weaknesses of the database, and to propose new questions about the use of the mountain-plains margin.

Table 2 presents a sequence of regional phases grouped in four chronological periods. The date range for each regional phase has been generated, where possible, from the radiocarbon dates. Information on the articulation of local to regional phases, as well as characteristic artifacts, features, and site types, is drawn from Jelinek (1967), Katz and Katz (1985a), and Leslie (1979).

Paleoindian Period (12,000–8200 B.P., or 10,000–6200 B.C.)

Environment

The climate at the beginning of the Paleoindian period was more equable and considerably cooler and wetter than today. The Llano Estacado was a steppe or savanna dotted with shallow lakes. Stands of pine and spruce were present, perhaps lining the watercourses. Environmental reconstructions for the Llano Estacado use pollen profiles from playa lakes and ecofacts from sites such as Blackwater Draw and Lubbock Lake.

Trees grew far down the mountain slopes, and the Sacramento section foothills were wooded. The flora and fauna of this district are represented by samples recovered from the Guadalupe Mountains, including materials from excavations such as Williams Cave (Ayer 1936)

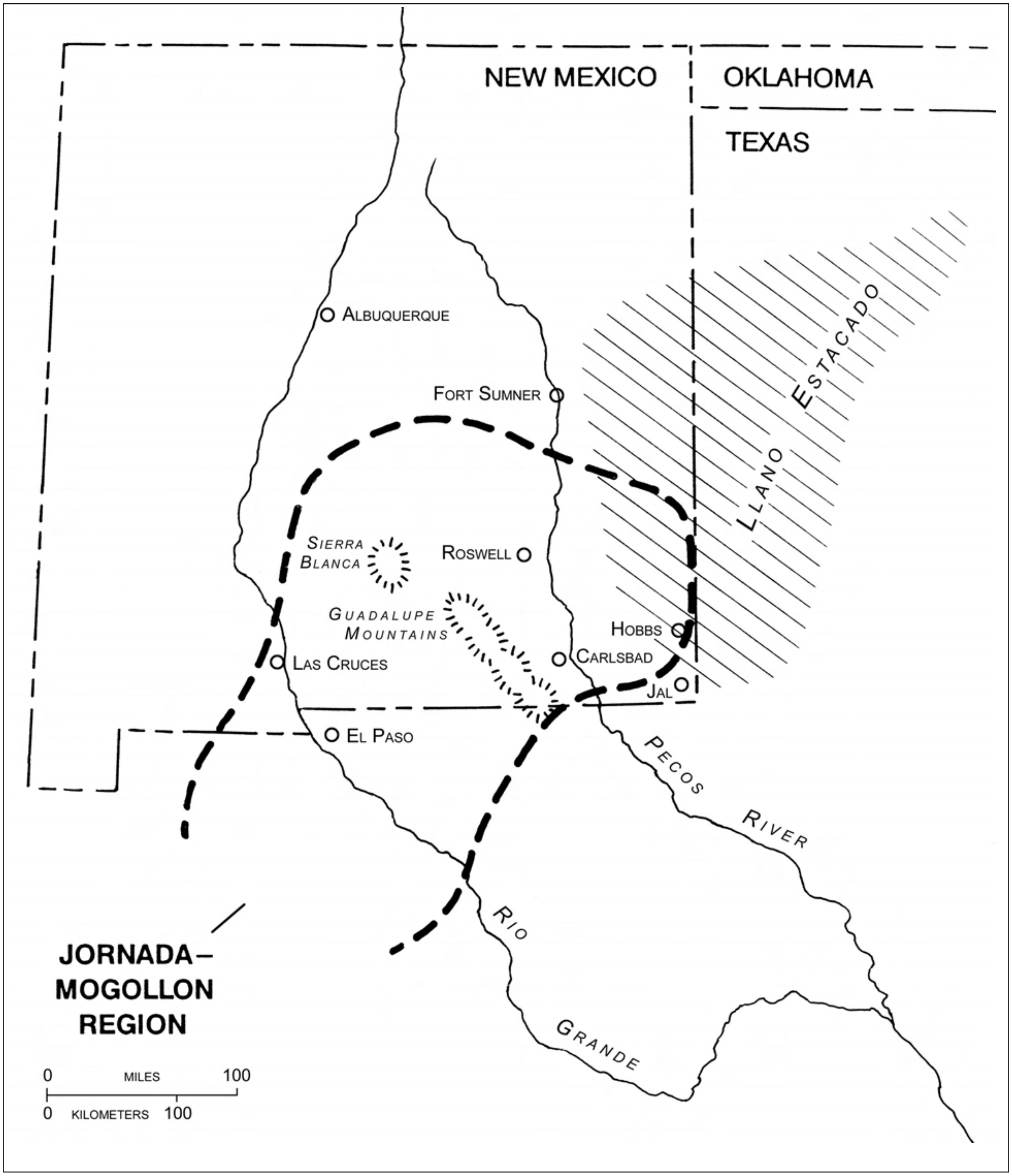

Figure 3. The Pecos Country of southeastern New Mexico.

Table 2. Regional phase sequence for southeastern New Mexico

AD/BC Regional Phase	Local Phase	Ceramic Trends	Ceramic Types (N)	Ceramic Types (S)	Projectile Point Trends (Types)	Other Artifacts	Site Attributes	Type Sites
1750 Ethnohistoric 2	L Post-Ochoa (L); Seven Rivers (K)	-	-	-	Metal	-	Short-term open camps, caves, rockshelters	LA 48738 (K)
1600 Ethnohistoric 1	E Post-Ochoa (L); Phenix (K)	-	-	-	(2F, Garza)	-	-	Garnsey Spring (P&S)
1500 Protohistoric 1	L Ochoa (L); Oriental (K)	? Drought -	-	-	Sm tri sd-ntch, ccv base, serrated (2D, 2E, 2F)	-	Contig-rm surf structs (L); tipi rings (K)	LA44582 (K); Garnsey Bison (S)
1375 Formative 7	E Ochoa (L); Post-McKenzie (J); Oriental (K)	<sherds,<types, <plain browns; .>intrusives	<RG types; corr. brns; Chup B/W; L MPB/W	Ochoa Indnt.; EP Poly; TR; Linc	Sm, long, narrow, sd-ntch & basal ntch, no serr (2C)	Shaft smoothers, sm thumb scrprs, ntchd ribs, 4-bevld knives (L); obsidian (J)	Lg, deep pithouses early, shallower later, single surf rooms very late, short-term camps in new locations (L); sm stone circles (K); ? tipi rings (P-11) (J)	Merchant (LA 43414) (L); Henderson Pueblo (P&S); P-3, P-11(J)
1300 Formative 6	Malchoa (L); L McKenzie, [Roswell] (J); Oriental (K)	Textured brns, a few glazes, little-no local pln brns	+MPB/W (60%); McK B (20%), <JB, <MPMB, <CB/G, <Los Lunas, <Pitoche, no RB	Local corr, +EPP, [GlzA, Ramos, Gila, LB/R]; no JB, no SPB in N part	Sm, sd-ntch, ccv base (2A, 2B)	Sm thick steep end scrprs (J)	Pithouses (L); only one lg site, a few sm scatters, contig rm surf structs, pithouses, many bison bones, <*Zea* (J)	Monument Spring (L); P-4C (J)
1200 Formative 5	Lt Maljamar (L); E McKenzie [Crosby] (J); Oriental (K)	Decrease in some local brns, others favored; SPB wanes, replaced by McKenzie	? RMB/W, JB, MPMB, +RB, McKB, <MPB/W, (SPB), <Chup, <CB/G, <<other intrusives	JB, SPB, MPMB, local brns, Ccor, SFB/W, <EPP, TR	Sd-ntch, ccv base, tri; cvx-st base, tri; cvx-st edges (2A, 2B)	-	Only 3 sites, but lg; rect, slab based surface rms (P-25) (J); stronger upland orientation, < sites, <feats (K)	P-1, P21, P-25 (J)
1125 Formative 4	E Maljamar (L); L Mesita Negra [pre-Crosby] (J); Oriental (K)	McKB: non-local gray present; > local grays; < local brns	Chup, CB/G, <MPB/W, >JB, RB (10%), trace SPB	JB, SPB, MPMB, local brns, Chup	Variability (esp. size) cont of diag-ntch forms (3A-3F)	Oval basin metates, 1-hnd manos w/1 or 2 grnding surfs, mortars, pestles (L)	Pithouses, few sm gatherhing sites (L); subsurface rms (P-24), sm sites (J)	P-24 (J)
1075 Formative 3	Lt Querecho (L); E Mesita Negra (J); Globe (K)	+Local brns; local and nonlocal grays	+MPMB; CB/G, MPB/W, CebB/W; <Red Mesa, JB, Alma, RB, SPB; EPB, SocB/W	JB, SPB, MPMB, local brns, MimbB/W	Same forms, mod size (3A-3F)	Oval basin metates, cvx-faced manos (L)	Larger villages at better waterholes, sm rect pitrooms, use of shinnery (L); lrgr sites, more intensive occup, 1 struct @ P-24 = semisub slab-lined w/ adobe floor (J)	P-24 (J)
950 Formative 2	E Querecho (L); L 18-Mile (J); Globe (K)	Almost all browns, local browns predominate; B/W	+MPMB; JB, SPB, Alma, RB, Red Mesa B/W	JB, SPB, MPMB; local brns; Ceb B/W	Same forms, mod size arrow points (3A, 3B)	1-hnd flat manos; ? slab metates, mortars, ? pestles	No structs, clay floor pads, more use of shinnery (L); a few sm sed villages, pithouses & contig surf rms (J); stone circles, to upland orientation (K)	P-4A (J)

Table 2 (continued)

AD/BC Regional Phase	Local Phase	Ceramic Trends	Ceramic Types (N)	Ceramic Types (S)	Projectile Point Trends (Types)	Other Artifacts	Site Attributes	Type Sites
750								
Formative 1	L Hueco (L); E 18-Mile (J); Globe (K)	Early brns, nonlocal predom; few sherds	+JB, MPMB, SPB, Alma, trace Lino	? Browns	Sm-med sized dart pt w/cvx-st edge, cvx-st base, diag ntch (5, 6A-6D)	1-hnd flat manos; ? slab metates, mortars, ? pestles	Short-term gathering camps, most near waterholes (L); few sites (J); riverine orientation (K)	P-14, P-20 (J)
500								
Archaic 4	E Hueco (L); Brantley (K)	-	-	-	Med size darts, stem shapes vary, some diag ntch (6C-D, 8A, San Pedro, Pecos [3 varieties])	-	Burned rock scatters, more burned rock rings, hearths, some upland sites, but riverine sites predom	LA 38276 (K), LA 48761) (K)
AD/BC								
Archaic 3	McMillan (K)	-	-	-	Med size, stmd darts (8C-D, 9, Darl)	-	Burned rock ring, hearths, riverine orientation continues with some upland procurement sites (K)	LA 38233 (K)
1000								
Archaic 2	Avalon (K)	-	-	-	-	Shell tools, grinding implements	Burned rock hearths, camps on major waterways, riverine orientation	LA 44544 (K)
1700								
HIATUS								
3200								
Archaic 1	(undefined)	-	-	-	(Jay)	-	-	-
5200								
HIATUS								
6200								
Paleoindian 3	L Paleoindian complexes	-	-	-	Lg lanceolate blades w/ transverse or collateral parallel flaking (Cody, Firstview, Plainview, ? Eden)	Side scrprs, end scrprs, drills	-	Blackwater Draw, Milnesand
8000								
Paleoindian 2	Folsom & Midland complexes	-	-	-	Med-size lanceolate w/ broad channel flake (Folsom, Midland)	Flake scrprs & knives, bifacial knives, gravers, cores	Short-term camps	Blackwater Draw, Edila
9000								
Paleoindian 1	Clovis complex	-	-	-		Transverse end scrprs, side scrprs, eared scrprs, gravers, perforators, bifacial knives, hammerstones, bone implements	Short-term camps, bone beds w/ chipped stone tools	Blackwater Draw, Locality 1

+ most abundant; < decreasing; > increasing; first appearance

(J) Jelinek (1967)
(K) Katz and Katz (1985a)
(L) Leslie (1979)
(P&S) Parry and Speth (1984)
(S) Speth (1983)

and the Last Chance Canyon and Rocky Arroyo packrat middens (Van Devender et al. 1978). With the exception of Blackwater Draw, very little is known about the Pecos Valley during this period.

With the terminal Pleistocene onset of a trend to a warmer, drier, and more seasonally pronounced climate, some species retreated to preferred environments; others perished. Plants and animals that could adapt successfully to the new conditions flourished. Likewise, hunters and gatherers adapted to these changing conditions.

Sites

One hundred and thirteen sites with Paleoindian components have been recorded in southeastern New Mexico (Table 3). The greatest number (45) have been recorded in Roosevelt County, and the smallest (3) in neighboring DeBaca County (Table 4). Paleoindian sites have been recorded only in the lowest ecozones—the scrublands, grasslands, and desert scrub—with over 70 percent recorded in the grasslands alone (Table 5).

Paleoindians exploited several topographic situations within this rather limited range. Regionally, the largest number of recorded components occurs on topographically raised surfaces such as hilltops and ridges. The low-elevation components are associated with arroyos, dunes, blowouts, or playas. Paleoindian components occur at or within sight of water.

Certain topographic preferences vary from one district to another. On the Llano Estacado (Lea and Roosevelt Counties), Paleoindian remains are most frequently recorded in blowouts. In the Pecos Valley (Eddy County), hilltops were the favored location, and in Chaves County, playas have the greatest numbers of Paleoindian components.

A distinction in site size also occurs between districts. Pecos Valley sites tend to be small (1,000–5,000 sq m), and Llano Estacado sites are larger (>10,000 sq m).

Table 4 depicts the status of Paleoindian sites. Most have been only recorded or collected; few have been tested. Excavation is listed for only one site. The most severe postdepositional impact to Paleoindian sites, when recorded, has resulted from erosion (Table 6). Ten of the 113 sites were believed to be intact.

Subsistence and Settlement

The Paleoindian subsistence strategy apparently focused on the procurement of large game. The diet was supplemented with wild plants. We know little about these plants and the extent of their use, or about the use of small mammals or other foodstuffs.

Features common to the region's Paleoindian sites are always characteristic of hunting activities: fire-cracked rock, lithics, and lithic scatters. Bone fragments, bone beds, and hearths are associated with many components, and ground stone, fossil beds, lithic quarries, and cave components have been infrequently recorded.

Paleoindian 1 (12,000–11,000 B.P., or 10,000–9000 B.C.)

The diagnostic projectile point for this earliest regional phase is the Clovis point. It is large and lanceolate, with a basally thinned concave base and bifacial fluting. Leslie's collection includes examples of points with all the Clovis characteristics but roughly one-quarter of the typical length. Besides their diminutive size, the material is a grainy brown chert unlike the fine-grained chalcedonies typical of many Paleoindian points. These points were collected in the extreme southeast portion of the region, which, like Blackwater Draw, has a significant early Paleoindian presence. Other artifacts associated with Clovis components include transverse end scrapers, side scrapers, eared scrapers, gravers, perforators, bifacial knives, hammerstones, and a variety of shaped and expedient bone tools.

Presently, the bones of large animals associated with chipped stone tools, and diagnostic lithics, either isolated or in scatters, characterize the known sites of the phase. A type site for Paleoindian I is Blackwater Draw Locality 1 (Hester 1972).

Paleoindian 2 (11,000–10,000 B.P., or 9000–8000 B.C.)

The phase-diagnostic Folsom point is medi-

Table 3. Sites by regional period and ecozone

Period	Forest	Woodland	Scrubland	Grassland	Desert Scrub	Unknow n	Total
Paleoindian	-	-	6	84	23	-	113
Archaic	2	6	40	237	85	1	371
Formative	6	38	199	746	381	9	1379
Proto/Ethnohistoric	-	2	2	24	13	-	41
Total	8	46	247	1091	502	10	1904

Table 4. Archaeological status of Paleoindian sites in southeastern New Mexico as of June 1990

County	Survey, Recorded Only	Collected	Tested	Excavated (% unknow n)	Excavated (% know n)	Unknow n	Total
Chaves	4	7	1	-	-	1	13
Curry	1	1	-	-	-	2	4
DeBaca	-	1	-	-	-	2	3
Eddy	7	8	3	-	-	1	19
Lea	15	7	2	-	1	4	29
Roosevelt	12	3	-	1	-	29	45
Total	39	27	6	1	1	39	113

Table 5. Condition of Paleoindian sites in southeastern New Mexico as of June 1990

County	Intact	Grazed	Eroded	Inundated (impermanent)	Mechanical Disturbance	Vandalized	Combined Effects	Other	Unknow n	Total
Chaves	1	-	5	1	-	1	4	-	1	13
Curry	-	1	1	-	-	-	-	-	2	4
DeBaca	-	-	-	-	-	-	1	-	2	3
Eddy	4	2	9	-	-	-	1	2	1	19
Lea	4	-	14	-	2	-	8	-	1	29
Roosevelt	1	-	5	-	-	1	10	-	28	45
Total	10	3	34	1	2	2	24	2	35	113

Table 6. Topographic setting of Paleoindian sites in southeastern New Mexico as of June 1990

Topography	Chaves	Curry	DeBaca	Eddy	Lea	Roosevelt	Total
Arroyo/wash	1	-	-	2	1	1	5
Blowout	1	-	-	1	7	11	20
Cliff/scarp/bluff	-	-	-	4	-	-	4
Dune	1	-	-	3	3	-	7
Hilltop	2	1	-	5	4	1	13
Hillslope	-	1	-	1	-	2	4
Low rise	-	-	-	-	1	2	3
Mountain front/foothill	1	-	-	-	-	-	1
Plain/flat	-	-	-	-	3	6	9
Playa	4	-	-	1	3	3	11
Ridge	1	1	-	2	5	3	12
Saddle	1	-	-	-	-	-	1
Base of talus slope	-	-	-	-	-	3	3
Talus slope	-	-	-	-	-	10	10
Terrace	1	-	-	-	-	-	1
Unknown	-	1	3	-	2	3	9
Total	13	4	3	19	29	45	113

um-sized and lanceolate with a broad channel flake on both faces. The lateral margins are finely pressure flaked. The Midland point, which is also found in the region, is usually described as an "unfluted" Folsom. Other chipped stone artifacts associated with this phase include flake scrapers and knives, bifacial knives, gravers, and cores.

Short-term camps are characteristic sites of this phase. Type sites include Blackwater Draw (Hester 1972; Sellards 1952; Stevens 1973) and Elida (Warnica 1961).

Paleoindian 3 (10,000–8200 B.P., or 8000–6200 B.C.)

The various projectile point types associated with this Late Paleoindian phase include Plainview and its varieties, Firstview, and perhaps Cody complex types such as Eden. These are large, lanceolate points and knives with transverse or collateral parallel flaking. Other stone tools include side scrapers, end scrapers, and drills.

Across the region, this phase is identified by its diagnostic projectile points. Characteristic site data is lacking. Sites with Late Paleoindian components include the Portales Complex materials at Blackwater Draw (Agogino and Rovner 1969), Milnesand (Warnica and Williamson 1968), and San Jon (Roberts 1942).

Archaic Period (7200–1500 B.P., or 5200 B.C.–A.D. 500)

Two episodes of little to no cultural activity are suggested during the Archaic period. One occurs at the end of the Paleoindian period (8200 B.P., or 6200 B.C.) and lasts for 1,000 years until the beginning of the culturally defined Archaic period at 7200 B.P. (5200 B.C.). The other hiatus separates the first two Archaic phases and lasts 1,500 years, from 5200 to 3700 B.P. (3200–1700 B.C.). These events can be seen in gaps in the radiocarbon sequence. Identifying the gaps is just the first step. We must now ask whether these gaps indicate the absence of human activity, human activity that did not produce datable samples, or new site types and activities that we have so far failed to recognize.

Environment

Overall, temperatures were higher and rainfall amounts lower than they were in the last Paleoindian phase. This climatic change is well documented on the Llano Estacado at the Lubbock Lake site, dated between 8500 and 6300 B.P. (6500–4300 B.C.). It is not clear if the rainfall pattern was warm- or cool-season dominant, but it is certain that bison and other large grazing animals became increasingly scarce during the period, perhaps because of insufficient grass cover.

Conditions continued to deteriorate during the 1500-year hiatus between Archaic 1 and 2. The beginning of the hiatus corresponds to the second of two episodes of severe drought at Lubbock Lake between 5000 and 4500 B.P. (3000–2500 B.C.). Comparable regional data is not yet available, but these drought conditions were probably widespread in the first half of the Archaic period.

Environmental conditions moderated at the beginning of the Archaic 2 phase, about 3700 B.P. (1700 B.C.), although the climate was never again as wet or cool as it was in the Pleistocene. Xerification took its toll, and by 4000 B.P. (2000 B.C.) a modern semiarid climate and a modern mix of plants and animals was well established in southeastern New Mexico. The only unusual climatic episode in the Late Archaic is a mesic interval, postulated to have occurred between 3000 and 2500 B.P. (1000 to 500 B.C.) with the transition from Archaic 2 to Archaic 3. Modern semiarid conditions returned with the beginning of Archaic 4.

Sites

Archaic components have been recorded at 371 sites (Table 7). Of these sites, 45 contain components that could be assigned to an ARMS period. Six components are identified as Early Archaic, 5 as Middle Archaic, and 34 as Late Archaic. ARMS does not recognize a terminal Archaic period. While the number of period identifications is small, it is noteworthy that Late Archaic assignments significantly outnumber the Early and Middle Archaic assignments.

Archaic sites occur in all ecozones from the forest to the Pecos River to the Caprock and in a wide range of topographic settings (Table 8). This contrasts with the narrowly focused use of the landscape during the Paleoindian period. However, more than half of the Archaic sites (58 percent) are found in only four situations—blowouts, dunes, ridges, and hillslopes—also favored during the Paleoindian period. Blowouts and dunes are at the lowest elevations in the region, and ridges and hillslopes are only slightly higher. These low-elevation settings are common in the Pecos Valley of Eddy County, which has almost one-half of the Archaic sites.

Archaic site size and location differ from the previous period. Many Archaic period sites are large (>10,000 sq m), and they occur at various elevations throughout the region. Small Paleoindian sites (1,000–5,000 sq m) were typically found at low elevations, while large ones (>10,000 sq m) were typically at higher elevations. (This may be a function of geography—large Paleoindian sites have been recorded on the Llano Estacado).

The information provided in the ARMS database on the archaeological status of Archaic sites goes a long way toward explaining why so few components have been assigned to any ARMS period. Almost half (48 percent) have been survey-recorded only, and this does not include artifact collection. While 38 percent have had some further archaeological activity, almost all of these involve only surface collection. Only 16 sites (4 percent) have been tested or excavated.

The condition of Paleoindian and Archaic sites is similar (Tables 6 and 9). The greatest danger to Archaic sites appears to be from erosion. Just 53 (14 percent) of Archaic sites were considered to be intact at the time of recording.

Settlement and Subsistence

Archaic sites have been recorded in all five of the major ecozones across the region. This represents a very modest expansion into the higher-elevation woodland and forest ecozones. Overall, the Archaic period adaptation to southeastern New Mexico is oriented to the lowlands. Most sites (62 percent) occur in the grassland ecozone, and 97 percent of all Archaic sites have been recorded in the three lowest ecozones: scrubland, grassland, and desert-scrub (Table 8).

There is, however, a significant shift in subsistence activities across this lowland landscape, as evidenced by the appearance of plant-processing features. This does not mean that hunting was abandoned, rather that its contribution as an activity and a dietary component may have lessened in response to changed environmental conditions.

Simple burned rock hearths are characteristic of almost every Archaic component, and the burned rock ring midden makes its first appear-

Table 7. Archaeological status of Archaic sites in southeastern New Mexico as of June 1990

County	Survey, Recorded Only	Collected	Tested	Excavated (% unknown)	Excavated (% known)	Unknown	Total
Chaves	33	44	4	-	-	11	92
Curry	5	1	-	-	-	2	8
DeBaca	-	2	-	-	-	6	8
Eddy	77	57	4	3	-	21	162
Lea	50	16	1	2	1	8	78
Roosevelt	14	5	-	1	-	3	23
Total	179	125	9	6	1	51	371

Table 8. Topographic setting of Archaic sites in southeastern New Mexico as of June 1990

Topography	Chaves	Curry	DeBaca	Eddy	Lea	Roosevelt	Total
Arroyo/wash	4	-	-	5	1	-	10
Base of cliff	3	-	-	2	-	-	5
Bench	-	-	-	1	-	-	1
Blowout	16	-	1	22	25	3	67
Canyon rim	1	-	-	2	-	-	3
Cave	-	-	-	2	-	-	2
Cliff/scarp/bluff	1	-	-	7	-	-	8
Constricted canyon	-	-	-	4	-	-	4
Dune	7	1	-	33	14	2	57
Floodplain/valley	1	-	-	4	-	-	5
Hilltop	7	-	1	8	6	1	23
Hillslope	8	1	-	22	8	-	39
Low rise	5	1	-	4	2	2	14
Mesa/ butte	1	-	-	2	-	1	4
Mountain front/foothill	3	-	-	-	-	-	3
Plain/flat	1	3	-	4	3	-	11
Playa	5	-	-	2	5	-	12
Ridge	15	1	1	23	10	1	51
Saddle	1	-	-	-	-	-	1
Base of talus slope	-	-	-	-	-	3	3
Talus slope	1	-	-	-	-	10	11
Terrace	7	-	-	12	-	-	19
Alluvial fan	2	-	-	-	-	-	2
Other and unknown	3	1	5	3	4	-	16
Total	92	8	8	162	78	23	371

Table 9. Condition of Archaic sites in southeastern New Mexico as of June 1990

County	Intact	Grazed	Eroded	Mechanical Disturbance	Vandalized	Combined Effects	Other	Unknown	Total
Chaves	9	3	47	1	1	26	-	5	92
Curry	1	-	1	1	-	3	-	2	8
DeBaca	2	-	-	-	-	-	-	6	8
Eddy	29	11	74	10	7	19	7	5	162
Lea	11	1	42	4	-	19	-	1	78
Roosevelt	1	2	6	1	1	10	-	2	23
Total	53	17	170	17	9	77	7	21	371

ance. Other commonly recorded features include lithic scatters, with and without burned rock. The burned rock scatter feature appears later in the period. Archaic period sites typically have several features.

In view of the appearance of plant-processing features, one would expect grinding implements to show a significant increase over the Paleoindian period. The data do not support this, most likely because, at the time this overview was written, the nature of the ARMS recording procedure favored features over artifacts. We suspect this has resulted in a significant underrecording of grinding implements.

Projectile point types increase in variety and in regional distribution as the Archaic period develops. For example, only one type (Jay) characterizes the first phase, whereas at least six types and varieties have been identified in the terminal Archaic phase.

Habitation features ("cave" and "wickiup" in the ARMS lexicon) have been recorded at a few Archaic sites in the grassland ecozone. These features are indicative of small groups of people who used them for only a limited amount of time. No other habitation types have yet been recorded.

Archaic 1 (7200–5200 B.P., or 5200–3200 B.C.)

Presently, only one projectile point type, Jay, is a hallmark of this phase. This distinctive point type is lanceolate with weak shoulders and a long, heavy, tapered stem. Jay points in southeastern New Mexico are found only in "riverine" settings, Blackwater Draw, and the Pecos River. The possibility of a riverine adaptation in southeastern New Mexico's Early Archaic is intriguing. No local phases have yet been defined within this regional phase. Radiocarbon dates falling within the 2,000-year-long phase have been obtained from Blackwater Draw and Brantley Reservoir.

Archaic 2 (3700–3000 B.P., or 1700–1000 B.C.)

The Archaic 2 phase begins after a cultural hiatus of 1,500 years. There are no diagnostic projectile points, and the phase has been identified only at the Brantley locality (Katz and Katz 1985a). Even there, the phase is provisional, based on excavated data from one deeply buried site, LA 44544, and several dated isolated burned rock hearths. LA 44544 is a river mussel extraction station in the rim of the Pecos River channel. Freshwater mussels were gathered, processed, and cooked beside the river, and shells were discarded in micro-activity areas. Grinding implements and shell tools are associated with the activities.

Archaic 3 (3000–2000 B.P., or 1000 B.C.–A.D. 1)

The Archaic 3 phase is also based on data from the Brantley sequence. Defined there as the McMillan phase (Katz and Katz 1985a), it continues to be a predominantly riverine adaptation. The burned rock ring feature makes its first appearance in regional prehistory along with burned rock hearths. The associated projectile points are medium-sized, stemmed dart points, including Darl, 8C, 8D, and 9 types in Leslie's

(1978) typology. The type site for the McMillan phase is LA 38233, a campsite overlooking the Pecos River.

Archaic 4 (2000–1500 B.P., or A.D. 1–500)

Two local phases are assigned to the Archaic 4 phase: the Brantley phase in the Brantley locality (Katz and Katz 1985a) and the early Hueco phase in Lea County (Leslie 1979). The riverine orientation of the two earlier regional phases continued, with limited use of areas further removed from the river. Burned rock hearths characterize most components, and the burned rock ring midden, introduced in Archaic 3, becomes more common. A new burned rock feature appears, the burned rock scatter. Most burned rock scatters co-occur with lithic scatters. The diagnostic projectile points of the phase are medium-sized dart points with variously shaped stems; some have diagonal notching. Types include Leslie's (1978) 6C, 6D, and 8A; the San Pedro point; and three varieties of the Pecos point defined by Katz and Katz (1985a). Two type sites in the Brantley locality, LA 38276 and LA 48761, are stratified campsites in the floodplain zone.

Formative Period (1500–625 B.P., or A.D. 500–1375)

Environmental Context

Most characteristics of the Formative period environment are essentially modern, including the characteristic episodes of intense, localized droughts (Holliday 1985). One such drought episode was recognized at the Garnsey Spring pollen locality (Hall 1984), but it has not been substantiated at localities of similar age in the region.

All of the plants and animals that occur today were present in the Formative period. The one significant difference between today's southeastern New Mexico and the Formative environment is the loss of its massive grassland formations. Dense grasslands dominated the landscape until they were decimated by overgrazing and drought during the historic period, and animal and plant species adapted to grassland have diminished or disappeared entirely. In addition to the obvious archaeological implications of similar environments, we have wondered if the region's archaeological sites were shallowly buried by topsoil and grass until the late nineteenth century. Has so much damage to the resource taken place in the last 100 years?

Sites

The ARMS database contains 1,379 sites with Formative components. Most (96 percent) are in the southern half of the region. Fifty percent are recorded in Eddy County, 28 percent in Chaves County, and 22 percent in Lea County. The Formative preference for settlement and subsistence activities within the Pecos Valley is quite clear even when we account for the differential survey between the northern and southern portions of the region.

Favored topographic situations for Formative period sites continue the Archaic pattern. Most Formative components occur at blowouts or dunes, ridges, or benches (Table 10). Together, blowouts and dunes account for 46 percent of the locations, even though Formative components have been recorded in 25 topographic settings.

There is also some similarity in site size between the Archaic and the Formative periods. The largest number of sites is still in the >10,000 sq m range, but the full range is much greater. Large numbers of sites have been recorded in the 1,000–5,000 sq m and 5,000–10,000 sq m ranges.

As in previous periods, more than half (61 percent) of Formative period sites have not had additional work beyond recording (Table 11). Some form of permanent collection has been made at 22 percent, but only 4 percent have been tested or excavated, the same percentage as the Archaic period. And we know how thoroughly we understand the Archaic period!

The condition of Formative sites is proportionately similar to that of other periods (Table 12). Almost half have been eroded, and most show other effects. Fourteen percent were considered intact by their recorders, which is similar to the percentage of intact Archaic period sites.

Settlement and Subsistence

Formative period activity occurs throughout

Table 10. Topographic setting of Formative sites in southeastern New Mexico as of June 1990

Topography	Chaves	Curry	DeBaca	Eddy	Lea	Roosevelt	Total
Arroyo/wash	7	-	-	13	2	-	22
Base of cliff	-	-	-	6	3	-	9
Bench	7	-	1	14	94	-	116
Blowout	101	-	2	192	1	1	297
Canyon rim	1	-	-	3	-	-	4
Cave	1	-	-	5	-	-	6
Cliff/scarp/bluff	5	-	-	28	-	-	33
Constricted canyon	1	-	-	10	-	-	11
Dune	70	-	-	164	96	3	333
Floodplain/valley	13	-	-	16	-	-	29
Hilltop	20	-	1	24	8	-	53
Hillslope	27	-	4	40	11	1	83
Low rise	14	-	-	15	9	1	39
Mesa/ butte	4	-	-	3	2	-	9
Mountain	-	-	-	2	-	-	2
Mountain front/foothill	-	-	-	1	-	-	1
Open canyon floor	1	-	-	2	-	-	3
Plain/flat	5	-	-	26	6	2	39
Playa	8	-	-	7	8	-	23
Ridge	47	-	2	62	34	1	146
Saddle	1	-	-	1	-	-	2
Base of talus slope	1	-	-	-	-	-	1
Talus slope	1	-	-	2	-	-	3
Terrace	24	-	2	19	4	1	50
Alluvial fan	2	-	-	2	-	-	4
Other and unknown	9	-	34	10	1	-	61
Total	370	0	46	667	286	10	1,379

Table 11. Archaeological status of Formative sites in southeastern New Mexico as of June 1990

County	Survey, Recorded Only	Collected	Tested	Excavated (% unknown)	Excavated (% known)	Salvage Excavation	Unknown	Total
Chaves	169	124	10	3	1	-	63	370
Curry	-	-	-	-	-	-	-	0
DeBaca	5	7	-	-	-	-	34	46
Eddy	453	119	19	6	3	1	66	667
Lea	210	46	3	8	-	-	19	286
Roosevelt	5	4	-	-	-	-	1	10
Total	842	300	32	17	4	1	183	1379

Table 12. Condition of Formative sites in southeastern New Mexico as of June 1990

County	Intact	Grazed	Eroded	Inundated (impermanent)	Inundated (permanent)	Mechanical Disturbance	Vandalized	Combined Effects	Other	Unknown	Total
Chaves	44	29	155	1	-	11	10	89	2	29	370
Curry	-	-	-	-	-	-	-	-	-	-	0
DeBaca	7	-	1	-	-	-	1	2	-	35	46
Eddy	96	43	312	2	2	32	17	107	10	46	667
Lea	46	14	142	-	-	20	11	43	1	9	286
Roosevelt	3	-	5	-	-	-	-	1	-	1	10
Total	196	86	615	3	2	63	39	242	13	120	1379

the entire region and across the entire landscape with little regard to ecozone or topography. Many subsistence-oriented feature types are similar to their Archaic counterparts. It is the habitation types that differ.

All five ecozones contain hearths, concentrations of fire-cracked or burned rock, and lithic and ceramic scatters, some with ground stone. The burned rock ring is common in all but the forest ecozone, and it occurs in limited numbers even there (Table 13).

Caves and rockshelters were used wherever they were found, and they have been recorded from woodland to desert scrub ecozones. Constructed dwellings, such as pithouses and above-ground room blocks, have been recorded only in the grassland and desert scrub ecozones. These ecozones, which characterize large portions of the Pecos Valley, were by far the most heavily utilized.

There are commonalities of form and location in the subsistence features of the Archaic and Formative periods. On this basis, it might appear that the Formative period continues the Archaic period adaptation with the addition of pottery and diminutive projectile points. However, large quantities of bison bone and bison-hunting and -processing toolkits add a dimension to the subsistence pattern not seen in thousands of years. Corn, corn pollen, and beans at several sites in the Middle Pecos (e.g., Jelinek 1967; Rocek and Speth 1986), indicate another addition to Formative subsistence pattern.

Formative 1 (1500–1250 B.P., or A.D. 500–750)

Sites continue to be located near the Pecos River or close to watering holes during the Formative 1 phase. The appearance of pottery is the hallmark of the transition from the Archaic to the Formative. The small assemblages from Formative 1 phase components consist of predominantly nonlocal types such as Alma Plain. Early brown wares, such as Jornada, South Pecos, and Middle Pecos Micaceous Brown, are also present. This phase has not yet been identified in the south, but Leslie (1979) remarked that brown ware pottery appeared at the end of the Hueco phase.

An interesting change to projectile points takes place during this phase. The points are similar to the late Archaic forms, i.e., dart points with convex to straight edges, convex to straight bases, and diagonal notching, but there is a decrease in size. They are larger than an arrow but smaller than a dart—a "darrow"—with a maximum length slightly less than 3.0 cm. While Leslie's (1978) Types 6C and 6D occur with both the Archaic 4 and Formative 1 phases, the latter phase is also characterized by Leslie's Types 6A and 6B and the smaller Type 5.

Ground stone artifacts also provide an apparent divergence from the late Archaic. These artifacts include one-handed flat manos, unshaped slab metates, and bedrock mortars. The absence of grinding tools at Archaic 3 and 4 components is peculiar, probably the result of oversight by the recorder or a lack of direct association with radiocarbon-dated hearths.

Portions of three local phases are assigned to Formative 1: the late Hueco (Leslie 1979), the Early 18-Mile (Jelinek 1967), and the Globe (Katz and Katz 1985a). Suggested type sites include two from the Middle Pecos locality: P-14 and P-20 (Jelinek 1967).

Table 13. Estimated percentage of major ecozones in southeastern New Mexico

	Forest	Woodland	Scrub Land	Grassland	Desert Scrub
% Area	1%	1%	24%	50%	24%
Number of Feature Types	8	30	46	69	46

Formative 2 (1250–1050 B.P., or A.D. 750–950)

There are major distinctions between the Formative 1 and 2 phases: domestic architecture, arrow points, and black-on-white pottery. There may also be many fewer sites: about half as many sites providing radiocarbon dates in Formative 2 than in Formative 1.

In the southeast, Leslie (1979) notes the presence of clay floor pads associated with an increase in the exploitation of the shinnery oak belt. In the Middle Pecos locality, the first sedentary villages appear. While small, both pithouses and contiguous surface rooms are present (Jelinek 1967). In the Brantley locality, the upland subsistence and settlement orientation finally dominates the riverine orientation of the Archaic period. Features of subsistence activities include rings and scatters (Katz and Katz 1985a).

The same ground stone artifact types continue from the previous phase, including one-handed flat manos, unmodified slab metates, and bedrock mortars. The appearance of "true" arrow points indicates changes in hafting technology and stylistic continuity with the darrow. Many forms remain the same, but the size of the projectile decreases. Leslie's (1978) Types 3A (Scallorn) and 3B (a Scallorn variant) characterize this phase.

Brown ware predominates the ceramic assemblage, but in this phase, the brown wares are local. They include Middle Pecos Micaceous Brown and South Pecos Brown in both the northern and southern portions of the region. The earliest known black-on-whites appear: Red Mesa Black-on-white in the north and Cebolleta Black-on-white in the south.

The portions of the local phase sequences assigned to this regional phase include the early Querecho (Leslie 1979), the Late 18-mile (Jelinek 1967), and the middle portion of the Globe (Katz and Katz 1985a). Site P-4A (Jelinek 1967) is a type site.

Formative 3 (1050–925 B.P., or A.D. 950–1075)

The hallmark of Formative 3 is intensification. The numbers of dates and dated sites are comparable to those of Formative 2, but the sites are larger. In the southeast, Leslie (1979) identified larger concentrations of small, rectangular pitroom "villages" at permanent lakes. Leslie associated the villages with exploitation of the shinnery oak belt. In the Middle Pecos locality, Jelinek (1967) also identified larger sites.

While local browns continue to dominate the ceramic assemblage, local and exotic gray wares make their first appearance. In the north, Middle Pecos Micaceous Brown is the most popular type, as it was in the previous phase. Crosby Black-on-gray represents the new gray ware. Pottery in the south shows less variation from the previous phase. Local and exotic brown wares continue, but Mimbres Black-on-white replaces Cebolleta Black-on-white.

Projectile points continue to be moderately sized arrows, but the number of types increases from two to six (Leslie's Types 3A–3F, Scallorn variants, and Livermore). Ground stone artifacts show more intentional shaping, and they include oval basin metates and convex-faced manos (Leslie 1979).

The local phases that correspond to the Formative 3 regional phase include the Early Mesita Negra in the Middle Pecos locality (Jelinek 1967), the late Globe in the Brantley locality (Katz and Katz 1985a), and the late Querecho (Leslie 1979). The type site is P-24 in the Middle Pecos locality.

Formative 4 (925–875 B.P., or A.D. 1075–1125)

A sharp reduction in occupation marks this regional phase. The decrease is evident in the characteristics of sites as well as in their numbers. Region-wide, sites are small, and surface architecture has been abandoned in favor of subsurface structures. In the Middle Pecos locality, the only site of substance is P-24, characterized by subsurface rooms. In the southeast, Leslie identified only a few small gathering sites. The structures he assigns to this phase are also pithouses. Just two sites are radiocarbon dated.

Gray wares remain an important component of the ceramic assemblage, and there is significant increase in locally made wares. This is balanced by a noticeable decrease in locally made brown wares, with the exception of a new type, McKenzie Brown. Chupadero Black-on-white appears throughout the region in this phase.

The six varieties of Leslie's Type 3 arrows all persist, but with noticeable variability, especially in size. Oval basin metates continue, and manos are one-handed with one or two grinding surfaces.

Portions of the local phase sequences assigned to the Formative 4 regional phase include the Late Mesita Negra in the Middle Pecos locality and the pre-Crosby phase in the Roswell locality (Jelinek 1967), the earliest Oriental in the Brantley locality (Katz and Katz 1985a), and the early Maljamar in the southeast (Leslie 1979). As with the previous phase, P-24 in the Middle Pecos locality seems to represent most of the characteristics of this phase.

Formative 5 (875–800 B.P., or A.D. 1125–1200)

Even fewer radiocarbon dates are available for Formative 5, but the settlement pattern shows a reversal from the previous phase, at least in site size and architecture. Jelinek (1967) assigned only three sites to this phase, but they are large. One, P-25, has rectangular slab-based surface rooms. In the Brantley locality, Katz and Katz (1985a) noted fewer sites with fewer features along the Pecos River and a stronger upland orientation.

The proportion of some local brown wares is reduced, while others are favored. For example, South Pecos Brown is replaced by McKenzie Brown in the Middle Pecos locality. Small amounts of intrusive types have been noted in all localities.

There is a significant change in arrow point morphology from corner notching to side notching. (Leslie's Types 2A and 2B).

Those portions of local phase sequences assigned to Formative 5 include the Early McKenzie and Crosby phases (Jelinek 1967), the early-middle Oriental (Katz and Katz 1985a), and the late Maljamar (Leslie 1979). The three sites in the Middle Pecos locality—P-1, P-21, and P-25—serve as type sites for this phase.

Formative 6 (800–700 B.P., or A.D. 1200–1300)

This century-long phase has the most radiocarbon dates and the most dated sites of the Formative phases.

Most of the sites are small. In the southeast, only Monument Spring is large; this site is characterized by pithouse architecture (Leslie 1979). Likewise, Jelinek assigns only one large site to this phase, P-4C. Other sites in this locality show a variety of architectural forms and patterns, including pithouses, surface rooms, and artifact scatters. Jelinek discusses at length the presence of quantities of bison bone and small amounts of *Zea* pollen.

Locally produced plain brown ware has disappeared from the ceramic inventory in the south; it is replaced by local textured and corrugated brown ware (Leslie 1979). In the north, Middle Pecos Black-on-white comprises 60 percent of the ceramic assemblage; McKenzie Brown, another 20 percent (Jelinek 1967). Glazed pottery may occur, but, if so, it comes only at the very end of the phase.

Small, side-notched arrows with concave bases persist. In the Middle Pecos locality, Jelinek (1967) comments on the occurrence of small, thick, steep end-scrapers.

Those portions of the local phase sequences assigned to the Formative 6 regional phase include the Late McKenzie and Roswell phases (Jelinek 1967), and the middle Oriental phase (Katz and Katz 1985a). In the southeast, Leslie suggests but does not name a transitional phase between the late Maljamar and early Ochoa; we have designated this the "Malchoa." The previously mentioned Monument Spring and P-4C sites are type sites for this phase.

Formative 7 (700–625 B.P., or A.D. 1300–1375)

The end of the Formative period corresponds with the beginning of the Little Ice Age. The hallmark of Formative 7 is rapid change; almost every cultural category we have been following changes. In the southeast, early Formative 7 components at the Merchant and Bell Lake sites have large, deep pithouses. These become shallower in the middle of the phase and are replaced by single, surface rooms by its end. Short-term camps exploit new locations. In the Brantley locality (Katz and Katz 1985a), small stone circles have been identified. Jelinek (1967) also notes the occurrence of stone circles at site P-11, which he calls "possible tipi rings."

The short-term campsites and stone circles appear to be remains of bison hunters, with assemblages that include shaft smoothers, notched ribs, and four-beveled knives (Leslie 1979). Jelinek (1967) also notes an abundance of obsidian at this time. Whether the bison hunters themselves were indigenous is unresolved.

The ceramic assemblage is characterized by fewer types and fewer overall sherds than previous phases. Painted intrusive types predominate, and plain brown ware is overwhelmed by textured brown ware.

Only one arrow point type characterizes this phase: Leslie's 2C (Harrell). This is a small triangle, with a long, narrow, unserrated blade, side notches, and a basal notch.

The three local phases assigned to Formative 7 are the post-McKenzie (Jelinek 1967), the late-middle Oriental (Katz and Katz 1985a), and the early Ochoa (Leslie 1979). Type sites for this regional phase are the Merchant (LA 43414) and Bell Lake (LA 43490) sites in Lea County (Leslie 1979), and sites P-3, P-11, and Henderson Pueblo in the Middle Pecos locality (Emslie et al. 1992; Jelinek 1967).

Proto/Ethnohistoric Period (625–250 B.P., or A.D. 1375–1750)

Environmental Context

The climate was similar to that of modern times during the Proto/Ethnohistoric period, although it may have been even more erratic. Intense, brief droughts, such as one that began the period (Speth and Parry 1978) and the one that marks its end (Katz and Katz 1985b), appear to have made the region less attractive to food producers, collectors, or gatherers.

Sites

Recorded sites are concentrated in the southern Pecos Valley; 85 percent are in Chaves or Eddy counties, with 66 percent in Eddy County alone.

The site situation differs from the previous period and actually harks back to the Paleoindian. The three favored topographic situations are ridges, cliffs, and arroyos (Table 14). The picture that is presented is one of close proximity to water but favoring higher elevations. The common denominator between Paleoindian and the Proto/Ethnohistoric is the prominence of hunting in the subsistence base.

Site sizes, generally smaller than in any other period, concentrate in the 100–1,000 sq m range. The analogies between this period and the Paleoindian continue with site size, although Paleoindian sites are larger than Proto/Ethnohistoric ones.

Eight-five percent of these sites have only been recorded or surface collected (Table 15). Very few sites have been investigated below the surface, although several chronometrically dated sites occur in each of the three archaeological localities used in this sequence. Twenty-six percent of the sites were recorded as intact (Table 16).

Settlement and Subsistence

More than 90 percent of the recorded Proto/Ethnohistoric sites are in Pecos Valley grassland or desert scrub ecozones, primarily in Eddy and Chaves Counties (Table 3). Only two sites each are recorded in scrubland and woodland ecozones, and none in the forest. These small numbers are attributable in part to the disproportionate survey statistics and in part to the ephemeral nature of Proto/Ethnohistoric sites. We assume that sites, probably Apachean, are there but have not yet been correctly identified.

The range of features shows an interesting dichotomy. Some are so basic to the hunting and

Table 14. Topographic setting of Proto/Ethnohistoric sites in southeastern New Mexico as of June 1990

Topography	Chaves	Curry	DeBaca	Eddy	Lea	Roosevelt	Total
Arroyo/wash	1	-	-	5	-	-	6
Blowout	2	-	-	2	1	-	5
Cave	-	-	-	1	-	-	1
Cliff/scarp/bluff	2	-	-	5	1	-	8
Dune	-	-	-	2	-	-	2
Floodplain/valley	-	-	1	1	-	-	2
Hilltop	-	-	-	1	-	-	1
Hillslope	1	-	-	-	-	-	1
Mountain front/foothill	-	-	-	1	-	-	1
Plain/flat	-	-	-	2	-	-	2
Playa	1	-	-	-	-	1	2
Ridge	-	-	-	4	1	-	5
Terrace	-	-	-	3	-	-	3
Unknown	1	-	-	-	1	-	2
Total	8	0	1	27	4	1	41

Table 15. Archaeological status of Proto/Ethnohistoric sites in southeastern New Mexico as of June 1990

County	Survey (recorded only)	Collected	Excavated (% unknown)	Excavated (% known)	Unknown	Total
Chaves	2	4	-	-	2	8
Curry	-	-	-	-	-	0
DeBaca	-	-	-	1	-	1
Eddy	8	18	-	-	1	27
Lea	1	1	1	-	1	4
Roosevelt	1	-	-	-	-	1
Total	12	23	1	1	4	41

Table 16. Condition of Proto/Ethnohistoric sites in southeastern New Mexico as of June 1990

County	Intact	Grazed	Eroded	Mechanical Disturbance	Vandalized	Combined Effects	Other	Unknown	Total
Chaves	1	-	4	-	-	-	2	1	8
Curry	-	-	-	-	-	-	-	-	0
DeBaca	-	-	-	-	-	1	-	-	1
Eddy	10	1	7	1	2	3	3	-	27
Lea	-	-	1	1	-	2	-	-	4
Roosevelt	-	-	1	-	-	-	-	1	2
Total	11	1	13	2	2	6	5	2	42

gathering lifeway that they cannot be distinguished from Archaic or Formative period occupations without diagnostic artifacts. These include hearths, burned rock scatters, lithic scatters, and ring middens. Other features are distinctive, such as the tipi ring and rock art (pictographs and petroglyphs). Apache rock art has been found in every zone where other types of Apache sites have been recorded.

Architecture, such as the pithouses and roomblocks characteristic of the Formative period, is not firmly associated with this last period. Radiocarbon dates and ceramic evidence suggest that architectural sites such as Henderson Pueblo and the Merchant site may have continued to be used.

Protohistoric 1 (625–500 B.P., or A.D. 1375–1500)

There are more dates and dated sites assigned to this phase than to the terminal Formative, yet we know much less about it. A near gap in the database, coupled with the distinctive nature of the little data that does exist, led to the establishment of the phase.

The presence of definite tipi rings, as opposed to the small stone circles of the previous period, is one of the primary criteria of the phase. It is within this 125-year interval that Athabaskans are widely assumed to have entered the Greater Southwest (Gunnerson 1956), including southeastern New Mexico.

There are other distinctions as well. The Type 2C point (Harrell) of the Formative 7 phase is replaced by other types of small, triangular points such as Types 2D (Washita), 2E, and 2F (Toyah). All intrusive pottery disappears, and the only local pottery remaining is a textured brown ware called Ochoa Indented. Several of the large architectural sites of the late Formative period continue in use, as indicated by radiocarbon dates, points, and pottery. Were these residents a remnant Formative population?

The two local phases that are subsumed within Protohistoric 1 are the end of the Oriental (Katz and Katz 1985a) and the Late Ochoa (Leslie 1979). The two type sites include LA 44582 (BR 47), a tipi ring site overlooking the Pecos River; and a component of the Merchant site (LA 43414) in Lea County, characterized by Ochoa Indented pottery.

Ethnohistoric 1 (500–400 B.P., or A.D. 1500–1600)

This phase is defined more by its date range than by other available data. There are presently only three radiocarbon dates from three sites. Several early Spanish expeditions entered the region between 1500 and 1600, including Coronado (1540), Espejo (1582), and DeSosa (1590) (Hammond and Rey 1966). Their chroniclers inaugurated the Ethnohistoric period, although the limited nature and degree of contact did not result in impacts to the archaeological record.

A new projectile point type, Garza, and Type 2F (Toyah) are associated with this phase. No known ceramic types are specifically associated, nor are any single component sites currently recorded. The presence of Garza points in a radiocarbon-dated hearth at the Garnsey Spring site in Chaves County (Parry and Speth 1984) suggests that this component can be representative of the phase.

Two local phases are assigned to this regional phase: Phenix (Katz and Katz 1985a) and early post-Ochoa (Leslie 1979). The Toyah point is characteristic of both.

Ethnohistoric 2 (400–250 B.P., or A.D. 1600-1750)

The available data is limited. Nevertheless, there are two criteria which allow us to assignment sites and even groups of people to this phase: metal and the written record.

For the first time we can name at least one group, the Seven Rivers Apaches. The Middle Pecos region is depicted on a 1710 Spanish map of Nueva Navara (Rio Grande Historical Collection, New Mexico State University), as Rio Salado de Apaches de los Siete Rios. The type site for this phase, LA 48738 (IW 5), has a ring midden (mescal pit), a sheet midden, tipi rings, a metal projectile point, and a radiocarbon date with a mean within the period, although not within this phase. This is the only reported site of which we are aware in southeastern New Mexico that contains all the elements of an ethnohistoric succulent plant processing site.

In addition, short-term open camps, several shelters and rock art sites, that are attributable to this phase.

Two local phases have been assigned to this last regional phase, Seven Rivers (Katz and Katz 1985a) and late Post-Ochoa (Leslie 1979). LA 48738 is the type site for the phase.

Previous Archaeological Work in the Area

Regge N. Wiseman

The projects listed below are testing programs, excavations, some surveys, and important synthetic treatments of archaeological resources in southeastern New Mexico. Not all tested sites within the area are included here because some produced very little information of value.

This particular study region is framed on the west by the south-central mountains (but including the Guadalupe Mountains), the north by Salt Creek in central Chaves County, the east by the eastern edge of the Llano Estacado in Texas, and the south by Interstate Highway 10 in west Texas.

For the most part, the periods represented are the Archaic through the Late Prehistoric. The latter period name, used commonly in the literature on the archaeology of the Southern Plains and Texas, refers to the period of pottery use but does not necessarily imply pottery manufacture at the sites or by the people under consideration.

•Akins (2003). Major excavations including one Archaic (pit-baking feature) and two Late Prehistoric (small pithouses, wickiup floor, extramural hearths) components at the Townsend Site along Salt Creek north of Roswell.

•Applegarth (1976). Doctoral dissertation for the University of Wisconsin. Excavation of several caves and shelters in the Guadalupe Mountains. This is a follow-up to Riches (1970).

•Beckett (1976). Summary of survey and interpretations of large tract surveys in the Mescalero Sands east of Roswell. Beckett proposes that acorns from the shin oak were the primary resource of the occupants of the recorded sites.

•Boyd (1997). Important synthesis of the archaeology of the Llano Estacado and adjacent regions in Texas.

•Bullock (1999). Excavation of a Late Prehistoric wickiup floor and associated features at a site on the edge of a small playa.

•Collins (1968). Unpublished but important master's thesis detailing the excavation and interpretation of Ochoa phase components in Andrews County, Texas (north of Midland).

•Collins (1971). An early but still useful synthesis of the prehistory of the Llano Estacado in New Mexico and Texas.

•Condon (2002). Excavations and tests of many thermal features at two Archaic sites below the southeastern escarpment of the Guadalupe foothills south of Carlsbad.

•Corley (1965/1970). Original publication and reprint of Corley's formulation of the Eastern Extension of the Jornada Mogollon.

•Ferdon (1946). Excavation of Hermit's Cave in Last Chance Canyon of the Guadalupe Mountains.

•Gallagher and Bearden (1980). First season's excavations by Southern Methodist University at open sites of most periods in the Brantley Reservoir on the Pecos River between Carlsbad and Artesia.

•Hall (2002). Characterization of the geoarchaeology of the sand sheets of southeastern New Mexico with particular attention to probabilities of occurrence of archaeological sites in the defined geologic units.

•Haskell (1977). An early but, for the times, thorough treatment of excavated features and Archaic to Late Prehistoric materials from one of the many sites at Laguna Plata.

•Henderson (1976). Major survey report for the Brantley dam site and reservoir on the Pecos River between Carlsbad and Artesia.

•Howard (1930, 1932, 1935). Excavations at several caves in the Guadalupe Mountains, New

Mexico and Texas.

•Hurst (1976). Report of intensive survey of three sections and extensive survey of 3.5 sections of land within this very high concentration of prehistoric and historic sites at the Maroon Cliffs east of Carlsbad.

•Joyce and Landis (1986). Late Prehistoric site near Maljamar that produced a dated thermal feature, pottery, and ground stone.

•Katz and Katz (1985a, 1985b, 2001). The second season's excavations and cultural synthesis of prehistoric (1985a) and historic (1985b) resources in the Brantley Reservoir on the Pecos River between Carlsbad and Artesia, New Mexico. This very important work forms the basis of the most recent synthesis (2001) available for southeastern New Mexico.

•Kemrer (1998). Excavation of a large domestic living area at an open site in the middle reaches of the Seven Rivers drainage system. Perhaps the most important finding is possible evidence (two cob cupule fragments) of prehistoric corn farming in the area.

•Kemrer and Kearns (1984). Formulation and synthesis of site types based on sample survey in the Abo oil fields west of the Pecos River and north of Roswell.

•Landis (1985). Testing at two Late Prehistoric sites along Bear Grass Draw. Pottery, ground stone, and a lengthy interpretive section.

•Laumbach (1979). Survey and documentation of sites in the proposed Laguna Plata Archaeological District.

•Leslie (1965a/1970). Brief description (original and reprint) of pithouses and surface rooms excavated at the Merchant site by the Lea County Archaeological Society. With Collins (1968), provides the only published description of Ochoa phase remains.

•Leslie (1978). Leslie's much-cited, well-illustrated typology of projectile points in southeastern New Mexico east of the Pecos River. Based almost entirely on surface collections.

•Leslie (1979). Summary, major modification, and best available description of Corley's (1965/1970) Eastern Extension sequence.

•Lord and Reynolds (1985). Excavation of three open sites in the WIPP area in southeastern Eddy County, New Mexico. Introduces the concept of the Neo-Archaic in lieu of the term Late Prehistoric for the pottery period.

•Luke (1983). Excavation of several Late Prehistoric thermal features (including ring middens), recovery of major sample of Archaic and Late Prehistoric projectile points, and survey of numerous other sites in a tributary canyon of the Pecos River in Crockett County, west Texas.

•Mallouf (1985). Master's thesis, University of Texas, Austin. Cultural synthesis of the eastern Trans- Pecos Texas, including the Guadalupe Mountains and adjacent Pecos River of New Mexico.

•Mera (1938). Survey and excavations in caves, campsites, and ring midden sites in the Guadalupe Mountains and in the open country east of the Pecos River, all in New Mexico.

•Oakes (1982, 1985). Reports of excavations and findings of two projects along NM 31 in the potash country east of the Pecos River. The 1985 report presents numerous radiocarbon dates associated with thermal features and pottery.

•Phippen et al. (2000). Excavations of several sites, mainly along Cornucopia Draw west of the Guadalupe Mountains and east of Otero County. Important descriptions, discussions, and synthesis of various forms of thermal features pertinent to the archaeology in the nearby Guadalupe Mountains and east of the Pecos River.

•Riches (1970). Master's thesis, University of Wisconsin. Survey of caves, shelters, and open sites in the Guadalupe Mountains. Prelude to excavations reported in Applegarth (1976).

•Rocek and Speth (1986). Analysis and interpretation of burials recovered from the Henderson

Site, a Late Prehistoric village at Roswell.

•Roney (1995). Excavations at Hooper Canyon Cave in the Guadalupe Mountains and survey of open sites in the upper Rocky Arroyo.

•Runyan (1972). Excavation of a site in the Laguna Plata Archaeological District. Describes manmade "clay pads" or floors of wickiup structures unique to this and perhaps one other (unreported) site in the region.

•Sebastian and Larralde (1989). An outstanding cultural overview/assessment/synthesis of the prehistory and history of the Roswell District, Bureau of Land Management.

•Simpson (2004a). Excavations of thermal features at four sites south of Carlsbad. Lipid residue analysis performed on several rock specimens.

•Simpson (2004b). Excavation of several thermal features at a site in the Loco Hills area. Remains date to a short time span during the Late Prehistoric period. Lipid residue analysis on pottery, ground stone, and burned rock.

•Shelley (1994). Summary and interpretation of the Archaic period geoarchaeology, projectile point sequence, and lithic technology in southeastern New Mexico.

•Smith et al. (1966). Brief description of Rattlesnake Draw, one of the few Paleoindian manifestations discovered within the review area.

•Speth (1983). Description and interpretation of the Garnsey Site, a Late Prehistoric/Early Historic bison kill at Roswell.

•Speth (2004). Various papers on the fauna, pottery, projectile points, ground stone, etc. of the Henderson Site, a Late Prehistoric village at Roswell.

•Staley et al. (1996). Report of excavations at several sites (including a Late Prehistoric/Early Historic bison processing locale) along two power transmission lines in the Mescalero Plains in Eddy and Lea Counties.

•Thompson (1980). Large-scale surface collections and limited tests at six sites with Archaic and Late Prehistoric remains near the Duval potash mine east of Carlsbad.

•Wiseman (2002). Excavation at the Fox Place, a Late Prehistoric hunter-gatherer pithouse village at Roswell. Site appears to be that of Plains-adapted peoples who occupied small pithouses like those at the Townsend Site (Akins 2003a).

•Wiseman (2003). Excavations at several Archaic and Late Prehistoric sites along US 285 from Roswell to Carlsbad. Includes Punto de los Muertos, a possible Archaic cemetery at Carlsbad.

•Young (1982). Excavations of an early historic ring midden, recovery of a major sample of Archaic and Late Prehistoric projectile points, and survey of numerous other sites in a small canyon in Pecos county, west Texas.

•Zamora (2000). Excavation of prehistoric structure floors (wickiups?) and a burned brush structure (wickiup) east of the Pecos River at Carlsbad.

Site Descriptions

OAS Staff

Sites were located and recorded in several phases within the project area. The principal cultural resource survey was carried out by TRC Companies, Inc. (Turnbow et al. 2000) under contract with Marron and Associates. They documented 12 archaeological sites and 64 isolated occurrences and performed background records searches. One of the sites, LA 113042, had previously been recorded by Western Cultural Resource Management (WCRM) (Gibson 1996) in connection with a pipeline survey. Of the 12 sites described by Turnbow et al. (2000), 11 are on BLM land, and LA 129220 is on New Mexico State Land, administered by NMDOT. Listings of the *State Register of Cultural Properties* and the *National Register of Historic Places* (NRHP) were consulted, and no cultural properties are in the vicinity. SWCA, Inc., worked in the area (Railey et al. 2006), revisited three sites within the project area, and recorded an additional site not in the project area. Four sites—LA 129215, LA 129219, LA 129221, and LA 129223—have been determined to be ineligible for the NRHP and are not included in this data recovery plan. Descriptions of the six eligible cultural resources and two potentially eligible cultural resources that overlap the project limits are presented below. The descriptions are in order by site number; the order from west to east is LA 129216, LA 129214, LA 113042, LA 129300, LA 129222, LA 129220, LA 129218, LA 129217.

The project has two aspects: rerouting of the highway to the north of the salt lakes and widening and improving the existing road; and reclaiming the parts of the old highway that will be abandoned due to rerouting. LA 129222 and LA 129300 are not along the existing NM 128 right-of-way, while LA 129214 and LA 113042 are at the junction of the new and old rights-of-way and will be affected by both aspects of the project. The remaining sites—LA 129216, LA 129217, LA 129218, and LA 129220—are along the old road and right-of-way. All of the sites included here are BLM Category 2 sites, since they have sufficient quantities of artifacts and features for that category and the potential of having intact subsurface deposits, and because most have the potential of providing radiometric and stylistic dates.

The descriptions that follow rely heavily on and are adapted from the survey report prepared by Turnbow et al.(2000). Supplemental observations were made by Railey et al. (2006). Final revisions are based on site visits by Rick Wessel of NMDOT, and by Regge Wiseman and Wolcott Toll of OAS in 2006. Data on all known features can be found in the survey report by Turnbow et al. (2000).

The Turnbow et al. (2000) feature locations are represented as points, but features are frequently over 5 m in diameter and often over 10 m. Moreover, the extremely challenging aspect of all of the sites, but especially those in large, active dunes, is that there is no way of knowing how far under the sands how much material lies. All of the substantial sites are in dune areas, so this is a recurrent problem. Moreover, the surface of the area is extremely active because of shifting dune sands, and each observation of sites from the surface is a single frame from a continuously running movie. We have recalculated the site areas based on actual boundaries rather than length by width calculations. These descriptions cover whole sites; portions of sites within the project limits are treated in more detail in the field methods section.

LA 113042

Description

This site was first recorded in by Gibson (1996) in connection with the El Paso Natural Gas pipeline. It is a very large site transected by the existing and the proposed rights-of-way for NM 128. Although it contains part of the existing highway, it was not covered by the SWCA right-of-way abandonment project. According to the TRC survey, the majority of features fall between the old and new rights-of-way.

The site has three geomorphic settings: ridgetop, slopes, and playa edge. Its elevation above mean sea level ranges from 3,020 feet along the ridge to 2,980 feet on the lower slopes. The terrain on the ridge is level and characterized by extensive creosote, acacia, and some prickly pear. Surface soils on the ridge top are a sandy loam with a high density of caliche and some exposed calcrete. Mesquite-stabilized coppice dunes 1–2 m high cover the slopes. Soils on the slopes are predominately historic eolian sand deposits overlying a sandy loam with a moderate to high density of caliche nodule inclusions. Flora on the slopes includes mesquite, crucifixion thorn, four-wing saltbush, creosote, acacia, dropseed, broom snakeweed, yucca elata, and some prickly pear. The playa edge is covered in coppice dunes with broad, uneven interdunal surfaces. The soils in interdunal areas are sand or sandy loam with a few caliche nodule inclusions. Other plants in the playa area are weeds along disturbed terrain, grama grass, dropseed, and broom snakeweed. Including dune surfaces, surface visibility averaged around 75 percent for the site. The dunes are likely to obscure cultural manifestations at most of these sites, so that ground visibility does not translate directly into feature or cultural material visibility.

LA 113042 is a large multicomponent prehistoric site with numerous features and variable concentrations of cultural materials (Fig. 4). The site boundaries are defined by the absence of cultural materials and features. The cultural material is on the ridges and slopes overlooking Salt Lake, a large playa to the south. The site extends a maximum of 420 m north-south by 460 m east-west and encompasses 109,111 sq m. The main concentration of the site lies on a north-south ridge bisected by existing NM 128 at Milepost 0.8. It continues down a relatively steep slope and across the lower slopes to the east as a sparse scatter of burned caliche with few artifacts. In the judgment of the field archaeologists, the materials on the lower slopes were redeposited from the ridge above, and some severe erosion is present along the fenceline.

Features

Of 28 defined features, only TRC Features 1, 2, 3, and 9 are within the project limits; Features 8, 20, 21, and 24 are close to right-of-way limits and large enough to require investigation of adjacent areas within the project limits (Table 17). The 28 features identified on the surface of this site include 17 burned-caliche, ash-stained midden deposits; 9 burned-caliche concentrations; 1 burned-caliche, ash-stained concentration; and 1 ash stain found by WCRM (Gibson 1996:3).

The burned-caliche, ash-stained middens range from 3.0 m to 30.0 m in diameter and are exposed primarily on slopes leading down to the playa basin to the east. The ash-stained deposits generally extend to more than 0.10 m in depth, and one was noted as extending deeper than 0.5 m below modern ground surface (bgms) within an arroyo cut. The materials in the midden generally consist of burned caliche, with numbers ranging from 150 to 2,500 pieces. The majority of midden areas contain chipped stone debitage. Seven middens contain ceramics of undifferentiated brown ware that may be Jornada Brown and El Paso Brown. A red-slipped brown ware was also noted in one midden. The middens probably represent multiple components ranging from the Archaic to the Protohistoric period, and most are expected to contain internal features and structural remains.

The midden features were nearly all concentrated in the central portion of the site. The southeastern edge of this area has been partially impacted by the El Paso Natural Gas pipeline. One midden (Feature 10) appears to have been vandalized, since a 1/4-inch screen had been left on top of the midden. Other middens may be concealed under dune sands to the north of the recorded midden areas. Features 10 and 12 previously were identified by WCRM.

The nine burned-caliche concentrations probably represent deflated thermal features such as hearths and roasting pits. They are in the northern portion of the site on heavily dissected drainage channels. Trowel probing of these features found no subsurface cultural deposits or materials. The ash-stain feature was recorded in the southern portion of the site by WCRM (Gibson 1996:3). This feature was not relocated by TRC.

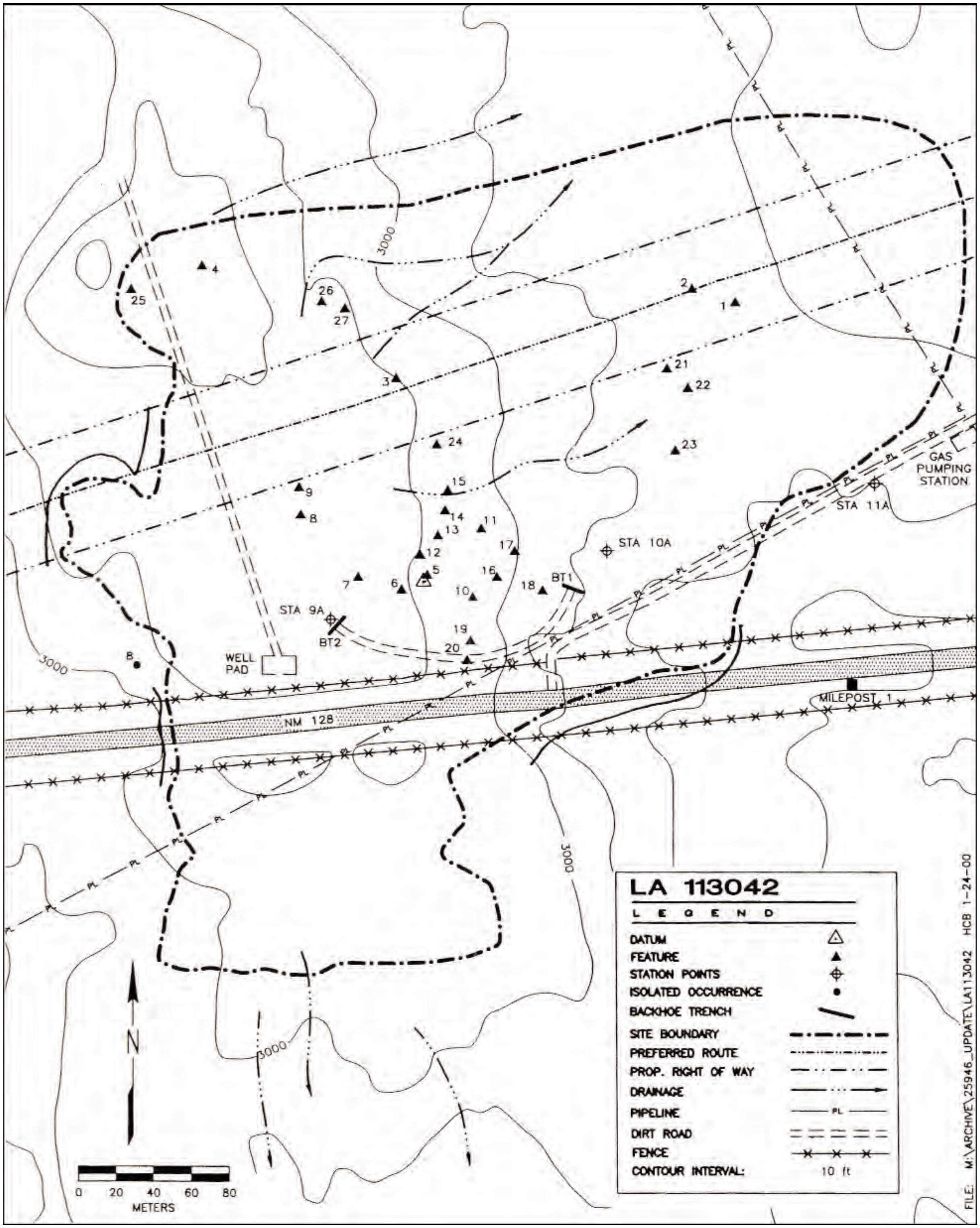

Figure 4. LA 113042 (from Turnbow et al. 2000).

Table 17. Features within and adjacent to the right-of-way, LA 113042

Feature No.	Type	N-S by E-W (m)	Depth (m)	Remarks
1	burned-caliche concentration	2 x 2	0	new ROW, N
2	burned-caliche concentration	2 x 2	0	new ROW, N
3	burned-caliche concentration	1 x 1	0	new ROW, N
8*	burned caliche, ash midden	20 x 10	0.1	edge new ROW, N
9	burned caliche, ash concentration	1 x 1	0.1	new ROW, N
20*	burned caliche, ash midden	10 x 5	0.4	N side old ROW, cut by gully
21*	burned caliche, ash midden	4 x 3	0.1	edge of old ROW
24*	burned-caliche concentration	1 x 1	0	out on DOT plan, edge of ROW (TRC)

* adjacent to ROW

Cultural Material

The surface cultural remains consist of a low-density scatter of burned caliche and chipped stone throughout the site. Ground stone and ceramics are much less common. Artifact densities increase to around one per square meter within the midden features. Even though the densities are low, TRC estimated 4,750 lithic artifacts on the surface.

The character of the debitage indicates early-stage reduction of chert, quartzite, limestone, and chalcedony. Chert and quartzite biface production and trimming also are recognized. Chipped stone tools are no doubt under-represented because of intense collector activity on the site. Nevertheless, more than 22 marginally modified flake tools and 20 unifacially shaped tools were observed.

Ground stone objects include 58 fragments. Most are sandstone mano and metate pieces, although one complete anvil and two complete manos are present. Battered stone includes five quartzite or rhyolite hammerstones.

Ceramics artifacts are rare at the site; TRC observed only 16 sherds. Most are undifferentiated brown ware pieces that are probably El Paso and Jornada brown ware types. An untyped, red-slipped brown ware sherd from a midden feature may be a Jornada brown ware. All ceramics are within 9 of the 13 middens.

Thermally altered rock and caliche are ubiquitous. Although approximately 100 pieces of limestone or sandstone were noted, burned caliche is estimated to exceed 100,000 pieces, mostly in midden concentrations.

Evaluation

The site appears to be in fair to good condition with some erosion nearest the ridge edge and the highway. A portion of the site was removed during the construction of NM 128, and the pipeline through the south portion of the site disturbed another 7,680 sq m of the site (Fig. 5). The pipeline disturbance appears to have passed through less important portions of the site along the extreme southeast edge of the midden area in the central portion of the site. A bulldozer-cut road leading to an abandoned well pad is on the ridgetop, but no feature disturbance is visible in this cut. Severe erosion in the western slopes and ridge top in the northern portion of the site has left little sediment overlying the calcrete deposit. Calcrete is exposed within numerous drainage channels on the slope and in areas on the ridgetop.

The best-preserved location on the site is on the eastern slopes just down from the ridgetop in the west-central portion of the site. An area of approximately 120 by 120 m contains features, middens, and intact cultural deposits largely preserved below recently deposited eolian sands. In contrast to the western slope and ridgetop, this setting is on the leeward side of the ridge in a depositional environment.

The site is probably the result of multiple camping episodes over a long period and potentially included longer residential use with more permanent structures. Numerous thermal features may be present in the midden areas. Protected from strong winds, cultural deposits in this area contain from 0.1 m to more than 0.5 m of

Figure 5. Eroded feature area next to right-of-way fence, LA113042.

ash-stained deposits. The deepest deposits are noted in a deep arroyo cut through the middle of Feature 20.

Although few diagnostic artifacts are present, the site probably contains components associated with the Archaic to late Formative periods and perhaps the historic period. The possible El Paso and Jornada brown ware ceramics suggest that Formative 1 (A.D. 500–750) or Formative 2 (A.D. 750-950) phase components are present. The decorated red-slipped ware suggests components as late as the Formative 6 period (A.D. 1200–1300).

Subsurface intact pit features would be expected associated with these middens. The ash-stained fill of the middens contain charcoal and other organic matter useful for chronometric and subsistence analyses.

As recommended by both WCRM and TRC, LA 113042 has been determined eligible for inclusion in the NRHP under Criterion D. The midden deposits through the central portion of the site suggest that absolute chronological dates can be obtained, and the cultural material associated with these remains should provide valuable data on the various temporal components. These midden deposits also may encompass structural remains that would provide valuable data on prehistoric settlement patterns in the region. Moreover, the site size, intensity of occupation, and location near a major playa suggest that a fieldhouse or other structures could be present.

LA 129214

Description

This very large and complex site is only about 250 m from LA 113042, and together the two sites represent major excavation effort and potential for data recovery (Fig. 6). Toward the west end of the project, the sites are on ridges sloping down towards Salt Lake. The playa accounts for the long-term reuse of both of these sites, and the two represent similar ranges of use of this area. This favorable location was used over a very long period of time from the Archaic to the historic. In addition to bifacial thinning flakes, probably attributable to the Archaic period occupation, and pottery from the Formative

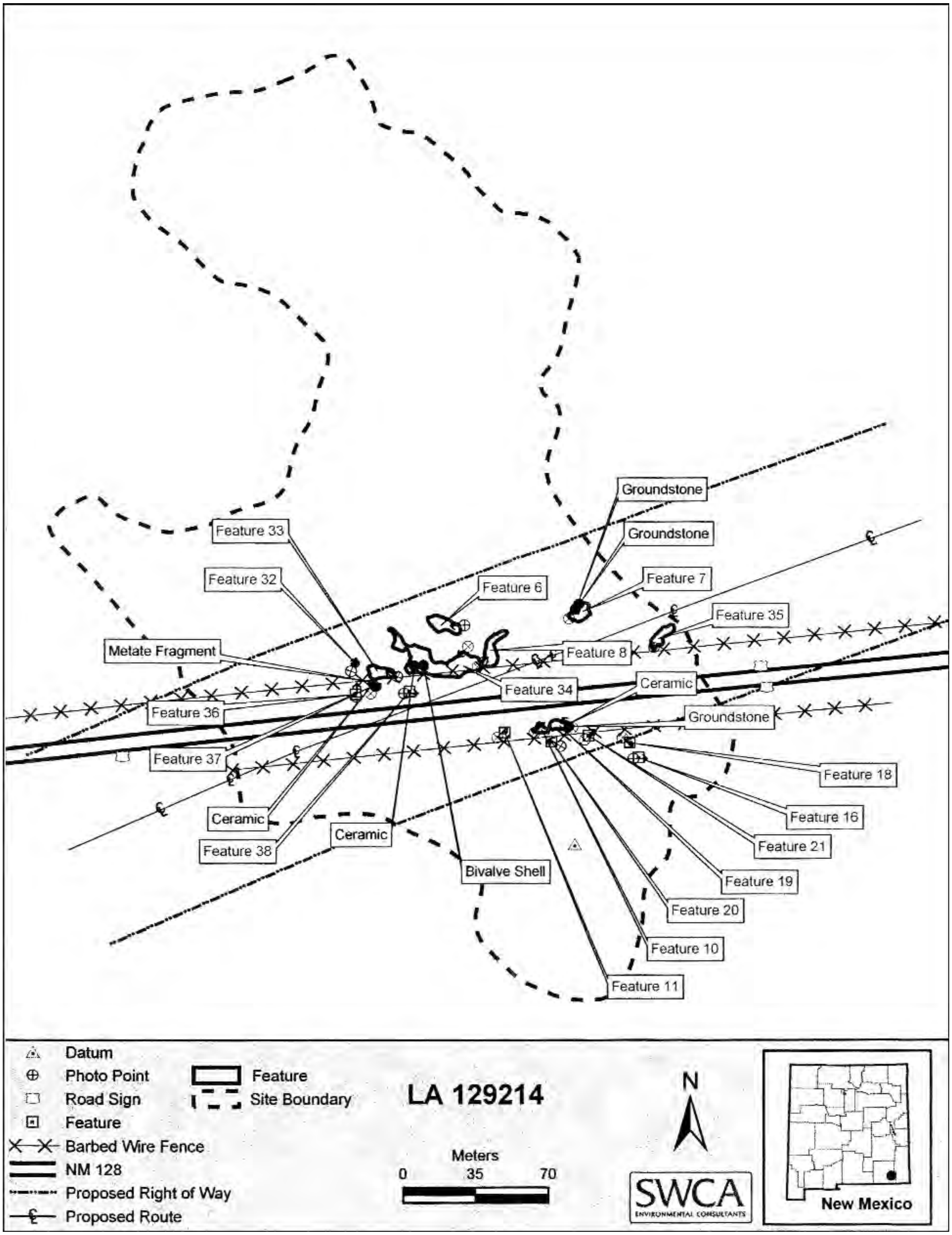

Figure 6. LA 129214 (from Railey et al. 2006).

(A.D. 500s–1300s), there is a piece of retouched glass suggesting Native American use as late as the late nineteenth century.

The ridge is generally level with surface soils composed of sandy loam with a high density of caliche, and calcrete outcrops sporadically on the ridge. The floral community on the ridge consists of creosote, acacia, and some prickly pear. The south- and east-facing slopes are characterized by 1–2 m high mesquite-stabilized coppice dunes (Figs. 7–9). Soils on the slopes are predominately eolian sand believed to have been deposited during the historic period. These deposits overlie a compact sandy loam with moderate to high densities of caliche nodules. Plants on the slopes include mesquite, crucifixion thorn, four-wing saltbush, creosote, acacia, dropseed, broom snakeweed, and some prickly pear. Coppice dunes continue on the lower slopes, but the interdunal surfaces become broader and uneven. This portion of the site may be aggrading, since few caliche nodule inclusions are visible. Besides mesquite, plants on the lower slopes include weeds in disturbed soils, grama grass, dropseed, and broom snakeweed. Including unvegetated dune areas, surface visibility at the site averages around 75 percent.

A visit to the sites in April 2006 revealed that cultural materials and probable features extend farther to the east of LA 129214 than the survey maps show, reducing the separation of the two sites. Along the south side base of the existing highway prism between the two sites, further materials are present within the old right-of-way on the south side of the highway. Since the project will include reclamation of the abandoned roadway, this extensive area will also need to be examined. This additional area was not formally recorded and is not reflected on maps. It will, however, require monitoring and closer inspection when the field phase begins.

The SWCA reassessment of LA 129214 in the project area gives feature sizes and depths different from those reported by TRC. Some of these differences may result from five years of erosion and deposition, and some may result from differences in recording methods or merging of areas formerly considered two features (TRC's Feature 5 was subsumed by SWCA's Feature 34). Table 18 shows feature dimensions from both assessments. Although SWCA reports not seeing ceramics within the project area, several of the TRC features include ceramics, and these ceramics are shown on the SWCA maps.

Densities of features and cultural materials vary widely across the landscape of this site. The site extends a maximum of 512 m north-south by 344 m east-west and covers around 81,000 sq m. Based on the available data, the site was used for camps and residential occupations. It lies on both sides of NM 128 at Milepost 0.5. Elevations range from 3,040 feet on the ridge to 3,000 feet in the playa.

Features

TRC identified 34 features on the surface of this site, including 23 burned-caliche, ash-stained midden deposits, 1 burned-caliche midden, 4 burned-caliche, fire-cracked rock concentrations, 5 burned-caliche, fire-cracked rock scatters, and 1 possible roomblock.

The most important features are the middens. The ash-stained middens range from 3 to 20 m in diameter and are exposed primarily on slopes descending to the playa. Only one is exposed on the ridgetop. Trowel probing of these features indicated that they are generally more than 0.10 m below the recent sand deposits, and many are deeper than 0.20 m below the surface (roughly the depth at which trowel probing was terminated). The materials in the midden generally consist of burned caliche ranging from 150 to 5,000 pieces. Most middens contain chipped stone debitage, and eight have ceramics artifacts, predominately undifferentiated brown wares that appear to be from Jornada Brown and El Paso Brown vessels. Other sherds from the middens include a single Playas Red Incised, a pinched El Paso Brown rim, and a large piece of Jornada Red-on-brown, all from different middens. The middens probably formed because of repeated occupation from the Archaic to the historic period. They likely conceal numerous hearths and roasting pits built on the same area. Some could contain pithouse remains. The middens are concentrated in the south portion of the site. This area is bisected by the existing NM 128 right-of-way, which contains four of the features. Middens may also be buried in other areas of the site where surface erosion is not as extensive.

The burned-caliche midden (Feature 4, out-

Figure 7. Dune and blowout area, LA129214, showing distribution of cultural material.

Figure 8. Dune and blowout area, LA129214, showing density of burned caliche.

Figure 9. LA 129214 looking east, showing disturbed area along the fence. The highway crosses LA 113042 in the background.

Table 18. Features within the right-of-way, LA 129214

Feature No.	Type	N-S by E-W (m) TRC (2000) SWCA (2006)	Depth (m) TRC (2000) SWCA (2006)	Remarks
5	burned caliche, ash midden	10 x 12	0.1	
		not relocated (see F 34)		
6	burned caliche, ash midden	15 x 15	0.1	Very large, dense
		26 x 12	0.3	
7	burned caliche, ash midden	8 x 8	0.1	
		10 x 8	0.1	
8	burned caliche, ash midden	4 x 4	0.1	Ceramics, ground stone
		7 x 14	0.05	
10	burned caliche, ash midden	6 x 10	0.2	Old ROW
		12 x 4	0	
11	burned caliche, ash midden	10 x 12	0.2	Ceramic, old ROW
		2 x 1	0.12	
16				Outside ROW
18	burned caliche, ash midden	7 x 10	0.15	Outside ROW on TRC,
		7 x 10	0	in on SWCA
19	burned caliche, ash midden	10 x 12	0.2	Ceramics, ground stone
		no SWCA entry		
20	burned caliche, ash midden	10 x 12	0.2	Hammerstone, near old ROW
		10 x 12	0	
21	burned caliche, ash midden	6 x 7	0.1	Ceramic, edge of old ROW
		4 x 7	0	
32	Possible roomblock	4 x 7	0.3	
		4 x 5	.20-.30	
33	burned caliche, ash midden	10 x 20	0.1	Ground stone
		10 x 20	0.3	
34	burned caliche, ash, and charcoal midden	6 x 9	0.2	Ground stone
		10 x 2	0.2	
35	burned-caliche concentration	14 x 6	0	SWCA new , test
36	burned-caliche concentration	2 x 2	0	SWCA new , no potential
37	burned-caliche concentration	3 x 3	0	SWCA new , no potential
38	burned-caliche concentration; additional features east of site limit at base of existing highw ay prism	1 x 1	0	SWCA new , no potential

side the project limits) is similar to the ash middens, although no ash-stained soils were noted. The burned-caliche scatters and concentrations probably represent thermal features. These features are generally outside the core midden areas along the margins of the site. Trowel probing found no evidence of organic staining associated with these features, although a few features which are visible through erosion at the base of dunes could still contain subsurface, intact cultural deposits. The potential surface structure (Feature 32) may be no more than a row of rocks pushed by a bulldozer, though testing will be necessary to verify the nature of this anomaly. The possible roomblock measures approximately 7.0 m east-west by 4.0 m north-south and is within the project limits. The low linear alignments are from 0.5 to 1.5 m wide and ascend 0.30 m above the surrounding terrain. They are formed of cobble-sized caliche nodules.

Cultural Material

A low-density scatter of burned caliche and lithic artifacts exists throughout the site. The exceptions are within the middens, where artifact counts increase to nearly one per square meter. In spite of generally low density, TRC estimated at least 4,000 lithic artifacts.

The chipped stone assemblage is dominated by debitage, mostly decortification flakes, implying that early-stage reduction occurred at the site. Bifacial thinning and pressure flakes also indicate that biface production and tool sharpening took place on the site. Recent collecting pressure may have removed most of the chipped stone tools; however, approximately 21 marginally modified and 20 unifacially shaped tools are present. The chipped stone artifacts are made of chert, quartzite, and limestone.

In addition to the chipped stone, the site produced one piece of retouched glass. The small tool was made from aqua bottle glass. Aqua glass dates from A.D. 1800 to 1920. Ground stone artifacts include more than 45 specimens. Most represent fragmentary manos and metates. All are made of sandstone, except for one limestone mano. Five quartzite hammerstones also were noted on the surface.

Ceramics artifacts are rare. Only 25 sherds were observed on the surface, including undifferentiated brown ware sherds, probably Jornada Brown and what may be El Paso Brown. One pinched El Paso Brown rim, a large piece of Jornada Red-on-brown, and a probable Playas Red Incised were also recorded within middens. All of the ceramic artifacts were found in eight of midden features.

Besides the artifacts, the site contained a large amount of burned caliche as well as thermally altered rock. The rock includes more than 500 pieces of limestone and sandstone. The burned caliche is ubiquitous across the site, with major concentrations in the midden features. It was estimated that more than 100,000 burned caliche pieces occur on the surface.

LA 129214 lies along the edge of one of the largest playa basins in the region. Such playas hold water during the monsoon season and contain a rich diversity of flora and fauna, especially in the late summer and the fall. With increased soil moisture, agriculture may also have been possible. The size and intensity of the occupation implies repeated use over many centuries, but the temporal span is difficult to determine since few diagnostic artifacts were observed. The large amount of chipped stone and paucity of ceramics suggest Archaic use of the site, with sporadic Formative use between A.D. 500 and 950. Playas Red Incised and Jornada Red-on-brown indicate components from A.D. 1200–1300 and A.D. 950–1075. The retouched glass tool suggest a historic period occupation dating to the late A.D. 1800s.

Given their size and distribution, the middens probably represent a continual cultural deposit of considerable magnitude that is exposed in interdunal blowouts and in erosional gullies and rills. Most of the middens are in the leeward side of the ridge, where eolian sands tend to be deposited. As such, portions of the midden are likely concealed by the aggrading deposits. Trowel probes and arroyo banks indicate these middens may be over 0.5 m thick in places. Deposition of a cultural stratum of this thickness and horizontal extent imply short-term campsites occupied over a long period of time and perhaps longer-term residential occupations. Midden formation likely resulted through accretion of refuse from years of reoccupation.

Evaluation

The geomorphic setting of LA 129214 has resulted in severe deflation of some portions of the site and remarkable preservation of cultural deposits in other areas. An extensive area on the leeward, eastern-facing slope contains buried cultural deposits and features associated with a rich diversity of cultural materials. This area extends over 240 m northwest-southeast by approximately 150 m northeast-southwest. Midden deposits exposed in this area may exceed 0.5 m in thickness in places and likely signify a much larger buried cultural deposit concealed below the active dune sands. Construction of the existing NM 128 highway cut through the central portion of these deposits subjected adjacent cultural deposits to accelerated erosion due to the steeper slopes. Features at the northern end of the site also appear to be largely deflated with no organic staining and little depth potential.

Midden deposits of this sort contain a wealth of information on prehistoric human behavior, including subsistence and dating information (e.g., Staley and Adams 1995). The deposits may contain a variety of features and structures, as well as information on long-term environmental change. Perhaps even more important, the site may address issues of agriculture in the region.

For these reasons, LA 129214 is listed as eligible for inclusion in the NRHP under Criterion D.

LA 129216

Description

LA 129216 is a large prehistoric campsite where TRC recorded nine thermal features and a sparse scatter of artifacts (Fig. 10). Very little recorded or observed material is within the new right-of-way. Shovel tests revealed no prehistoric cultural material in the area of project effect. The site is within a coppice dune area at an elevation of 3,670 feet. A playa basin lies adjacent to the site. NM 128 now forms the southern edge of the site, and the railroad marks the western edge. The other boundaries are identified by a decrease in cultural material.

The site measures 208 m east-west by 116 m north-south and covers an area of around 11,094 sq m. Soils on the surface are a mixture of recent eolian sand deposits overlying a sandy loam with a moderate to high amount of caliche nodules. In order of abundance, plants include mesquite, four-wing saltbush, creosote, acacia, dropseed, crucifixion thorn, and fluff grass. The southeastern portion of the site lacks mesquite coppice dunes and is dominated by creosote and some acacia. Surface visibility is moderate because of the vegetation on the coppice dunes. Cultural material is generally sparse, and the identified features consist mostly of burned caliche scatters north of the new right-of-way.

Features

The 9 thermal features identified on the surface of the site include 2 burned-caliche, fire-cracked rock scatters and 7 burned-caliche concentrations (Table 19). These features are concentrated in the central portion of the site. They range from 2.0to 5.0 m in maximum length and contain from 40 to 100 pieces of burned caliche. Trowel tests into the features indicate that subsurface burned caliche is minimally present between 0.10 and 0.20 m bgs. Ash-stained soils were not noted within the features. Two features are noted as eroding out of the edges of mesquite coppice dunes, and intact remains may still be present within these dunes. Several of the features are associated chipped stone debitage and ground stone. Features 1 and 2, both caliche scatters, are plotted just to the north of the new right-of-way limit. Each is several meters across. They may therefore extend into the project area and should be investigated.

Cultural Material

Although the site appears to be aceramic, a Type 2-B arrow point indicates at least one component dates to between the Formative 2 (A.D. 750–950) and Formative 6 (A.D. 1200–1300) phases. Ground stone artifacts include 10 specimens. Most are fragments of sandstone manos and metates. A complete pestle was found north of Feature 5, and a complete sandstone metate was within Feature 9. A quartzite hammerstone was also found on the site. By far the most abundant material scattered over the site is burned caliche. More than 10,000 pieces are estimated to be present on the surface. In contrast, only 50 pieces of fire-cracked rock were noted.

Evaluation

LA 129216 is in a dune field with the potential to conceal cultural deposits. During the initial survey, no evidence of intact cultural deposits was noted, but trowel probing of the features and one shovel test did find buried pieces of burned caliche up to 0.2 m below the undulating surface. Eight additional shovel tests were excavated within the proposed right of way at the southern portion of the site within the project area. Shovel tests terminated from 0.2 to 0.6 m bgs; some encountered calcrete at 0.2–0.4 m bgs. The uppermost sediments include 0.04–0.2 m of what Nials (1980) called "modern sand." Below these are semicompact brown to reddish brown sandy loams followed by an extremely compact sandy loam with carbonate filaments that Nials classified as "Pleistocene Soils."

Given the number of thermal features and the dispersed scatter of cultural materials, LA 129216 probably represents a series of short-term camps. The presence of grinding implements and biface production suggest that mixed foraging and hunting activities were carried out from the site.

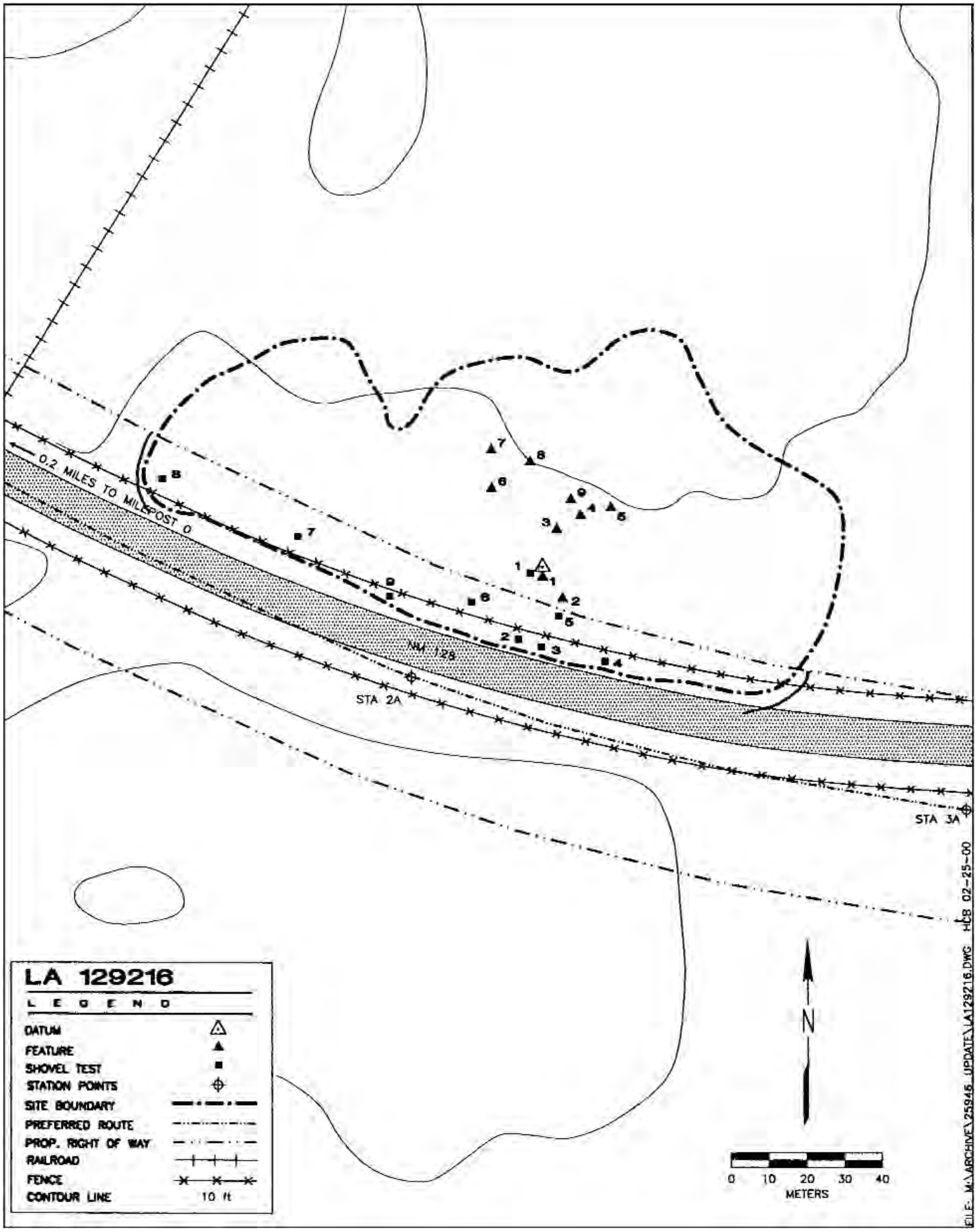

Figure 10. LA 126216 (from Turnbow et al. 2000).

Table 19. Features within the right-of-way, LA 129216

Feature No.	Type	N-S by E-W (m)	Depth (m)	Remarks
1	burned-caliche scatter	3 x 5	0.14	Edge of ROW, outside on DOT plan
2	burned-caliche scatter	4 x 4	0.1	Edge of ROW, outside on DOT plan

Cultural material was found in the upper 0.25 m of deposits in three units. The materials include 21 pieces of burned caliche, 1 flake, and several charcoal chunks. No clearly defined cultural lenses or features were observed. Although cultural materials exist below the surface, no clearly intact cultural deposits were observed. It is possible that the cultural deposits have been deflated and later covered by the recent eolian sands. The eligibility of LA 129216 for the NRHP has not been determined.

LA 129217

Description

LA 129217 is a large site (195 by 112 m) in high-relief dunes. TRC recorded a long, narrow lobe to the northeast (Fig. 11). The area of the site is around 9,900 sq m. Cultural materials are present only in the blowouts between the red sand coppice dunes. LA 129217 and LA 129218 are nearly contiguous, their boundaries separated by only about 22 m south of existing NM 128. Of 9,927 sq m, 5,975 sq m are included in the project area, including three features definable from the surface (Table 20).

Features

Materials are exposed only in the blowouts. The site measures 195 m southwest-northeast by 112 m, encompassing 9,927 sq m. The soils in blowouts are sand to sandy loam, with a few caliche inclusions. The dunes are stabilized by moderate coverage of shin oak, grama grass, dropseed, and a few mesquite.

Eight features were identified on the surface. Feature 4 has by far the most material and artifacts, including ground stone and projectile points. Two projectile points from the site appear to be Archaic. Site integrity is considered to be good. The features consist of a burned-caliche midden (Feature 8), burned-caliche concentrations (Features 2–5), and scatters of burned caliche (Features 1, 6, 7). A basin-shaped pit with ashy fill (Feature 9) was found 20–26 cm below the surface inside the existing right-of-way by shovel test.

The feature identified as a burned-caliche midden (Feature 8) consists of 1,000 cobble-sized pieces of caliche throughout an entire blowout. It probably represents numerous thermal features. The burned-caliche concentrations range from 2.0 to 2.5 m in diameter and contain 50–100 cobble-sized pieces of burned caliche. In the burned-caliche scatters, caliche fragments are more sparsely distributed: 30–100 over 5–7.5 m areas. Trowel testing in these features revealed subsurface burned caliche to a maximum depth of 0.15 m and no staining. All but Feature 7 had associated artifacts.

Cultural Material

At the time of their 2000 survey, TRC analyzed the entire surface assemblage at LA 129217. The 21 artifacts included 12 chipped stone debitage, 3 chipped stone tools, and 6 ground stone fragments. The debitage consists of 3 large cortical core flakes, 1 small noncortical core flake, and 8 middle-sized cortical core flakes. The chipped stone tools include 2 projectile points and 1 biface fragment. The lithic materials include chert, quartzite, rhyolite, and limestone.

Both projectile points were interpreted as dart points. One fragmentary specimen is missing the stem but appears to have corner notching. Given its morphology, the specimen could represent one of a number of Archaic to early Formative period types defined by Leslie (1978). The other point is complete and exhibits a triangular blade with weakly defined barbs; short,

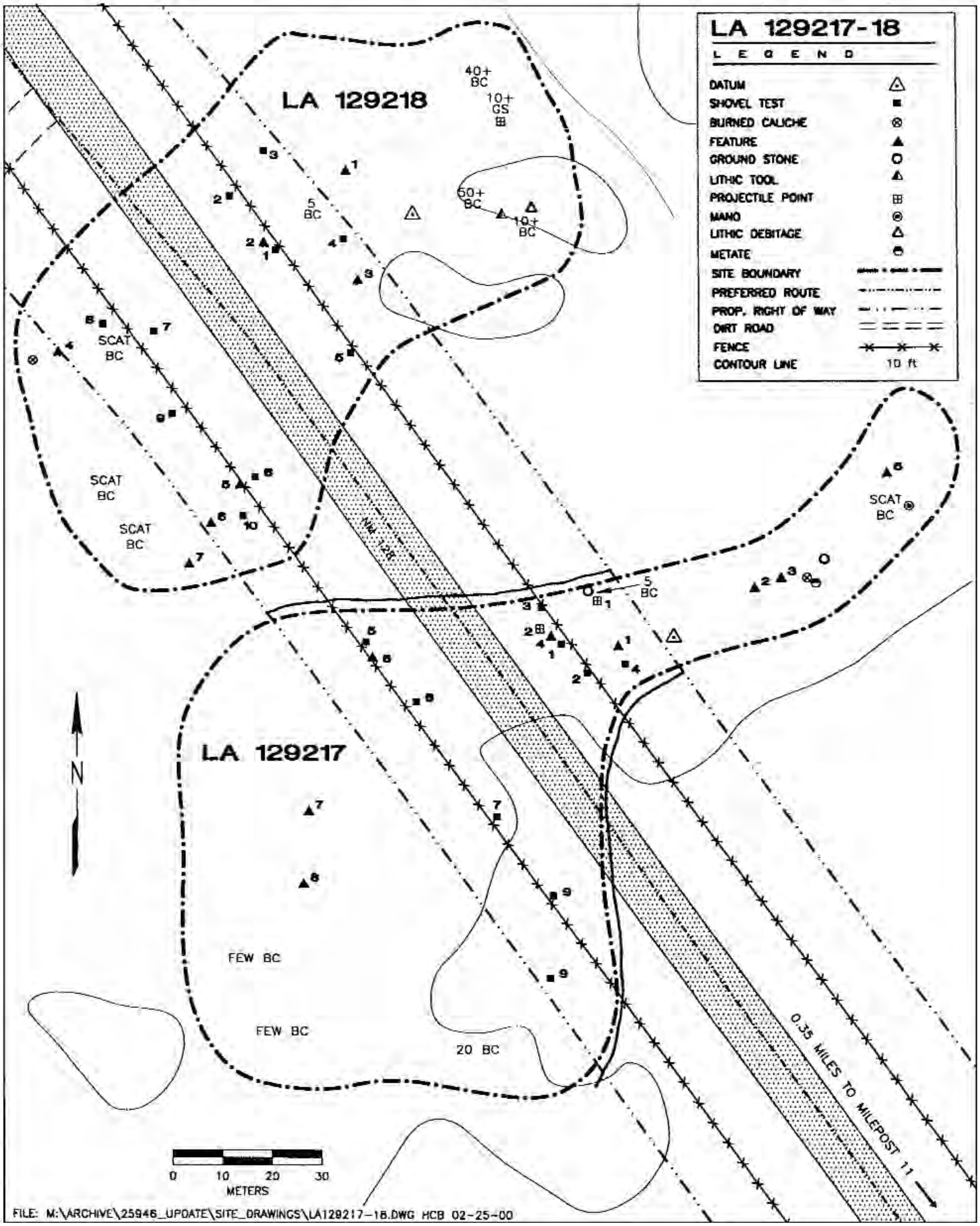

Figure 11. LA 129217 and LA 129218 (from Turnbow et al. 2000).

Table 20. Features within the right-of-way, LA 129217

Feature No.	Type	N-S by E-W (m)	Depth (m)	Remarks
4	burned-caliche concentration	2 x 2	0.1	projectile point, ground stone
6	burned-caliche scatter	10 x 5	0.1	biface
7	burned-caliche scatter	6 x 5	0.1	
8	burned-caliche midden	8 x 10	0.2	

contracting stem; and straight base. Found in Feature 4, it measures 37 mm long, 26 mm wide, and 5 mm thick. The point bears no close similarity to any of the types described by Leslie (1978), but it is possible that the stem has been reworked. The specimen is similar in appearance to a point Leslie (1978:145, Fig. 25A:g) classified as a Bulverde. It does have broad resemblance to the Bulverde as defined by Suhm and Jelks (1962:171, Plate 85). The Bulverde is estimated to date between 3000 and 2500 B.C. (Turner and Hester 1985:82-83).

Ground stone artifacts noted on the surface include three mano fragments and three metate fragments. All are made of sandstone. Burned caliche nodules are sparsely scattered over the site. A few pieces of thermally altered sandstone also occur. Pottery was not observed on either "site."

Evaluation

Given the number of features dispersed over the site, LA 129217 likely represents a series of short-term camps. Two dart points suggest at least one component dating to the middle of the Archaic period from perhaps 3000 to 2000 B.C. The grinding and hunting implements indicate the site most likely served as a processing area of faunal and/or floral remains.

The integrity of LA 129217 is considered to be good. Although no intact features or cultural deposits were noted on the surface, trowel probing revealed subsurface materials present to at least 0.1 m bgs in six features and to at least 0.2 m bgs in two others. To further evaluate the site's eligibility to the NRHP, 10 shovel tests were excavated. Four were within the proposed right of way on the eastern side of the highway, and the other six were in the right-of-way west of the existing NM 128. The units were excavated from 0.3 to 0.8 m bgs. Five of the 10 units produced subsurface cultural materials, and Test 8 yielded an intact basin-shaped ash stain from 0.2 to 0.3 m bgs (Feature 9). Based on these results, the site has data potential to address chronological, subsistence, and technological research issues for the region.

The eligibility of LA 129217 for inclusion in the NHRP has not been determined. Contrasting with the sites further to the west in the Phase 1 project area, it lies within the beginning of the shin oak zone and therefore may help us to better understand the importance of shin oak as a subsistence component.

LA 129218

Description

LA 129218 crosses the existing highway and is largely included in the new right-of-way (Fig. 12). This site is contiguous with LA 129217, has dune relief up to 2.5 m, and contained an Archaic point. There is little reason to separate this site from LA 129217, considering the comparable geomorphology and cultural manifestations of the sites, the lobate definition of site boundaries, and the small distance separating them. A large portion of LA 129218 (6,384 sq m of 12,738 sq m) and a majority of the features identified by survey are included in the project limits. The included area is still only a portion of the sites as defined.

At an elevation of 3,290 feet, LA 129218 is a large prehistoric camp with seven thermal features and a sparse scatter of cultural materials. The site lies in coppice dunes with substantial blowouts. Cultural materials and features are

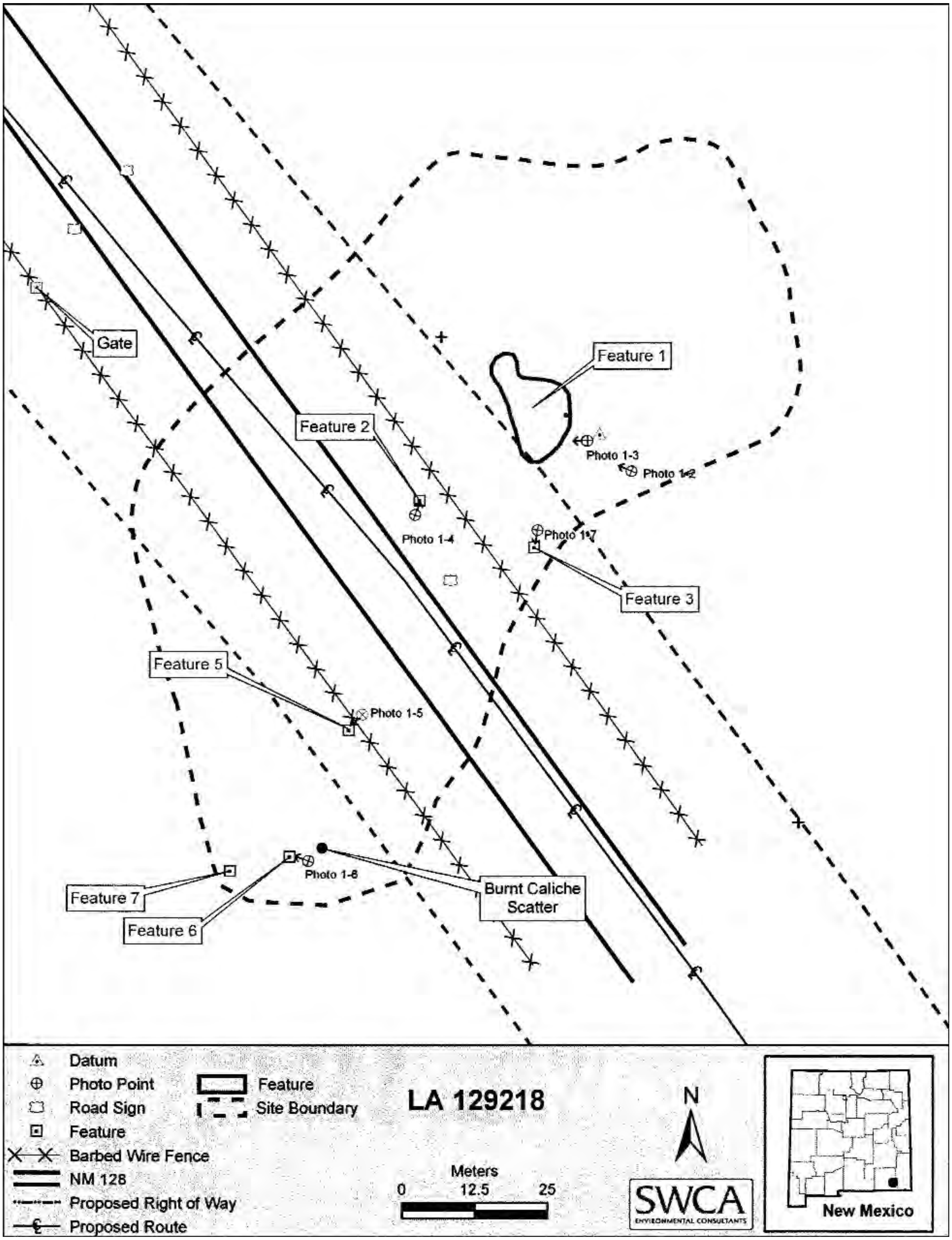

Figure 12. LA 129218 (from Railey et al. 2006).

only exposed in the blowouts, often extending 1.0–2.5 m below the overall terrain. It measures 135 m southwest-northeast by 79 m southeast-northwest. Sediments in the blowouts are sand to sandy loam with a few caliche nodule inclusions. The dune deposits consist of recent eolian sands stabilized by moderate coverage of scrub oak, grama grass, dropseed grass, and a few mesquite. Surface visibility is estimated at 80 percent in the blowouts but is nonexistent under the dunes, which cover the majority of the site surface. LA 129218 is on both sides of existing NM 128 at Milepost 10.55.

Features

The seven features identified on the surface of this site include two burned-caliche middens, three burned-caliche concentrations, and two burned-caliche scatters (Table 21). The midden features were within large blowout areas and eroding out of the dunes surrounding the blowouts. Trowel testing in these areas revealed burned caliche to 0.15 m bmgs, but no stained soil was noted. The burned-caliche concentration, probably thermal features, are eroding out of dunes. Each concentration contained subsurface burned caliche to at least 0.1 m bmgs but no staining. The burned-caliche scatters were also eroding out of dunes in blowouts and had subsurface burned caliche to at least 0.2 m bgs.

Cultural Material

At the time of the TRC survey, the surface assemblage consisted of 41 artifacts and a sparse scatter of burned caliche and fire-cracked rock. The chipped stone includes 1 small noncortical core flake, 1 medium-sized bifacial thinning flake, 10 medium-sized cortical indeterminate flakes, 2 large indeterminate cortical flakes, 2 small indeterminate noncortical flakes, 2 medium-sized indeterminate noncortical flakes, 1 retouched quartzite tool, and 1 projectile point. Materials include quartzite, sandstone, chalcedony, and chert. The projectile point is a complete dart characterized by a slightly convex blade; short, prominent barbs; and a straight stem with a concave base. It is made from chert. The hafting element of this specimen is distinct from the types defined by Leslie (1978). It does bear some similarity to the Pedernales type (Suhm and Jelks 1962: 235–237; Turner and Hester 1985:171–172), but it lacks the deep bifurcated base and flute-like thinning flake scar originating at the base. Pedernales-type points are believed to date between 2000 and 1200 B.C. (Turner and Hester 1985:171).

Table 21. Features within the right-of-way, LA 129218

Feature No.	Type	N-S by E-W (m) TRC SWCA	Depth (m) TRC SWCA	Remarks
2	burned-caliche scatter	8 x 14	0.15	ground stone
		3 x 3	0	
3	burned-caliche concentration	6 x 3	0.15	
		3 x 3	0	
4	burned-caliche concentration	.5 x .5	0.1	
		not relocated	-	
5	burned-caliche midden	8 x 8	0.15	
		5 x 5	0	
6	burned-caliche scatter	2 x 2	0.15	
		2.5 diameter	0	
7	burned-caliche concentration	3 x 4	0.15	

Ground-stone artifacts observed on the surface include 21 fragments. They are manos or unidentifiable pieces made of sandstone.

Evaluation

In a dune environment conducive to the burial of cultural deposits, LA 129218 contains subsurface cultural materials. Trowel testing within the burned caliche features revealed subsurface burned caliche to 0.2–0.3 m bgs but did not locate ash-stained soils. Ten shovel tests were excavated within the proposed right-of-way: five on the eastern side and five on the western side of the existing highway. The units terminated from 0.1 to 0.5 m bgs.

Three tests reached deposits Nials classified as "Pleistocene Soils" from 0.05 to 0.3 m bgs. Four of the 10 shovel tests also contained subsurface burned caliche to 0.4 m bgs. Given the data potential of these deposits, the site is considered likely to contain buried features and artifact assemblages that could address pertinent research questions regarding Archaic settlement patterns, technology, and subsistence. The site is interpreted as a campsite with at least one component dating to the Middle or Late Archaic period based on the projectile point. The grinding and hunting implements suggest that the occupants participated in foraging and hunting.

LA 129218 has been determined to be eligible for inclusion in the NHRP under Criterion D. Because of its proximity to LA 129217, we plan to treat the two sites with a coordinated excavation strategy.

LA 129220

Description

LA 129220 is a historic well with associated stock tanks and holding pens on both sides of present NM 128 at Milepost 9.4 on New Mexico state trust land. At an elevation of 3,250 feet, the site lies on a ridgetop overlooking a basin to the south. It measures 170 m south-north and east-west and encompasses 14,359 sq m (Fig. 13).

Vegetation is characterized by creosote, broom snakeweed, acacia, grasses, and mesquite. Soils are sandy loam with abundant caliche nodule inclusions and, in some areas, Stage 4 carbonate deposits are exposed on the surface. Surface visibility in the area is 90 percent.

Features

Ten features on the surface include a windmill and well, two large water tanks, two smaller water cement holding tanks, one small holding pen, one water trough constructed from a 55-gallon welded-steel drum cut in half, and three large corrals or holding pens for cattle (Figs. 14, 15). Only the railroad-tie corral on the north side of the current highway is within the Phase 1 project limits.

Cultural Material

The artifacts on this site include a sparse scatter of late historic to modern cultural materials. Items around the well include 19 wooden poles with fittings that served as well rods to bring water to the tanks. Each rod was 18 feet long. In addition, nine metal sleeves or casings, each 30 feet long and 3 feet in diameter, were located adjacent to the well. Additional materials include barbed wire fragments, rubber hose fragments, sheet metal fragments, 50 wire nails, miscellaneous wire, one 55-gallon drum lid, several cans opened with a triangular punch, and one small fragment of porcelain from a plate. More recent modern materials include beer bottles and cans.

Evaluation

This site consists of features related to twentieth-century ranching operations in the region. Construction of the site occurred sometime after 1943, the date stamped into the metal plate at the windmill base. "May 9,1948," is incised into the cement water tank, which dates the construction of that part of the site. Most artifacts on the site also suggest post-1940s use of the site. Historical documents should exist for the well and property boundaries and ownership.

The windmill has collapsed, and its fan is missing. The well, tanks and corrals are in better condition. The features were photographed and measured, and all surface artifacts were documented by TRC. The site has been determined eligible under the NRHP, and archival research

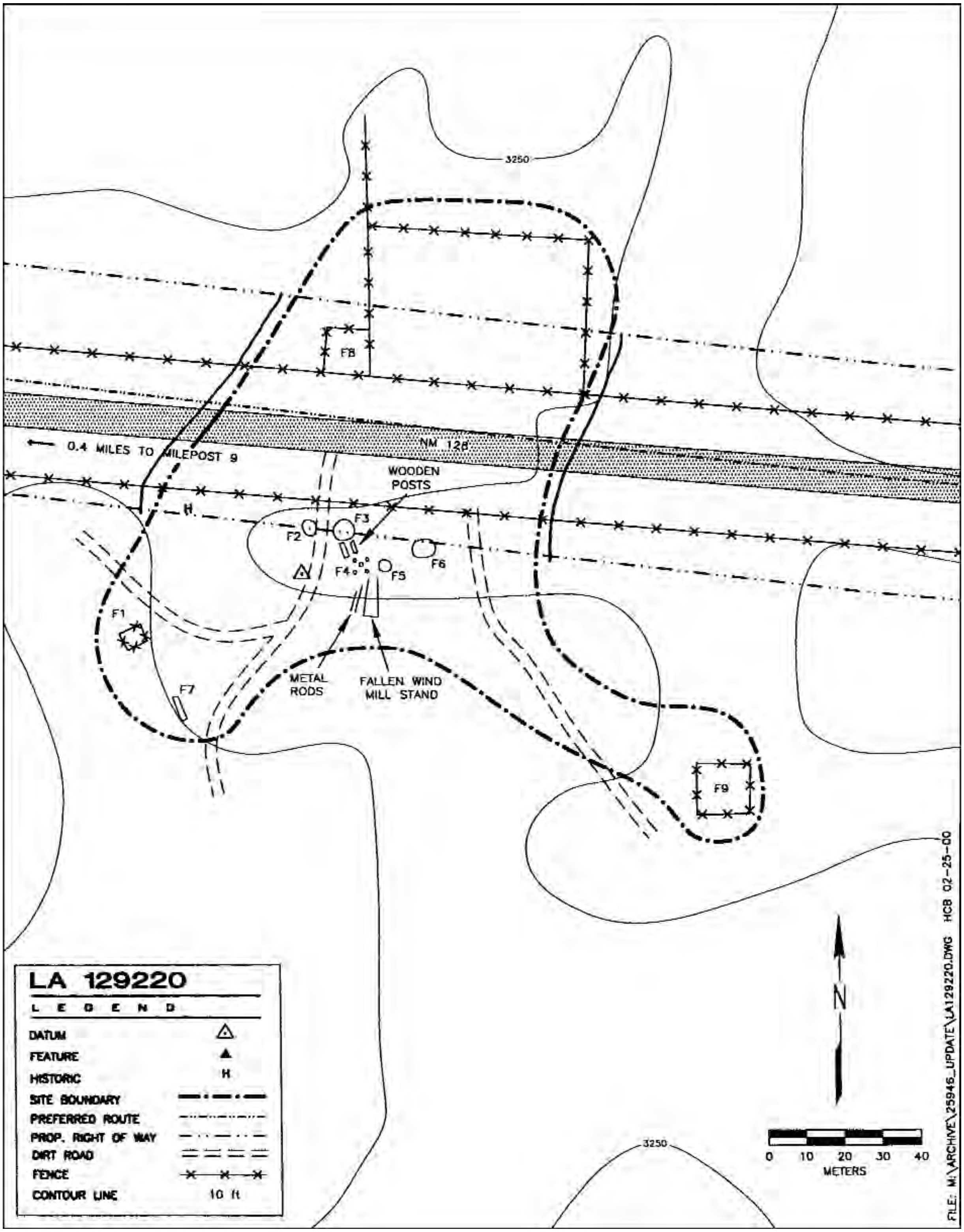

Figure 13. LA 129220 (from Turnbow et al. 2000).

Figure 14. Historic railroad-tie corral within the project limits, LA 129220.

Figure 15. Water tank features outside project limits south of NM 128, LA 129220.

will be conducted on associated people, the windmill, and other equipment.

LA 129222

Description

LA 129222 is north of the existing highway and extends almost to the edge of the present right-of-way fence (Fig. 16). It is a large prehistoric campsite with a large number of scattered artifacts. Three thermal features were identified on the site. At an elevation of 3,010 feet, the site lies on a low bench above a playa depression to the west and north. The site measures 138 m east-west by 122 m north-south and encompasses 14,836 sq m. The surface of this site is quite different from that of the sites in dunes at either end of the project. The area is fairly flat and characterized by a crusty, cryptogamic soil. As is true of LA 129223, immediately adjacent to the west, the salty lake deposit seems to be affecting the soil and stunting the vegetation (Fig. 17). One area has creosote with some crucifixion thorn and a few broom snakeweed. Outside this creosote zone the surfaces are covered with moderate fluff and dropseed grass and occasional crucifixion thorn. Surface visibility is 70 percent. The site is on the north side of NM 128 at Milepost 5.3.

Features

The three thermal features identified on the surface include two articulated concentrations of burned caliche, including 1 with ash-stained soil, and a dispersed scatter of burned caliche. All are outside the proposed project limits. Trowel probing within Feature 3 revealed charcoal remains to a minimum depth of 0.10 m bgs. The other articulated burned caliche feature contains subsurface burned caliche to 0.10 m bgs but no ash deposits. The scatter of burned caliche is eroding out of the dunes. The features are concentrated in the central portion of the site. Additional buried thermal features are expected in this area given the moderate density of thermally altered material.

Cultural Material

The cultural material include a low density of burned caliche and lithic artifacts as well as a possible Chupadero Black-on-white sherd. The chipped-stone artifacts include debitage, four marginally retouched tool fragments, one unifacially shaped tool, and one marginally retouched "end scraper." The chipped stone artifacts are produced from chert, chalcedony, quartzite, limestone, and sandstone. The highest densities of chipped stone artifacts are associated with Feature 2, and a moderate scatter of burned caliche lies to the northwest of Features 1 and 2 in the central portion of the site. Even though the overall chipped stone artifact density is low, the site was estimated to have over 450 specimens.

More than 25 pieces of ground stone were recorded, predominately sandstone mano and metate fragments with a few limestone mano fragments. A quartzite mano fragment shows secondary hammerstone use.

Ceramic artifacts are limited to a possible Chupadero Black-on-white sherd found in the southwestern portion of the site. This type dates from A.D. 1150 to 1450 and correlates with the Formative 5 (A.D. 1125–1200) to Formative 7 (A.D. 1300–1375) phases.

The site also contains an estimated 10,000 pieces of burned caliche and 20 pieces of thermally altered limestone and sandstone. The majority of the thermally altered material is exposed in the central and southwestern portions.

Evaluation

LA 129222 is most likely a multicomponent prehistoric campsite with where foraging-tool production and cooking took place. The identified features suggest hearths or roasting pits. The possible Chupadero Black-on-white sherd indicates that the southwestern portion of the site could contain a Formative 5 to Formative 7 phase occupation. Other portions of the site remain undated due to the lack of diagnostic artifacts.

The site appears to be in fair to good condition. Some erosion occurs along NM 128 on the southern edge of the site, and a bladed road and pad exists in the southwestern portion of the site. Part of the site may have been removed during the construction of NM 128. Trowel probing of the features confirmed ash-stained fill to at least 0.10 m bgs in Feature 3. Other trowel tests in the central portion of the site revealed sediments are over 0.3 m bgs, indicating a potential for buried

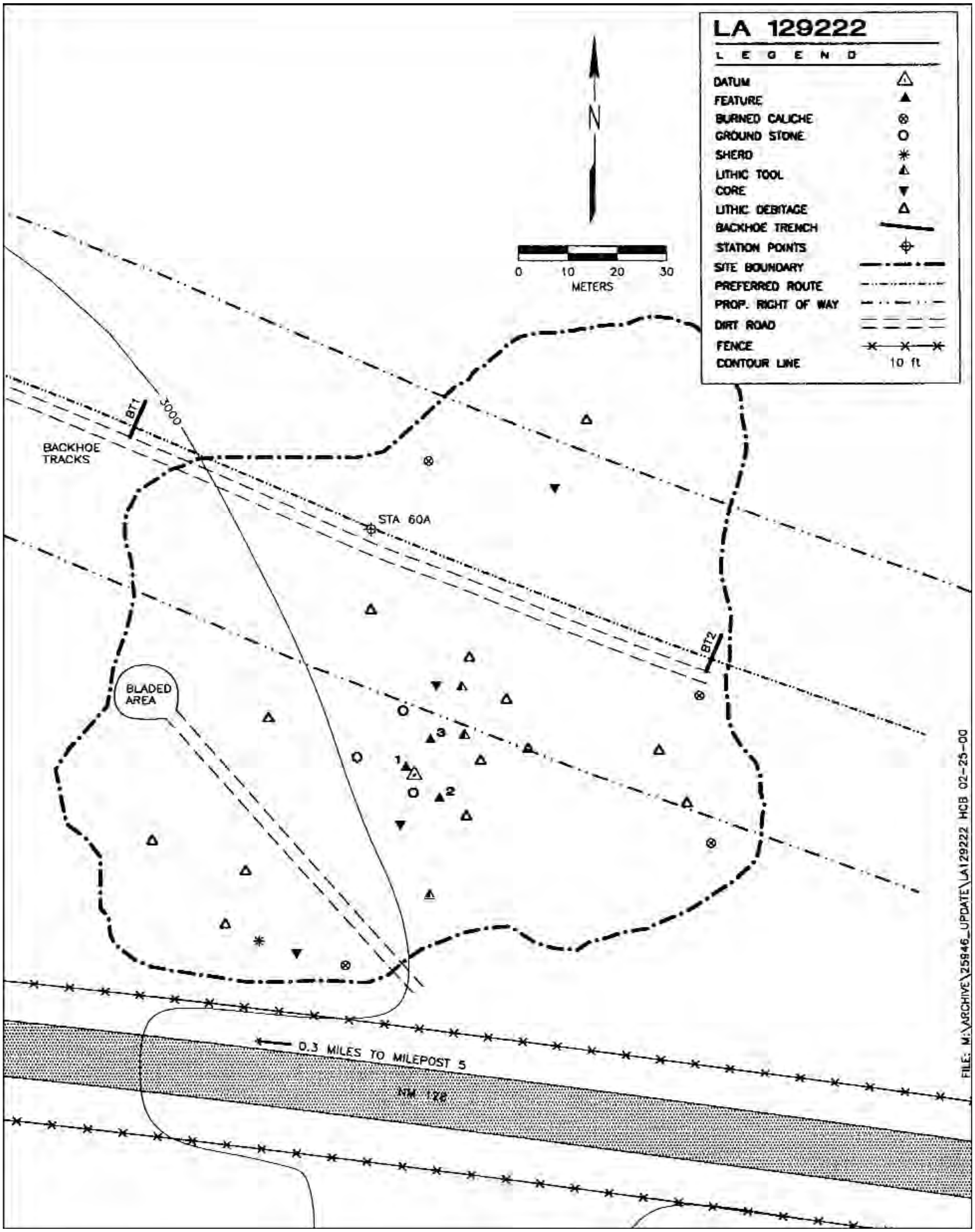

Figure 16. LA 129222 (from Turnbow et al. 2000).

Figure 17. Topography, vegetation, and soils in mid–project area around LA 129222 and LA 129223. Centerline stake at right.

intact cultural deposits and features. These deposits may be even deeper in areas stabilized by grasses. Based on the intact thermal feature and the potential for other buried cultural deposits, LA 129222 is eligible for inclusion in the NRHP under Criterion D.

Although no features were identified within the Phase 1 project limits, the topographic setting of this site warrants investigation of that portion of the site area. Geomorphological study should take place through trenching, and the surface within the project area should be collected. If trenching indicates buried surfaces within the project limits, the area of excavation should be expanded.

LA 129300

Description

LA 129300 is between LA 129215 on the west and LA 129223 on the east (Fig. 18). Its north margin is defined by a line of boulders along the railroad right-of-way, which in turn forms the edge of the new highway right-of-way. It is a large site, over 165 m north-south (not the 350 m specified by TRC) and 125 m east-west, with a total site area of 16,625 sq m. The proposed right-of-way covers the north one-third of the site, an area of 7,700 sq m. Dense cultural materials are present on a ridge above a playa south of the new right-of-way. TRC defined 15 features, but only 3 of them (Features 1, 9, and 15) are within the proposed project limits (Turnbow et al. 2000:60). All the features are greater than 10 cm deep. Grinding tools, part of a Formative period projectile point, and 25 sherds indicate that at least some of the features are Formative in age. The abundance of artifacts and caliche and the thickness of deposits suggest that the site was occupied for some period of time, probably on a seasonal basis. The range of ceramic types suggest Formative occupations may have spanned A.D. 500 to 1375. Railroad construction has removed the northern edge of the site, and the soil is gen-

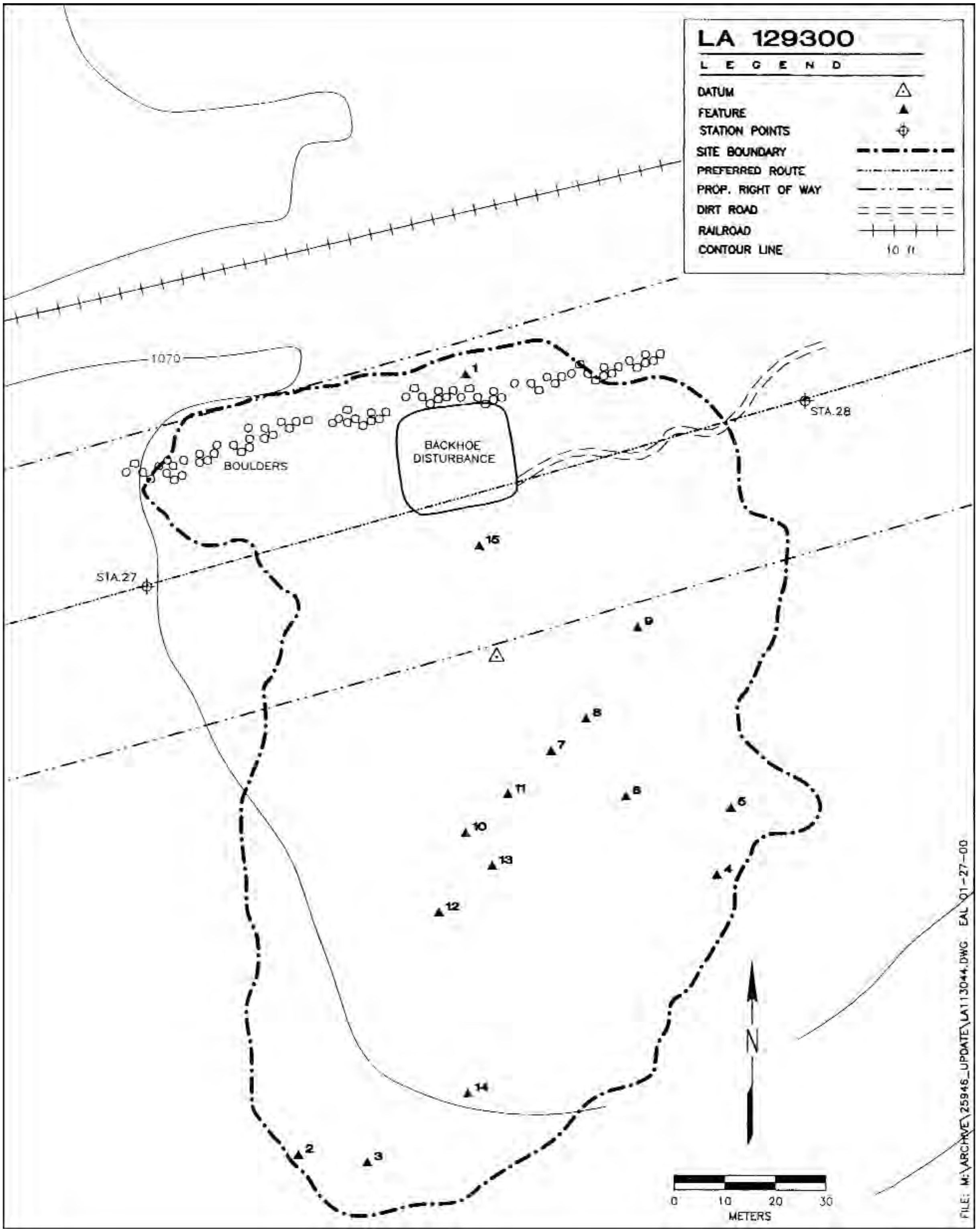

Figure 18. LA 129300 (from Turnbow et al. 2000).

erally thin, but the southeast portion of the site almost certainly contains intact cultural features and deposits (Figs. 19–22).

Scattered materials extend beyond the defined boundary in the drainage to the east. The northern edge of the site was arbitrarily defined by the railroad bed. LA 113044 lies north of the railroad on the same ridge (Gibson 1996) but appears to be separated from LA 129300 by an expanse lacking cultural materials. The elevation of the site is 2,970 feet. Soils are predominately recent eolian sands overlying a sandy loam with a moderate to light quantity of caliche nodules. Calcrete deposits are noted on the surface in several areas. Vegetation includes mesquite, crucifixion thorn, four-wing saltbush, creosote, acacia, dropseed, snakeweed, yucca elata, and some prickly pear. Surface visibility is around 75 percent.

Features

Fifteen features were identified on the surface of the site, including six burned-caliche and ash-stained midden deposits, 1 burned-caliche midden without ash-stained soils, and eight burned-caliche concentrations (Table 22). The burned-caliche and ash-stained middens range from 6 m in diameter to 30 by 15 m. Areas of darkly stained soil are visible on the site outside the proposed highway right-of-way. Trowel probing of features confirmed that the ash-stained deposits extend more than 10 cm deep. The burned-caliche concentrations probably represent thermal features and lack other cultural materials, except for Feature 4, which contained more than 100 flakes and pieces of brown ware. Testing of these features generally found subsurface burned-caliche nodules but no ash-staining.

Cultural Material

The cultural materials on the surface of this site are sparse except in the vicinity of features. Most common materials include burned-caliche nodules, which are estimated to exceed 10,000 specimens, and there are around 50 pieces of fire-cracked sandstone and limestone. Surface artifacts are not common but were estimated to number over 500. Chipped stone artifacts comprise 475 pieces of debitage, 30 cores, 15 marginally retouched tools, and 1 projectile point base. Materials include chert, quartzite, and limestone. The projectile point fragment is a chert comer-notched dart with a straight base. Given the damage, the point is not securely typed, but it does resemble Type 8-B as defined by Leslie (1978:131, Fig. 18b). Leslie estimated the temporal span of the type from the Late Archaic to around A.D. 950.

Ceramic artifacts included 17 undifferentiated brown ware and 8 red-slipped brown ware sherds. These specimens date portions of the site to the Formative period (A.D. 500–1375). The ceramics are associated with three of the seven middens and one burned-caliche concentration. The 22 ground stone artifacts observed on the surface include mostly sandstone manos and metate fragments. One quartzite hammerstone is also present, as was a piece of curly mussel shell.

Evaluation

LA 129300 is a large campsite or possible residential site dating from perhaps the Late Archaic to at least the Formative period. The size and thickness of the cultural deposits and the sheer number of surface artifacts suggest the site was occupied over a long period of time by small groups or perhaps more intensively by a few larger populations. Features exposed on the surface probably represent the remains of hearths, roasting pits, perhaps other pits, and evidence of a wide range of activities. Structural remains may be present. The dart point may date from the Late Archaic to the early Formative period. The brown ware ceramics suggest a Formative 1 (A.D. 500–750) to Formative 2 (A.D. 750–950) phase. The red-slipped ceramics may be a variety of Jornada Brown and suggest a date as late as the Formative 7 (A.D. 1300–1375) phase.

The integrity of the site is variable. Railroad construction removed the northern portion of the site. Soils are minimal, and calcrete is exposed within numerous drainage channels on the western slope and in areas on top of the ridge. The best-preserved cultural deposits lie on the eastern slope in the southeastern portion of the site. Middens, other features, and ashy sediments in this 60 by 60 m area imply considerable data potential. Trowel probing of the features indicates from 0.10 to 0.15 m of ash-stained deposits,

Figure 19. Looking east toward LA 129300, showing current site access.

Figure 20. The project area from the railroad tracks, LA129300. The site is beyond the large rocks at the edge of the railroad right-of-way.

Figure 21. Main area of LA 129300, south of the new right-of-way.

Figure 22. LA 129300, looking west. The figures (left middle distance) are in the main site area. Some material extends down the slope. Centerline stake in center foreground.

Table 22. Features within the right-of-way, LA 129300

Feature No.	Type	N-S by E-W (m)	Depth (m)	Remarks
1	burned-caliche concentration	.75 x 1	0.1	
9	burned caliche, ash midden	15 x 8	0.15	Ground stone, cores
15	burned-caliche concentration	2 x 2	0.1	

including some eroding out from under dunes. These deposits probably contain pits, hearths, structural remains, and a rich artifact assemblage likely associated with subsistence and datable materials.

LA 129300 has been determined eligible to the NRHP under Criterion D. When the new road is completed, this major site will have the highway through its north edge. It will change from being inaccessible to very accessible, and the site will be subject to increased artifact collection and possibly looting.

Isolated Occurrences

In keeping with the long-term, wide-scale human use of the area, each project that ventures onto the landscape encounters isolated occurrences. The TRC survey in 2000 recorded 64 isolated occurrences (Turnbow et al. 2000), and the SWCA project recorded 8 (Railey et al. 2006). These range from the recent to the ancient. They include triangular-punched cans, an evaporated milk can, several pieces of amethyst bottle glass, a Farmers soda bottle from Artesia, a waterworn rock that was a possible tool, a hammerstone, a utilized flake end scraper, cortical core flakes and noncortical core flakes, pieces of burned caliche, fire-cracked rock, mano fragments, a Chupadero Black-on-white sherd, and an unidentifiable projectile point fragment. Although these finds are not of concern to a data recovery effort, they demonstrate the general diversity of cultural materials.

Data Recovery Plan for Prehistoric Components

Regge N. Wiseman

Taxonomic Considerations

The prehistoric remains over the vast region of the southeastern quarter of New Mexico are currently subsumed under one broad taxonomic category—the Jornada branch of the Mogollon Culture (LeBlanc and Whalen 1980; Katz and Katz 2001; Sebastian and Larralde 1989; Stuart and Gauthier 1981). Two avenues led to this situation. The first was Lehmer's (1948) original proposal that the archaeological remains in south-central New Mexico, far western Texas, and the northern part of Chihuahua be described as the Jornada branch of the Mogollon Culture. The geographic boundary of this region is rather vague to the east, where it encompasses what appears to be the main mountain masses of the Sierra Blanca, Sacramento, and Guadalupe Mountains of New Mexico (Lehmer 1948), but the eastern boundary does not include the area between those mountains and the Pecos River to the east.

In the mid-1960s, John Corley (1965/1970) of the Lea County Archaeological Society (LCAS) in Hobbs proposed that the archaeological remains east of the Pecos River be subsumed under the Jornada branch of the Mogollon and called them the Eastern Extension. Apparently for convenience, Corley drew the western boundary of the Eastern Extension at the Pecos River even though the site distribution upon which he based his proposal stops several miles east of that river (Leslie 1979: Fig. 3). The distance between the western edge of the site distribution and the Pecos River appears to be on the order of 10 to 15 miles. The one exception to this characterization is a small group of sites in the vicinity of Pearce Canyon along the east side of the Pecos River below the town of Loving, New Mexico, and just north of the Texas state line.

Thus, at the time the Eastern Extension was proposed, neither Lehmer nor Corley had seriously considered the archaeological remains on either side of the Pecos River, a strip of territory 20 miles wide to the south in the vicinity of Carlsbad and as much as 60 miles wide to the north in the vicinity of Roswell. The reason for this seeming oversight is simple—the archaeology within the strip was basically unknown at the time (Stuart and Gauthier 1981; Sebastian and Larralde 1989). However, since the pottery was essentially the same at sites within the main Jornada branch and the Eastern Extension, the correlation of cultural developments across this strip of territory, and therefore including the strip within the Jornada branch, seemed both safe and appropriate.

Three factors appear to guide our perceptions of prehistoric relationships in this part of New Mexico: Southwestern pottery (especially from the El Paso area and the Sierra Blanca of New Mexico), pithouse or surface structures (reminiscent of Southwestern structures, especially since such structures were unknown in Texas at the time), and whether or not farming was part of the subsistence base. It is probably fair to say in general that upon finding pottery associated with pithouses and surface houses, Southwestern archaeologists tend to assume (until proven otherwise) that the inhabitants of such sites also engaged in farming. Based on these perspectives, the attribution of sites across southeastern New Mexico to a Southwestern affiliation seemed secure.

While the idea of a Jornada-Mogollon affiliation for the archaeology of southeastern New Mexico seems to have been widely accepted among New Mexico archaeologists, Robert Mallouf (1985), now director of the Center for Big Bend Studies in Alpine, Texas, has always considered the archaeological remains of the Guadalupe Mountains to belong to the Trans-Pecos region of West Texas, since the Guadalupes are part of the Chihuahua Desert, and their archaeological resources are related to those in the desert. Although he does not actually portray the New Mexico part of the Guadalupe Mountains on his map of the Trans-Pecos region (1985: Fig. 1), he discusses a number of sites in that area. He evidently includes all of that mountain range within the Trans-Pecos culture area on the basis of its Chihuahuan Desert biota and the duplication of site types with those of the Trans-Pecos, especially the various forms of burned rock features, including ring middens.

Since 1965 additional archaeological and synthetic work has been accomplished in southeastern New Mexico in the form of cultural resource management activities. A distillation of the latest effort at synthesis is included in the previous chapter. Of direct pertinence here are the culture historical sequences for the Brantley Reservoir locale and adjacent Guadalupe Mountains (or "Brantley sequence"; Katz and Katz 1985a, 1985b) and Leslie's (1979) expansion of Corley's (1965/1970) original Eastern Extension sequence. The Corley/Leslie Eastern Extension sequence, concerned as it is with the excavated remains of pithouses, surface structures, and Jornada pottery, certainly conforms to expectations of a farming society in these regards. Interestingly, no remains of cultigens were found in the various LCAS excavations, leading Leslie to suggest that perhaps acorns from the shin oak, *Quercus havardii*, were substituted for farm products, especially corn. Habitation (structural) sites investigated by Corley, Leslie, and associates in the southern part of the Eastern Extension region tend to be associated with or near extensive shin oak tracts.

A taxonomic assignment of the Guadalupe Mountains–Brantley region to the Trans-Pecos has several implications. First, as far as can be ascertained at present, the peoples inhabiting the Trans-Pecos (with the exception of those at La Junta de los Rios on the Rio Grande, present-day Presidio, Texas) lived an Archaic-like hunter-gatherer lifestyle throughout the prehistoric and historic periods. In concert with the Trans-Pecos, the Guadalupe Mountains and nearby Pecos River (Brantley) have failed to produce pithouses or surface type structures reminiscent of Southwestern-style houses. Even though such structures (pithouses and pueblos) have been reported for this region, the claims have not been substantiated through location visits and extended discussions with a knowledgeable individuals in the region.

Small amounts of pottery are present at Late Prehistoric sites in the Guadalupe Mountains and along the Pecos River, a pattern also present in the Trans-Pecos. Personal examination and literature reports suggest that all of the pottery was produced in the nearby El Paso area and the Sierra Blanca region of New Mexico. This suggests that the pottery was traded into the area rather than being an element of the local technological tradition.

The archaeological sites of the main Jornada branch region to the west and the Eastern Extension of the Jornada to the east of the Guadalupe Mountains also have initial Archaic occupations generally similar to those of the Guadalupe Mountains–Brantley region. However, in the first millennium A.D., at least some of the peoples in both regions began living first in pithouses and later on in surface structures or pueblo-like units (Lehmer 1948; Miller and Kenmotsu 2004; Corley 1965/1970; Leslie 1979; Collins 1968). Some of the pueblos in the main Jornada region grew to 100 rooms or more, while those in the Eastern Extension rarely had more than two to three contiguous rooms. Main Jornada and Eastern Extension peoples also made their own pottery, and farming was a major aspect of the subsistence system of the main Jornada region. The question remains whether Eastern Extension peoples grew corn or used acorns as the mainstay food.

In summary, the prehistory of the Guadalupe Mountains and nearby Pecos River valley (Brantley locale) can be characterized as follows: economic adaptation to Chihuahuan vegetative communities, emphasis on burned-rock archaeological features (especially ring middens), absence of pithouses and pueblo-style structures, presence of small amounts of pottery made to the west and northwest, and little or no evidence of farming. These characteristics diverge sharply from those of the Jornada Mogollon manifestations to the west and the Eastern Extension manifestations to the east, especially during the Late Prehistoric (pottery) period.

This brings the discussion to the Loving Lakes project. Phase 1 is concerned with a series of sites along an east-west line that starts just east of the Pecos River southeast of Carlsbad, traverses the south end of the strip of territory between the Pecos and the shin oak country to the east, and terminates just inside one of the westernmost shin oak tracts in this part of the state. Thus, the project sites span the presumed boundary, or boundary zone, between the Guadalupe Mountain–Brantley archaeological manifestation to the west and the Eastern Extension manifestation to the east, providing an opportunity to assess the relationship between the two manifestations and document archaeological sites within an area basically omitted from consideration during the formulation of the Guadalupe Mountain–Brantley and Eastern Extension concepts. Can a boundary between the two proposed cultural manifestations be defined and the relationships between them documented?

Theoretical Perspective on Hunter-Gatherer Subsistence Systems

This section applies to the Archaic and Neo-Archaic components of the Loving Lakes Phase 1 sites. *Neo-Archaic* (Lord and Reynolds 1985) refers to sites that date to the Late Prehistoric (pottery) period but are created by full-time hunter-gatherers rather than by hunting-gathering task groups from farming settlements. Temporally diagnostic lithic artifacts identified during site survey span the Early Archaic through protohistoric periods, but these diagnostic artifacts were so rare that the vast majority of individual features or site areas cannot be dated. Because the features themselves are similar and are not obviously diagnostic of occupation periods, the features will require independent chronological determinations.

Past research in the Guadalupe Mountains–Brantley region, as in the Trans-Pecos in general, indicates that baked succulents such as lechuguilla and sotol were fundamental to subsistence starting at some point during the Middle to Late Archaic periods and continuing into the Late Prehistoric and even early historic periods (Young 1982; Greer 1965, 1967, 1968; Roney 1995; Katz and Katz 1985a). Archaeological remains of baking ovens usually take the form of midden rings or circles of burned rock surrounding central pits, although burned rock mounds of other shapes are also known (Phippen et al. 2000). Since these succulents provide a reliable year-round source of carbohydrates (Dering 1999), they were understandably important in prehistoric and historic diets (Hines et al. 1994) and may have diminished the importance of or even replaced many other carbohydrates, including corn (Sebastian and Larralde 1989; Roney 1995).

While succulents such as agave and sotol were important food resources for people living west of the Pecos River, these species are virtually absent east of the river. A few ring middens have been reported on survey for sites east of the Pecos (ARMS files), but they are absent at the vast majority of sites, whether Archaic or Late Prehistoric. Clearly, the Archaic and Late Prehistoric subsistence strategies east of the Pecos River were focused differently than those west of the river.

The general belief among archaeologists is that most Archaic adaptations utilized a wide variety of wild animal and plant species. Depending on a host of factors, the strategies employed by a specific group or groups of humans may be characterized as collecting or foraging (Binford 1980; Kelly 1995). Bases for characterization include but are not necessarily limited to the species exploited, the distribution and density of the exploited species, species availability and timing of harvests, and the size and spacing of human groups reliant on those species.

In simplest terms, foragers move the people to the food, and collectors move the food to the people. Collectors do this by means of task groups that are sent out to obtain specific resources and return them to the group, a behavior warranted by resources that occur in clumped or patchlike distributions. The primary differences between collector and forager lifestyles are the degrees to and ways in which people plan, organize, and conduct their food quest in response to resource distributions and seasons of availability.

In theory, forager and collector sites should have fairly distinctive attributes, as follows:

Forager sites, to which people move for resources, are inhabited for shorter periods of time, have smaller accumulations of trash, and similar suites of artifacts, all because the same general activities are carried out at each site. Because they are occupied for relatively short periods of time (days or a few weeks), relatively few items (manufacturing debris, broken artifacts, etc.) should be left behind. Ephemeral housing such as brush wickiups (archaeologically expressed as slightly depressed use-surfaces or floors) may be present. One site should look pretty much like another, and their archaeological visibility should be subtle, perhaps even inconspicuous. However, if the foraging group reuses the site numerous times over a period of years, then more substantial quantities of refuse and artifacts may accumulate. Archaeologically, these sites may look very much like the base camps of collectors.

Collectors send out work parties to set up temporary special-activity sites, collect the target resources, and take the food back to long-term base camps. *Base camps* are generally quite visible archaeologically because they are used for a wide range of daily activities, resulting in the accumulation of a wide range of artifact types, activity areas, and refuse deposits. Some form of shelter or housing, whether ephemeral or more substantial in construction, is usually present, as may be pits for food storage. Base camps are generally used over long periods of time (several months) each year for several years, sometimes in sequential years and sometimes in staggered years or sets of years. A logistically organized group generally has only one or two base camps that it uses during a given year. *Special activity sites*, on the other hand, are created during collecting expeditions, might be used only once, are almost invisible archaeologically because they are used for such short periods, have little or no accumulation of nonperishable debris and broken artifacts, and have limited artifact inventories reflecting few activities.

Sebastian and Larralde (1989) and Collins (1991:8) emphasize an alternative view of these strategies: that foragers and collectors can and do, at least in some instances, implement both strategies depending on their needs. That is, the two strategies may be viewed as two ends of a continuum and are not necessarily dichotomous. In a given year or over a series of years, some groups may actually employ both strategies because of factors such as season, climate, economy, demography, and competition (Boyd et al. 1993). Sebastian and Larralde (1989:55–56) cite the Archaic peoples of southeastern New Mexico as an example of "serial foraging":

> A strategy of serial foraging involves a small residential group that moves into the general vicinity of an abundant resource and camps there, uses the target resource and other hunted and gathered resources encountered in the general area until the target resource is gone, or until another desired resource is known to be available, and then moves on to the next scheduled procurement area. Such a strategy could be expected to create a great deal of redundancy in the archaeological record, an endless series of small, residential camps from which daily hunting-and-gathering parties move out over the surrounding terrain, returning to process and consume the acquired foods each evening. If the resources were randomly distributed, all the sites would look generally the same. But since many of the resources appear in the same place year after year or in some other cyclical pattern, some sites tend to be reoccupied.

Reoccupied sites, then, would be a clustering of small, single-event, serial-foraging sites. But Sebastian and Larralde (1989:56) envision a complicating factor:

> The only exception to the rule of basically redundant but sometimes overlapping small campsites would be the winter camps. Given the relatively brief winters of the Roswell District, many of the sites would, on the surface, be no different in appearance from reoccupied short-term camps. Excavation of such sites might recover resources indicating a winter seasonal occupation or features indicative of storage, however. If we were able to differentiate single, large-group occupations from multiple, small-group occupations, we might find that winter sites differ from warm season camps in that they were occupied by larger groups.

In the above scenario, the settlement types of serial foragers should then start taking on the appearance of collectors' sites. While this introduces some difficulty in archaeological studies, it probably approximates reality to a greater degree and certainly seems to make better sense with respect to the archaeological record of southeastern New Mexico as we become increasingly familiar with it.

In addition to discussing the feature and artifact content of sites, Collins (1991:7–8) suggests biological correlates of forager and collector sites, particularly those involving burned-rock middens. He suggests that the difference between the two might be signaled by whether the plant species were processed. That is, collectors would focus on species that are available in large numbers or amounts during short periods of time, requiring some form of preparation and storage for long-term benefit to humans. Foragers, on the other hand, would rely mostly on plant species that are available throughout the year, precluding the need for storage but usually requiring greater mobility because their distribution across the landscape is general, not patchy. He suggests that animal species might also be conducive to this type of analysis, but because animals are mobile, they are not particularly useful in this regard.

Before leaving the subject of subsistence strategies, it is appropriate to touch on the subjects of gardening (or farming) and food storage. As discussed earlier, the evidence of prehistoric farming in the Guadalupe Mountains–Brantley region is slight at present. Roney (1995:21) stated that corn was recovered from only three shelters in the Guadalupe Mountains, but in each case, few remains were found. The Pratt Cave example (Schroeder 1983:67) involves one or more kernels recovered from the vicinity of a hearth. Since two chile seeds were recovered from a lower level in the same test, it is possible that the corn was introduced during the historic period by Apaches, rather than during Archaic times, as suggested by Roney. According to Roney, the proveniences and temporal associations of the other two reports of corn are also uncertain.

Two corn cupule fragments were recently recovered from an open site in the middle reaches of the Seven Rivers drainage at the north end of the Guadalupe Mountains (Kemrer 1998). However, given the paucity of these remains, it is possible that people carried the corn to the site from a distant farm area and ate it there before throwing the cob into the fire for fuel. In view of this scant evidence, it is likely that horticulture or farming was not practiced by prehistoric inhabitants of the Guadalupe Mountains, or it was practiced on only a very limited scale. Clarification of this point is needed.

Storage, usually in the form of pits, is believed to be an indication of base camps and habitation sites. The storage of quantities of foodstuffs is a characteristic of logistically organized subsistence systems. Generally speaking, storage implies a site that is easily protected or otherwise secure from theft. Sebastian and Larralde (1989:86) advance the interesting hypothesis that, because some resource patches are spread over the landscape and create a logistical problem for exploitation, some people may actually have cached food in the collection areas and then moved their families from cache to cache as needed throughout the winter season. This constitutes yet another variation on the forager theme, and to the extent that. it may reflect the situation in southeastern New Mexico, it has the strong potential for confusing the interpretation of archaeological remains.

How does one come to grips with this problem? In discussing research on burned-rock middens in Texas, Collins (1991:7–8) provides a test for determining whether a forager system or a collector system prevailed during the occupation of a specific site or set of sites:

> Therefore, complex components associated with burned rock middens which evidence quantities of remains of any one or more r-selected resources [i.e., are highly productive but available for only short periods] to the near exclusion of other kinds of resources imply, at least to some degree, the adaptive characteristics listed above and would favor an interpretation that burned rock middens were specialized food preparation features. Mesquite beans, prickly pear [fruits], all deciduous nuts such as pecans and acorns, and psoralea are examples of r-selected plant foods.
>
> In contrast, plant and animal foods that are edible and available for all or much of the year (sotol, prickly pear *pads*, lechuguilla, antelope, rabbits, deer, bison in some areas, fish, mussels, turkey, and others) can be exploited in the more generalized foraging strategy and have different behavioral correlates. Evidence that foods of this kind provided the principal staples of groups responsible for burned rock middens would be evidence that these were not specialized food processing facilities, and that those responsible may have been foragers.

These comments should apply equally well to sites lacking burned-rock middens of the types Collins refers to (i.e., annular or ring middens and dome-shaped middens).

Data Recovery Themes

The investigations proposed for the project sites will be directed towards answering basic questions about settlement and subsistence behavior in the north end of the Trans-Pecos culture area, east of the Pecos River, the shin oak communities farther east. Ultimately, this work will focus on the applicability of the Guadalupe Mountains–Brantley (Katz and Katz 1985a) and Eastern Extension (Corley 1965/1970; Leslie 1979) culture sequences to archaeological remains in the project area. An important aspect of this effort will be to determine the presence or absence of a boundary or boundary zone between manifestations of the two sequences.

All project sites except LA 129220 have prehistoric components. Judging only by definitive surface manifestations, some are Archaic, others are Late Prehistoric, and some have components belonging to both the Archaic and Late Prehistoric periods. Because of the scarcity of temporally diagnostic artifacts and findings from other projects in the region (Lord and Reynolds 1985; Staley et al. 1996), there is a high probability that all of the sites are multicomponent. Feature types tentatively identified include burned-rock hearths and baking features, burned-rock scatters, culturally stained middens, and artifact scatters. The presence of pottery at several of the sites signals the presence of nonrock hearths, but these will have to be discovered through excavation (Wiseman 2001). The data recovery project proposed here will investigate and date several dozen of these features, as well as locate and investigate as many additional subsurface features as possible during our excavations. Every effort will be made to recover and record information pertinent to the following themes:

1. Evaluate (verify or modify) our perception of the cultural content of the phases of the Guadalupe Mountains–Brantley and Eastern Extension cultural sequences and, where possible, augment the criteria by which the phases can be distinguished, both among phases within each sequence and between sequences. The dearth of diagnostic artifacts noted on the site surfaces during survey requires us to maintain maximum flexibility as to what periods, phases, and sequences may be encountered during the project. Thus, the entire span of human occupation in the New World (Paleoindian through recent historic), as well as representatives of one or both culture sequences, could be present among the project sites. Can we distinguish which sites and components belong to these sequences?

2. Evaluate the subsistence trend outlined by Katz and Katz (1985a) for the Brantley area and those hinted at by Corley and Leslie for the Eastern Extension. Katz and Katz believe that a major subsistence shift took place during the prehistoric sequence. Riverine resources such as mussels were important foods during the Avalon, McMillan, and early Brantley phases (Middle Archaic through terminal Archaic), and nonriverine resources were largely supplemental. But starting in the Brantley phase and continuing throughout the Globe, Oriental, and Phenix phases (the entire Late Prehistoric period), upland resources became more important and riverine resources less important. While this is better conceived as a change in emphasis than a sharp change from one set of resources to another, it led to a markedly reduced human presence along the Pecos River. Do the Archaic components in our project area reflect this scenario? If not, how do they differ, and why?

Corley (1965/1970) and Leslie (1979) limit their comments about subsistence practices in the Eastern Extension area. They note the absence of macroremains of corn in all of their sites and suggest that acorns from the extensive shin oak communities provided the primary carbohydrate staple for the inhabitants of the region, especially during the Late Prehistoric period. Is this hypothesis supported by the microbotanical data we anticipate recovering from flotation and pollen samples? (These techniques were unavailable to Corley and Leslie.) If acorns are determined to be the principal carbohydrate source, are there technological differences in the artifact assemblages that can be used to distinguish corn from acorn reliance in settings where direct botanical data is unavailable?

3. Determine whether the inhabitants of the project sites farmed and, if so, determine how prominently cultigens figured in the diet compared to wild foods. Given their proximity to horticultural peoples of the Southwest, it would be surprising that prehistoric peoples in the Guadalupe Mountains–Brantley and Eastern Extension regions farmed little or not at all. But before this expectation can be confirmed, we must use modern techniques to investigate the matter. If investigation suggests that they did not farm, we need to determine whether the reasons are cultural, demographic, climatic, or some combination of these. Could the availability of extensive shin oak communities (acorns) precluded the need for, or usefulness of, the adoption of farming, as has been suggested?

Data Recovery Questions

1. The nature of the occupations. Are the prehistoric components of the project sites base camps, temporary camps, long-term residential sites, special activity sites, or some combination?

Are structures, storage pits, other types of pits, and thermal features (hearths, cooking pits, etc.) present? It is virtually guaranteed that most if not all project sites were occupied more than once during the prehistoric period. Assuming so, we need to discover not only what kinds of features are present, but also which ones were contemporaneous and which were not and to identify the specific phases represented. Were the activities or site function during each component the same or different?

At this stage in the investigations we have little observational data with which to answer these questions. More intensive work will probably greatly modify our perceptions and interpretations of the prehistoric components at all of the project sites. The minimal data available suggest that two or more components are present at all sites, probably representing two or more phases in the Guadalupe Mountains–Brantley or Eastern Extension sequences. To confirm this expectation, we will need to discover, isolate, and study features and artifacts belonging to separate occupations (components). Because of the geomorphic complexity of the sites, stratigraphic, stylistic, and chronometric data will be necessary to first isolate and then group features into components.

Once individual components are defined, we can then proceed to document the range of activities that took place at each. The cultural features (storage pits, other types of pits, hearths, baking pits, etc.), associated artifacts, and patterning of these remains are critical to defining site types. Important subsidiary studies, including the analysis of artifacts and plant and animal remains, will assist in determining site type as well as overall subsistence patterns.

2. Artifact assemblages and occupation activities. What artifact assemblages are present at the project sites? What types of tools and manufacture debris are present? What is the relative abundance of the various types? On the basis of the artifacts, what types of activities were performed at the sites? How do these assemblages compare with those from other sites in the region?

The types of artifacts at a site help define the kinds of activities that took place at each specific location (component). Manos and metates imply the grinding of plant foods, projectile points imply hunting, and scrapers imply hide dressing. Multipurpose tools such as hammerstones, awls, and drills, and manufacture debris such as chipped lithic debitage, shell fragments, and some types of fragmentary artifacts, imply a host of generalized activities involving the manufacture or maintenance of items associated with day-to-day living. We infer that a wide range of artifact and debris types signifies a base camp/habitation situation, and that fewer artifact and debris types signify special-activity sites. The relative abundance of each category provides a *very rough* index to the relative frequency of occurrence of each activity at the site.

Caution is required in interpreting the data in this manner because of the effects of tool use-life on artifact assemblage composition (Schlanger 1990). This line of interpretation makes several assumptions about the data and the activities it represents, and the technique greatly simplifies a number of complex variables and conditions. One way of compensating at least partly for the problem of absence or poor representation of certain tool types is to recover very tiny remains such as tool-sharpening flakes and notching flakes, the presence of which will attest to the former presence of artifact types and activities that occurred at a site but which did not leave other traces such as broken tools.

With these details worked out, we can then compare the different components among the project sites as well as with project sites with other sites in the Guadalupe Mountains–Brantley and Eastern Extension regions.

3. Subsistence. What plants and animals were being collected/hunted, processed, or consumed at the project sites? What biotic communities were being exploited? Were the inhabitants of the sites exploiting all available biotic communities or only selected ones? Were cultigens being grown or consumed? What season or seasons were the sites occupied?

Plant and animal remains recovered at archaeological sites provide first-line evidence for reconstructing various aspects of the human food quest. Animal bones and the pollen and charred remnants of plants will be studied to identify the species present and the biotic zones exploited, to characterize the diet and food preparation techniques, and to provide insights into the effects of taphonomic processes on the archaeological record. Plant and animal data also can help us determine which season of the year the taxa were acquired. Although only certain plant and animal remains provide seasonal data, they are very useful in helping define the time of the year the sites were occupied. Since it is unlikely that the data from the project sites constitutes a total view of the diet throughout the year or through time, it will be necessary to compare these results with those of other projects in the region to gain a better understanding of the total subsistence system.

It is imperative that we establish whether or not domestic plants were grown in the project area. Leslie's (1979) assessment of the structural sites in the vicinity of Hobbs, in far southeastern New Mexico, though without benefit of flotation and pollen recovery techniques, suggests that corn was not being grown east of the Pecos River within New Mexico. The WIPP project (Lord and Reynolds 1985), 7 km northeast of our easternmost project sites, excavated three nonstructural sites but failed to find evidence of cultigens in flotation and pollen samples. On the other hand, corn was clearly being grown within the Pecos Valley at Roswell (Dunavan 2004). Thus, if cultigens are documented for the project sites, then the relative quantities may help us determine the status of cultigen use by the occupants of the sites. Relatively large numbers of domestic remains or high ubiquity rates would indicate that the people were farmers. Small amounts of cultigens would be less clear, for hunter-gatherers could have obtained them in trade from farmers at Roswell or farther west.

An important adjunct study regarding subsistence will be an analysis of burned rocks (including caliche) from the excavated thermal features. The analysis will have field and laboratory stages. The field assessments will document the oxidation-reduction qualities and morphology of the burned rocks and the patterns of those qualities within each feature (Black et al. 1997; Ericson 1972; Tennis et al. 1997; Wessel 1990a, 1990 b; Wessel and McIntyre 1986). Each rock also will be examined for indications that it was used as a boiling stone, for example, if it were removed from the thermal feature and placed in baskets to cook food, then returned to the thermal feature for reheating (Duncan and Doleman 1991; Doleman 1997).

The second stage of burned-rock analysis will be the lipid-residue analysis of selected burned rocks (Malainey and Malisza 2004a, 2004b; Malainey et al. 1999a, 1999b, 1999c, 2001). Although still being developed, this technique holds much promise for helping to reconstruct subsistence behavior by identifying lipid residue from plants and animals on a variety of materials and items.

4. Exchange and mobility. What exotic materials or items are present at the sites? Do they indicate exchange or mobility of the site's occupants? What source areas are implicated?

Materials and artifacts not naturally available in a region are indicative of either exchange relationships with other people or a mobility pattern that permitted a group to acquire these items during their yearly round. Judging which situation is applicable to the project sites is difficult and will require careful comparison with data from other sites in southeastern New Mexico. If we can determine whether the site occupants acquired the goods through trade or by direct access, we will gain perspective on the territory they used and possibly on the identity of the people themselves.

The seeming absence of exotic materials is another matter entirely. After all, it is possible that exotic materials in the form of tools passed through a given site. But in small sites and sites of short occupation, the exotics may not have found their way into the archaeological record because the artifacts did not break at the site. However, it is possible that if these tools were used at the site and required resharpening during the occupation, then tiny flakes from that resharpening should be present. This would also be true if preforms made of exotic materials had been brought into the site and finished into tools. Tiny biface thinning and notching flakes would result. Accordingly, fine screening must be used to recover very small flakes. Failure to recover these items will limit our perceptions of the critical factors in human relationships and questions of mobility.

It is also possible that the site occupants simply did not acquire exotic materials. This is precisely where comparisons with other assemblages in the region and the long-term accumulation of excavation data from numerous sites, large and small and of all types, is necessary for acquiring perspective and, eventually, resolving the problem.

5. Dating the occupations. What are the dates of occupation at the various project sites?

Since it is likely that most project sites were occupied on two or more occasions, it is crucial to date as many individual features and components as possible. At the individual feature level, we need to determine which are contemporaneous (or approximately so) and which are not. This will enable us to define the dates of each component, estimate the sizes of the occupations through compilation of features by period, and ascertain the activities performed at the different time periods at the sites. This in turn will permit documentation of site and region use through time, whether or not these uses changed through time, and if they did change, the directions, intensity, and, hopefully, the reasons for those changes.

The dating situation is critical in southeastern New Mexico (Katz and Katz 2001; Sebastian and Larralde 1989) where dendrochronology, the most accurate and preferred dating technique in the Southwest, works poorly or not at all (W. Robinson, pers. comm., 1975). Few absolute dates derived by other techniques are currently available (Sebastian and Larralde 1989), although the situation is getting better as a result of a series of projects conducted during the 1990s and after 2000. Recent advances in radiocarbon dating make it the most viable technique for southeastern New Mexico at the present time. Obsidian hydration and thermoluminescence have been tried in the region, but since these techniques are fraught with problems and generally are not reliable, they will not be used in this study.

During excavation, charcoal will be recovered from as many features and cultural situations as possible, both through macrobotanical samples and flotation samples. Because of the importance of dating the project sites, we will submit samples for accelerator mass spectrometry analysis where necessary as well as larger samples when available for conventional radiometric dating.

6. Shin oak community study. A vital part of this project will be to assemble thorough background data on the shin oak, *Quercus havardii*. Preliminary indications are that, "historically," shin oak communities covered about 1.5 million acres (Peterson and Boyd 1998), but it is not clear from the use of the term whether this figure refers to before or after the widespread vegetative changes brought on by the period of heavy grazing initiated in the late nineteenth century (Dick-Peddie 1993).

Specific data needs include reconstruction (insofar as possible) of predisturbance shin oak distribution within a 16 km (10 mi) radius of the project sites; plant distribution and density within its various communities; and acorn productivity, periodicity, nutritive composition, and processing requirements for human consumption. This data will be collected by means of a thorough literature search and interviews with long-time local ranchers and the appropriate biologists. An attempt will be made to collect at least a kilogram of fresh acorns from the project area (or farther away if necessary) for analysis of lipid content (Malainey and Malisza 2004a, 2004b) and nutritive composition. Determining levels of tannic acid is especially important, since it has implications for the study of food preparation techniques.

7. Geomorphology study. LA 129217 and LA 129218 are situated in deep sand with surface characteristics of deep blowouts spaced among 1 to 4 m high parabolic dunes. Some blowouts contain cultural materials, while others of comparable depth appear to lack them. It seems from this perspective that cultural locations within the overall sites may be spottily distributed, and therefore some of them will be difficult to locate.

Hall (2002) recently completed a geoarchaeological study of the Mescalero Sandsheet in southeastern New Mexico. The study presents a general model of the geologic units, their origins and relationships, and their approximate dates of formation/deposition. To maximize our data recovery efforts, the geomorphology of the project area, particularly in the vicinities of LA 129217 and LA 129218, must be examined by a geomorphologist to guide decision making in the exploration for cultural activity loci within the deep sands.

Field Methods for Prehistoric Sites

OAS Staff

This section provides an overview of the techniques and strategies that will be used during data recovery investigations of the prehistoric sites. Because each site has unique characteristics, specific work plans for each site are provided in a later section. The methods, which are tailored to data recovery at the seven prehistoric sites, are in part adapted from Boyer et al. (2003:67–72) and Post and Hannaford (2005:73–79) and are also based on experience gained in testing and excavating other hunting and foraging sites in southern and southeastern New Mexico (e.g., Mbutu 1997; Quigg et al. 2002; Wiseman 2000, 2003).

General Field Strategy

Knowledge of the prehistoric archaeological sites consists only of that gained from surface observations and limited shovel and trowel tests during survey. These observations document the presence of potentially significant intact features and subsurface deposits at five sites, but in two cases (LA 129216 and LA 129217), the presence of intact features and deposits is undetermined. Even in the cases where significant deposits are present, those deposits are localized within the sites, reflecting the patchy accumulation of traces of multicomponent occupations as well as selective exposures due to deflation and dune accumulation. These qualities of the sites have led us to propose a general investigative strategy analogous to surface collection, testing, and intensive excavation. These stages are designed to recover information relevant to the research questions as quickly and as efficiently as possible. Investigations at LA 129216 and LA 129217 will proceed to intensive excavation only if surface characterization and testing suggest the presence of cultural deposits or features that will contribute to the goals of the research.

Surface Documentation

Initial work at each site will consist of establishing provenience controls and preparing an intensive documentation of the site surface. Surface material will be collected or observed as point proveniences in sparse areas or in 2 m sq units (4 sq m) in higher-density areas. Artifacts will be collected and inventoried, altered rock and caliche will be noted and quantified by type and number, anthropogenic soil characteristics will be noted, and obscuring vegetation or sand will be noted. Perimeters of any surface-visible features will be mapped. These data will be entered into a spatial database, and the spatial distributions will guide subsequent data recovery decisions.

Stratification

Based on the detailed surface information, each site will be subdivided into three investigative strata. The first will consist of areas where surface indications strongly suggest the presence of intact spatial relationships, features, or subsurface deposits. These areas will receive targeted and intensive excavation. The second stratum will consist of areas where surface indications are sparse or absent and where there is no suggestion of intact features or subsurface deposits. These areas will be "tested" for the nature and extent of any subsurface cultural resources. The third stratum will be those areas where overburden (usually dune accumulation, but also including highway construction fill) prevents confident characterization of any underlying cultural remains. Mechanical equipment will be used to investigate and then remove overburden, with the subsequent use of intensive investigation protocols where appropriate. For the purposes of this data recovery plan, tentative strata designations have been made using site survey documentation and aerial photographs. These tentative strata are approximations that serve to structure the site-specific excavation strategies. However, those strata and the associated specific strategies will be amended once more precise information is available from the intensive surface characterization of each site, and as knowledge of the site increases during fieldwork.

General Field Methods

Provenience Control

The first step in data recovery will be to establish a Cartesian grid system across the site. A permanent main site datum will be established for use as a reference for all horizontal and vertical measurements. TRC survey crews placed site datums outside the project area on all of the sites. These are relatively permanent, consisting of rebar stakes with aluminum caps, and they will be reused or supplemented as appropriate. UTM locations of the site datums reported by Turnbow et al. (2000) are in error based on NMDOT reevaluation, and new geographic positioning system coordinates will be obtained. A base map of the site will be prepared using a total station, accumulating the locations of subdatums, excavation areas, structures, features, artifacts, and topographic features, as warranted.

Surface collection and excavation units will be linked to the grid system. These units will be identified by the grid lines that intersect at their southwest corners. Grid points will be staked and parallel tapes extended along grid lines at 2 m intervals to facilitate rapid documentation of high-density artifact areas.

The basic excavation units will be 1 by 1 m grids, but naturally defined horizontal and vertical units are considered optimal. Therefore, areas without surface-visible features will first be cleared using grid control until a cultural unit such as a feature type is defined. At that time the feature will become an independent provenience unit, subdivided by grid units if appropriate. Very large features (such as structures) will be subdivided, usually into halves or quadrants, to increase the precision of horizontal provenience control while maintaining cultural relevance of the excavation segments. Point proveniencing within 1 by 1 m grid units will be asserted whenever horizontal integrity of cultural material within structures or features is suspected (e.g., intramural or extramural surface artifact distributions).

Surface stripping of wide areas is necessary for the discovery and documentation of features as well as the artifact distributions in their vicinity. Target areas for surface stripping will be defined based on surface observations of artifacts, burned caliche, soil characteristics, and topography. When defined, target areas will be transected by systematically placed 1 m wide trenches. Trench spacing will be determined by the nature and size of the target area, with spacing up to 5 m between trenches. Trenches will serve both as discovery units and as means of providing stratigraphic expectations for the excavation of the areas between the trenches. A *minimum* of 1 in 4 grid squares will be screened through 1/8-inch mesh in a systematic pattern across each target area. Artifacts will be collected, and altered rock and caliche will be recorded. Surface-visible features may be excavated as part of initial trenches only if that strategy is consistent with the feature excavation strategy defined below. Features discovered in subsurface exposures will be noted, and grid or trench excavation in that area will cease until their stratigraphic and spatial context can be defined. At that point, they will be excavated using the feature excavation strategy (for small features substantially contained within the trench), or their excavation will be deferred until their extent and context can be determined around their entire perimeter.

Since some of the lithic debitage sizes and types necessary to the goals of the research questions are likely to pass through 1/4-inch mesh, grid recovery will be changed to 1/8-inch mesh (or finer) whenever stratigraphy or the qualities of recovered artifacts suggest that increased precision is warranted. Similarly, 1/8-inch screening of grid units will be implemented within 1–2 m of known feature boundaries. Larger contiguous areas will be subject to high-precision recovery at the discretion of the project director. In the absence of these criteria, recovery will revert to the systematic pattern of 25-percent high-precision recovery.

Portions of target areas between trenches will be stripped in grids, using the knowledge gained from the trenches to modify recovery to higher levels of screening precision, if warranted. High-precision screening will be implemented within 2 m of the perimeters of identified features whether they are visible on the surface or are detected in the initial trenches. Similarly, if artifact recovery in the trenches or observations of the stratigraphy suggest the presence of definable surfaces or surface zones, recovery precision will be increased to at least 1/8-inch mesh. If the trench excavation observations or evidence of features does not warrant increased recovery precision in areas between trenches, the systematic pattern of 25-percent high-precision recovery will resume.

Where target areas are too small or of inappropriate shape for initial exploratory trenches, individual 1 by 1 m units will serve the purposes of discovery and the establishment of stratigraphic contexts. Recovery precision will be carried out so that a *minimum* of 25 percent of all target areas is screened through 1/8-inch or finer mesh.

Vertical Provenience

Just as the grid system will be linked to the main datum, so will all vertical measurements. All measurements will be made in meters relative to an arbitrary elevation assigned to the main site datum. Since it is often difficult to provide vertical control for an entire site with one datum, subdatums will be established as needed. Horizontal and vertical control of these points will be maintained relative to the main datum.

Before it is possible to delimit the extent and nature of soil or sediment strata, it is usually necessary to examine them in cross section. This requires the excavation of exploratory units or trenches, which will consist of 1 by 1 m grid units excavated in arbitrary 10 cm horizontal levels. When natural divisions—soil or sediment strata—have been defined, they will be used to delimit the boundaries of vertical proveniences. Outside the boundaries of exploratory grid units or trenches, strata will be used as the main units of vertical excavation. In the absence of definable stratigraphic units, horizontal levels will be continued. In general, stratigraphic control for any feature will be established through controlled excavation of part of the feature to provide a profile. The profile will then guide removal of the remaining fill in natural stratigraphic units. Homogeneous fill immediately above defined use surfaces (formal floors or other definable activity surfaces) will be removed as single units of 10 cm or less, leaving floor artifacts in place for point proveniencing. Floor artifacts and samples will be numbered sequentially (point provenience or PP numbers), located horizontally and vertically relative to the site datum, and indicated on structure or feature maps. Subfloor tests will be placed in excavated features to ascertain whether cultural deposits continue below; all excavations will be taken to sterile soil. Augers or mechanical equipment will be used to confirm the absence of lower cultural deposits for large excavation areas.

Mechanical Excavation

Exploratory backhoe trenches and mechanical removal of overburden are planned for the data recovery excavations where deeper soils are expected and where dunes may mask buried cultural deposits. Backhoes will be equipped with buckets between 32 to 36 in (81 to 91 cm) wide, and trenches will be excavated to a minimum width of 90 cm (35 inches) and to a maximum depth of 4 ft (1.2 m) where close-up observation of trench stratigraphy is required. The 4 ft depth will be exceeded only where trench observations can be made without personnel entering the trenches. If personnel entry is required for selected trenches, trench sides will be stepped to conform with Occupational Safety and Health Administration requirements.

An archaeologist will monitor the excavation of each backhoe trench. Any functionally or temporally diagnostic artifacts will be opportunistically collected from trench backdirt as they are observed. After excavation, loose and smeared soil will be cleared from the trench walls with hand tools, and all trenches will be closely examined for cultural deposits or features, depositional facies boundaries, and evidence of soil horizons. The stratigraphic character and cultural content of each backhoe trench will be documented on a standardized excavation form. Artifacts found in situ in trench walls may be point-provenienced. Horizontal provenience of trenches will be maintained at each site by assigning each trench a unique number and recording trench locations on the site map.

Mechanical scraping will be employed when hand excavation fails to encounter intact features or cultural deposits. Scraping will also be used to remove noncultural overburden from above cultural deposits or explore for horizontally extensive cultural deposits or features. Mechanical scraping may be accomplished with a wide, smooth-edged bucket or scraping blade. Soil will be removed in 5 to 10 cm thick layers to minimize disturbance or displacement of features, deposits, or artifact concentrations that may be exposed. An archaeologist will monitor and direct all scraping activities with the goal of identifying and exposing use-surfaces, features, or stratigraphic breaks as the scraping proceeds.

Recovery of Cultural Materials

Most artifacts will be recovered in two ways: visual inspection of levels as they are excavated, and screening though variable-sized mesh. Other materials may be collected as bulk samples that can be processed in the laboratory rather than the field. Regardless of how cultural materials are collected, they will all be inventoried and recorded in the same way. Collected materials will be assigned a field specimen (FS) number which will be listed in a catalog and recorded on all related excavation forms and bags of artifacts. FS numbers will be tied to proveniences, so that all materials collected from the same horizontal and vertical provenience units will receive the same FS number. The FS number will be the primary tool that will maintain the relationship between recovered materials and associated spatial information. FS designations will be maintained from excavation through analysis and curation.

Most artifacts will be recovered by systematically screening soil and sediment removed from excavation units. All soil and sediment from exploratory grids and features will be passed through screens. Two sizes of screen, 1/4-inch mesh and 1/8-inch mesh, will be used routinely. Mesh finer than 1/8 inch will be used when a specific target material has been identified (such as seed beads). While many artifacts are usually large enough to be recovered by 1/4-inch mesh, some such as smaller biface flakes are too small to be retrieved in a 1/4-inch screen (Carmichael and Franklin 1997). These artifacts can provide important clues about the activities that occurred at a site. However, there is a trade-off in gaining this additional information. As the size of mesh decreases, the amount of time required to screen soil and sediment to recover artifacts increases. Sampling is a way to balance these concerns; and coarser mesh will be used when the expectations for the interpretive value of small artifacts is low (such as when there is no temporal control for the context of the items, or when there are no feature associations that would support functional interpretation). However, the presence of small artifacts provides some information, and even in large, open excavations without evidence of features, 1/8-inch mesh will be used on at least 25 percent of 1 by 1 m grid units in a systematic pattern. Higher proportions of 1/8-inch screening can be instituted at the discretion of the site supervisor. Once feature limits have been defined, 1/8-inch screen will be used for exterior units within 2 m of the feature perimeter. However, as a minimum, all sediments within features (such as hearths and ash pits) will be screened through 1/8-inch mesh, as will all soil and sediment at floor or living-surface contacts.

At any point where artifact recovery becomes redundant and inefficient in terms of achieving the goals of the research questions, the project director can request consultation and concurrence from HPD staff to reduce the level of screening precision from the standards set forth in this plan.

Other cultural materials, such as macrobotanical samples, will be recovered from bulk soil or sediment samples. In general, samples for flotation analysis will be collected from culturally deposited strata and features. Where adequate material is available within a provenience, samples should contain at least 2 liters of soil. Macrobotanical materials such as corncobs, acorn caps, wood samples for identification, and charcoal will be collected as individual samples whenever found. All botanical samples will be cataloged separately and noted on pertinent excavation forms.

Specific Field Methods: Features, Structures, and Extramural Areas

Most excavation will be accomplished with hand tools. Methods of excavation will vary depending upon whether a feature, structure, or extramural area is being examined.

Features

Features are horizontally (and usually discretely) bounded cultural deposits and will constitute individual horizontal provenience units. Features will be assigned sequential numbers as they are encountered at a site. Feature numbers will be recorded on a feature log. Feature information will be recorded on a feature form describing in detail shape, content, use-history, construction, and inferred function. All features will be photographed with 35 mm black-and-white film, documenting the excavation process. Other photographs, including 35 mm color slides and digital images showing construction or excavation details, will be taken at the discretion of the excavator.

After defining the horizontal extent of a feature, small features (less than 2 sq m) will be bisected. One-half of the feature will be excavated in one or more 10 cm levels, and fill will be screened through 1/8-inch mesh. A scaled profile of internal strata will be drawn. The second half of the feature will be removed by internal strata. Flotation and pollen samples will be recovered from each stratum, and remaining fill will also be screened through 1/8-inch mesh. After all the fill has been removed, a second cross section, perpendicular to the original profile, will be drawn illustrating the feature's vertical form. In addition, a scale plan of the feature showing the grid location, size, and location of profile lines will be drawn.

Intermediate size features (between 2 and 4 sq m) may be bisected (as in small features) or may be further subdivided into quadrants or 1 by 1 m grids at the discretion of the site supervisor.

Large Features or Structures

Excavation of large features or structures (greater than 4 sq m) differs from small-feature excavation procedures only in that additional horizontal subdivisions are required. Individual numeric designations will be assigned as part of the feature sequence within each site. Excavation will begin by removing one half of the fill or by digging an exploratory trench across the center of feature. Because of safety concerns, exploratory trenches will not exceed 1.2 m in depth without horizontal expansion to minimize the risk of trench collapse. Exploratory trenches will be excavated by grid units to provide controlled samples and cross sections of the deposits. This procedure will be repeated, perpendicular to the initial trench, to provide additional information on the filling processes. The exploratory cross section(s) or profile(s) will be mapped and the nature of the fill defined. The remaining fill will be excavated by quadrant. Quadrant boundaries will be determined by the locations of grid lines or exploratory trench(es) and may not always be the same size.

At least one quadrant, whether cultural or noncultural in nature, will be excavated by defined strata. This method will provide a sample of materials associated with these strata, allowing for a more comprehensive understanding of the filling sequence. Recognizing that quadrants are rarely equal in size, the quadrant(s) selected for sampling will usually be the largest to maximize the number of artifacts recovered from each stratum. However, a smaller quadrant may be chosen if defined strata are better represented. If a feature is filled with cultural deposits that address specific research questions, more than one quadrant may be sampled by strata.

Smaller features are often found within larger ones, especially structures. These smaller features, including architectural details, will be excavated and recorded independently while still being associated with the encompassing feature. Scaled plan and profile maps of each large feature will be drawn, detailing the locations of internal features, artifacts found in direct contact with surfaces, and any other details considered important. A series of 35 mm black-and-white photographs and digital photos will be taken for each large feature or structure showing its overall form, construction details, and the relationship of internal features with any architectural elements. In addition, photographs may be taken during excavation when warranted, and 35 mm color slides may be taken at the discretion of the site supervisor.

Midden deposits will be considered large features. If subsurface midden deposits are encountered by exploratory excavations, overburden will be removed by hand or mechanical equipment to expose the feature limit. Once the midden extent is known, a trench consisting of contiguous 1 by 1 m units will be excavated across two axes. Perpendicular stratigraphic profiles will be recorded. If internal features are present, excavation units will be expanded to define them. These features will then be excavated as outlined above. If the site supervisor believes that information recovery is complete and that artifact recovery has become redundant (in terms of the research questions) within a given midden excavation, a sampling justification will be prepared and submitted to with HPD staff for consultation and concurrence.

Extramural Excavation Areas

Areas outside structures or around thermal features were often used as work areas. These areas will be examined to determine whether work areas can be defined. Excavation in these zones will proceed by grid unit. Soil and sediment encountered within 2 m of recognized features will be screened through 1/8-inch mesh. Similarly, if exploratory trenches across targeted extramural areas reveal stratigraphic expressions of surfaces or surface zones, those surfaces or strata will be excavated with the higher precision recovery of 1/8-inch mesh. Plans of each extramural area investigated will be drawn, detailing the excavation limits and locations of any features.

Sensitive Materials

At this time, the only special situations we can prepare for are human burials, but few burials are expected given the primarily transient nature of the sites. If human burials are encountered, consultations will be initiated with BLM and NMDOT personnel upon the initial recognition of fragmentary or articulated human remains. Following approval to proceed, human remains will be excavated using standard archaeological techniques, including definition of the burial pit, use of hand tools to expose skeletal materials, mapping and photographing the positions of the skeleton and grave goods, and the collection of appropriate nonosteological samples.

While human remains or other sensitive materials are being excavated, no person will be allowed to handle or photograph them except as part of data recovery and repatriation efforts. Photographs of sensitive materials related to data recovery efforts will not be released to the media or general public.

Unanticipated Discoveries

There is always a risk of finding unanticipated deposits or features during an archaeological excavation. This is especially true of the project outlined in this plan, since it is based solely on survey observations. Procedures that will be followed in the event of an unanticipated discovery will vary with the nature and extent of the find. Small features, structures, or cultural deposits that were not anticipated will be excavated according to the procedures outlined above. On the other hand, finds that have the potential to significantly alter the scope and intent of this plan will be investigated after consultation with the NMDOT, HPD, BLM, and any tribes that request to be part of the consultation process.

LA 129214

A piece of aqua bottle glass with what appears to be intentional retouch along one edge suggests a historic period Native American component at LA 129214 (Turnbow et al. 2000). It was found in Feature 32, on the edge of the project limits. According to recent information, the manufacture of aqua glass started around 1880 (Polk and Phillips 2005), when the need to view and identify the actual contents of bottles became desirable because the adhesion of labels was still not perfected (G. Martinez, pers. comm., 2006). Although the technological linkage between the retouched glass and a Native American historic component seems to be strong, the dating of the aqua glass is imperfectly consistent with that conclusion. By the mid- to late 1880s, all but a few Native Americans had been placed on reservations. If the temporal and cultural association proves to be correct, it will be one of only a handful of probable Apache components documented from the region (such as the Rocky Arroyo West site, north of Carlsbad [Wiseman 2003]).

If a historic Native American component is present at LA 129214, it will be studied with the same approach as the Archaic and Neo-Archaic components. The basic research themes of establishing chronology, finding and documenting structures and other features, definition of activities and subsistence system, and interpretation of the results in a regional perspective will be undertaken with the same degree of thoroughness as the prehistoric components.

LA 129220

The beginning of the recent historic period of Euromerican movement into and use of what we now call the lower Pecos Valley and environs of southeastern New Mexico started in earnest in 1865, immediately after the American Civil War (Sebastian and Larralde 1989). In 1866 large herds of cattle were driven into the region from Texas. They were rested and fed before being moved northward to the Bosque Redondo reservation for the Navajos and Mescaleros, to the mines and settlements in Colorado, and later to railheads for shipment to the east. During this time, large tracts of land were claimed by Texas cattlemen who established large cattle ranching enterprises to supply and further develop the markets started in the mid 1850s and 1860s.

Although the period of the very large ranches came to an end in the late 1880s, both cattle and sheep ranching continued as smaller operations that have continued throughout the region to this day (Sebastian and Larralde 1989; Katz and Katz 1985b). The structures and features of LA 129220, a mid-twentieth-century site, belonged to one of these operations.

To our knowledge, no recent historic ranching properties in southeastern New Mexico and dating to the mid-twentieth century have been investigated beyond basic field recording at the survey level and through investigation of various written sources. In both respects, much more can be done to document LA 129220. The site features (stock pens, pipes, fallen windmill stand, water tanks, etc.) need to be more thoroughly inventoried, measured, described, and photographed. Archival research is needed to document the history of site use, land ownership through time, and the overall ranching operation of which this site was a part. A variety of archival sources (homestead deeds if applicable, ownership deeds, local histories, etc.) should be consulted, and long-time residents and other knowledgeable persons should be interviewed.

Data Recovery Strategies for LA 113042, LA 129214, LA 129216, LA 129217, LA 129218, LA 129220, LA 129222, AND LA 129300

Our current knowledge of the sites is limited to observations of surface materials, some of which may have been exposed by construction activities and erosion, and limited shovel and trowel testing performed by TRC in 2000. Consequently, data recovery excavations at the sites will proceed in phases oriented toward assessing the nature, depth, and extent of deposits at each site, and toward recovering data from the components represented at each site. Table 23 summarizes the number of features identified and the area within current project limits of each of the sites.

Table 23. Area, features, and sampling strata within the project limits

Site	Area within Project (sq m)	Number of Features within Project	Area of Strata within Project Limits Stratum 1 (sq m)	Stratum 2 (sq m)	Stratum 3 (sq m)
LA 113042	37047	4	4975	16224	5885
LA 129214	16174	17	4918	2557	9470
LA 129216	1789	0	0	1258	531
LA 129217	5975	4	548	0	5427
LA 129218	6384	6	632	0	5752
LA 129220	5251	1	0	0	0
LA 129222	6353	0	0	0	6353
LA 129300	7700	3	495	4076	2103
Total	86673	35	11568	24115	35521

General Sampling Strategy

Areas defined as sites are in several cases very large, as are portions of the sites within the project limits. It is not possible to completely excavate areas this large, and the following sampling strategy will be implemented to maximize cultural data recovery and supplement it with geomorphological observations to establish environmental context. In all phases of excavation, it is critical that the field personnel have flexibility to adapt levels of coverage to the sites as they become better understood and defined. The procedures outlined here are designed to examine and record areas of high likelihood of cultural remains and to provide high probabilities of detecting features not apparent from the surface. These sampling strata will be addressed in order at each site. Not all sites contain all three strata.

Stratum 1

Large areas of five sites have been exposed, showing wholly or partially articulated features and artifact concentrations suggesting that intact features and surface artifact distributions are present. Excavation will include a feature-focused strategy to include 1/8-inch screening of both the feature and a continuous area of at least 2 m outside the perimeter of the feature. Excavation will also include a surface-focused strategy based on sampling, with expansion where additional features are encountered. *At least* 40 percent of Stratum 1 areas will be subjected to hand excavation. Backhoe trenching and blading will follow, with hand excavation expansions from any discovered features. We will follow surfaces under any immediately adjacent overburden or dune areas (into Stratum 3 areas) to define the relationships between the overburden and the cultural deposits prior to initiating Stratum 3 investigations.

Stratum 2

Areas with good surface visibility in which cultural evidence is sparse or clearly disturbed will be sampled on a surface-focused basis. Hand-excavated grid units will be placed judiciously to explore specific cultural and depositional settings within the stratum, covering *at least* 4 percent of the stratum (equivalent to a single 1 by 1 m unit in each 5 by 5 m area of the stratum). All isolated units will be screened through 1/8-inch mesh, while the site supervisor may elect to use 1/4-inch mesh for contiguous units as long as at least 25 percent of the contiguous units are screened through 1/8-inch mesh. Any features or surfaces encountered by these test units will be excavated by procedures outlined for Stratum 1. In areas of Stratum 2 where features or surfaces are not encountered, backhoe trenches will be judiciously placed, with a density of *at least* one per 20 m of the maximum dimension of the area. Any cultural evidence exposed by the trenches will be pursued consistent with Stratum 1 procedures, after the mechanical removal of overburden. The final phase of investigation in Stratum 2 areas will be surface blading to expose large areas quickly. Any features will be investigated as indicated for Stratum 1.

Stratum 3

Areas with substantial dune accumulation or road construction fill will be investigated with a trenching strategy to determine the presence and nature of cultural deposits, features, or surfaces. In most cases, these procedures will be initiated after adjacent Strata 1 and 2 investigations have been completed, since extensive use of heavy equipment in this phase will be deleterious to the integrity of other site areas. Initial trenches will be placed judiciously through the overburden material to provide profiles for the observation of both cultural stratigraphy and geomorphology. Trench location and length will be determined by the nature and extent of the overburden (rather than the more systematic placement of Stratum 2 trenches), with spacing equivalent to one trench per 20 m of the longest dimension of the stratum. Features or surfaces exposed within the dune overburden will initiate feature- or surface-focused excavation strategies. After the nature and depth of the overburden is understood from the trenches, and after included cultural features or surfaces are excavated, heavy equipment will be used to remove the overburden to a depth immediately above any basal cultural surfaces as defined within the trenches and at the margins of adjacent Stratum 1 or 2 excavations. Any features or surfaces encountered will be investigated by invoking feature- or surface-focused strategies as described for Stratum 1. Additional mechanical scraping will proceed as the penultimate investigative tactic, as described for Stratum 2. Any features noted during these mechanical investigations will be subject to hand excavation. Final mechanical trenching will evaluate the possibility of addition buried features or cultural deposits.

Individual Site Investigation Plans

The following plans are examples of how the data recovery might proceed at the sites, given their individual characteristics, the research goals of the project, and the basic procedures that have been proposed to achieve those goals. Field personnel will make the final decisions concerning implementation of this data recovery plan, consulting with NMDOT, BLM, and HPD staff if the decisions could be construed as a departure from the general principals and procedures outlined above.

LA 113042

Temporally diagnostic artifacts indicate that Archaic and Formative period components are present. Prehistoric surface artifacts are most visible and abundant in deflated or blowout areas that cover the site area. Cultural deposits are expected to be of mixed age and will be found at variable though mostly shallow depth. Apart from dune overburden, localized deposits at least 0.5 m deep are known to exist because of prior disturbance. A total of 37,047 sq m of the total site area of 109,111 sq m are within the project limits. The project limits overlap two discontinuous areas of the site, one defined by the new highway, where construction activities will take place, and one where the old right-of-way will be removed and the easement will be rehabilitated. Relatively few recorded features are within the project limits, and they are mostly smaller concentrations of burned caliche, although one extensive area of burned caliche is present. Dune development within the project limits is sufficient to make considerable sand removal necessary. The site area as originally defined by TRC extended across the gas pipeline at the east end of the present site boundary, and that area will be examined during surface collection to confirm the accuracy of the present boundary location.

We expect that surface characterization within the project limits will define four discontinuous Stratum 1 areas, totaling about 5,000 sq m (Fig. 23). Three of these areas include defined features, while one may include a feature. Four larger areas are defined as Stratum 2, encompassing about 16,000 sq m. This area includes portions of the existing right-of-way that were cut during original road construction. Two areas that are defined as Stratum 3 within the proposed road alignment, about 5,900 sq m, are covered by dunes.

Site treatment sequence:

1. Establish site grid and main datums. The TRC datum is in place, but UTM location needs to be verified.

2. Systematic surface characterization within the project limits. This consists of 100-percent artifact collection employing an electronic total station for point-proveniencing in low-density areas and 2 by 2 m collection units in higher-density areas. Surface occurrences of burned rock and burned caliche will be mapped and quantified. Site boundaries will be redefined following this stage, if warranted.

3. The site surface will be divided into the three treatment strata based on surface distributions of artifacts, burned caliche and rock, and topography.

4. Feature and surface-focused excavations will be initiated within the four Stratum 1 areas. In addition to the features and their surrounding surfaces, trenches of contiguous 1 by 1 m units will be placed across the areas away from the surface-visible features. Additional isolated units will be placed judiciously to document spatial variability and discover the nature of subsurface deposits away from features. Excavation units will be placed at the transitions between Stratum 1 and Strata 2 and 3 deposits to help guide later decisions concerning overburden removal and correlations between any cultural strata within the dunes and the apparently deflated deposits that dominate Stratum 1.

5. Stratum 1 areas will be investigated by judiciously placed excavation units and exploratory trenches along with focused excavations around surface-defined features.

6. If additional subsurface-defined features or artifact concentrations are identified in the initial investigations of Stratum 1, then excavations will follow the intensive strategy described below.

7. Features or deposits will be intensively excavated. Hand excavation will be expanded from test units or exploratory trenches to define features or define the extent and depth of artifact distributions or cultural deposits. Excavations around features will be expanded to expose associated surfaces, features, or deposits.

8. Features, including structures, will be excavated using hand techniques and fully documented.

9. Four percent of the area where subsurface deposits are less likely (Stratum 2) will be sampled using 1 by 1 m units placed judiciously in individual areas of the stratum. Shovel tests, backhoe trenching, and mechanical scraping will be used to confirm the extent of negative results from these test units.

10. If subsurface cultural materials, features, or deposits are encountered in Stratum 2, the areas will be investigated using Stratum 1 procedures. Excavations will be expanded and will follow the intensive strategies for features and surfaces.

11. The site map will be continuously annotated to show excavation areas and features or the extent of the cultural deposit.

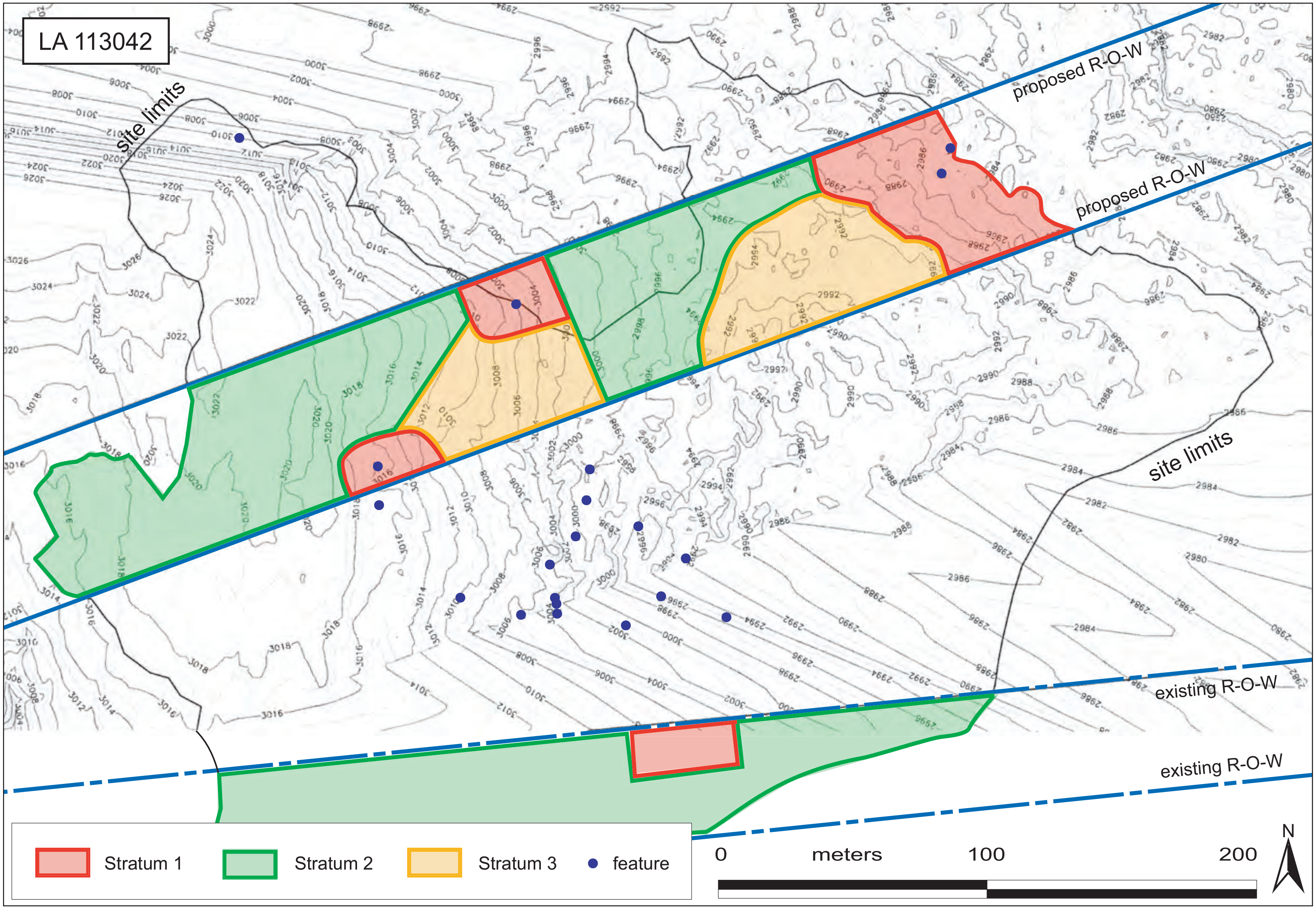

Figure 23. Data recovery strategy, LA 113042.

12. Once hand excavation and documentation of artifacts, features, or cultural deposits has been completed in adjacent Stratum 1 and 2 areas, mechanical equipment will be used to trench through areas of overburden (Stratum 3). The trenches will be documented for cultural and geomorphological information.

13. If cultural features or deposits are encountered, the Stratum 1 procedures will be invoked. Mechanical equipment may be used to remove noncultural material–bearing overburden to advance the hand-excavation effort. Following completion of hand excavation of any cultural materials within the overburden layer, the overburden will be removed. Additional mechanical trenching and scraping will confirm the absence of cultural features. If features are encountered, they will be excavated per Stratum 1 procedures.

14. Final site mapping will be conducted.

LA 129214

This multicomponent site has evidence of Archaic through Formative occupations, including a possible historic Native American component. Large quantities of cultural material are visible in blowouts between dunes over a large area, and a number of features are indicated. Intact, subsurface deposits are likely, and large collections of artifacts may be anticipated, since over 16,000 sq m of the site as currently defined are within the project limits. The combination of a very high density of cultural material in exposed areas and a high proportion of dune coverage makes this site a candidate for requiring the most work of any on the project. In addition to the identified features, we observed continuing burned caliche and some artifacts along the base of the existing highway prism extending east toward LA 113042 within the old right-of-way. Surface recording along this portion of the site boundary may extend the site area further during the early stages of data recovery operations.

The majority of the site area within the project limits falls tentatively within the definitions of Stratum 1 or 3 (Fig. 24). Four discontinuous areas of Stratum 1 are within the project area (about 4,900 sq m). A long, narrow area lies to the south of the present highway alignment, and two slightly smaller circular areas lie in blowouts to the east along the planned alignment. A much larger area (about 2,850 m), surrounding a dune, occupies most of the northwestern quarter of the project limits. Two areas of Stratum 2 are defined, one at the southwestern corner of the project area, and one at the northeastern corner (about 2,560 sq m). Both areas are adjacent to areas of Stratum 1. Areas of high dunes or the existing highway grade cover the remainder of the site (about 9,470 sq m).

Site treatment sequence:

1. Establish site grid and main datums.

2. Conduct systematic surface artifact collection and characterization within project limits. Artifacts will be point-provenienced in low-density areas within 2 by 2 m collection units in areas of moderate density areas, and within 1 by 1 m collection units in the areas of highest artifact density within Stratum 1.

3. Formal strata definitions will be refined based on the surface information.

4. Feature- and surface-focused excavations will be initiated within the four Stratum 1 areas. In addition to the features and their surrounding surfaces, trenches of contiguous 1 by 1 m units will be placed across the areas away from the surface-visible features. Additional isolated units will be placed judiciously to document spatial variability and discover the nature of subsurface deposits away from features. Excavation units will be placed at the transitions between Stratum 1 and Stratum 3 deposits to help guide later decisions concerning overburden removal and correlations between any cultural strata within the dunes and the apparently deflated deposits that dominate Stratum 1.

5. Any subsurface features or cultural deposits detected away from the surface-visible features will be excavated by expansions of the trenches or isolated units. We expect that considerably more than 40 percent of the surface of the Stratum 1 areas will be excavated at this site (more than 1,970 sq m).

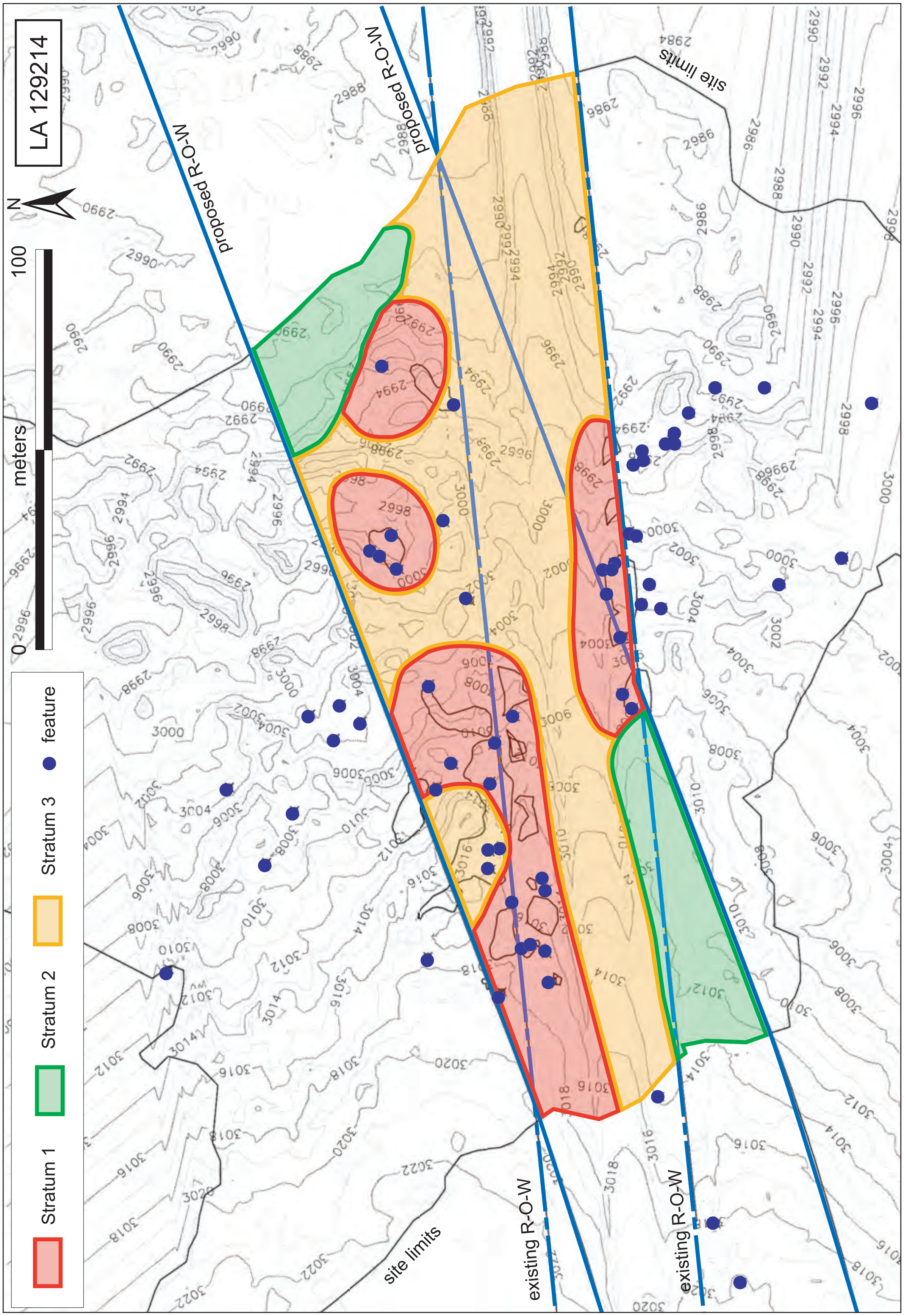

Figure 24. Data recovery strategy, LA 129214.

6. The two Stratum 2 areas are contiguous with Stratum 1 areas. Judicious placement of test units within these areas will be guided by the experience gained in the adjacent higher-density areas. At least 4 percent of the area will be sampled (at least 103 sq m). Any discoveries of intact features or cultural deposits will result in expansions of the excavation units, following Stratum 1 protocols.

7. Backhoe trenching and mechanical scraping of Stratum 1 and contiguous Stratum 2 areas will be carried out at the conclusion of hand excavations. Backhoe trenches will be placed judiciously, with an average density of at least one trench per 20 m of linear dimension. South of the existing highway, backhoe trenches will be placed parallel to the length of the right-of-way. Features and cultural deposits detected in the backhoe trenches will be documented, and hand excavation of features and adjacent surfaces will be pursued. The trenches will also provide information on site geomorphology.

8. Backhoe trenches will be carried into the adjacent dune areas of Stratum 3. Trenches will be placed judiciously, aligned to provide stratigraphic exposures through dune areas for both geomorphologic and archaeological observations. Trench density will be equivalent to one trench per 20 m of linear dimension.

9. Features or cultural deposits encountered within the dune overburden will be excavated per Stratum 1 protocol, with the ancillary goal of setting a lower bound definition for massive dune removal.

10. Any features, surfaces, or other cultural deposits that had been defined by Stratum 1 excavations and that had continued underneath the overburden of Stratum 3 would be followed into the Stratum 3 areas. We anticipate that more than 4 percent of Stratum 3 ultimately will be subject to hand excavation.

11. Upon the completion of the hand excavation sample within Stratum 3, mechanical equipment will be used to systematically trench the areas, extending geomorphic observations downward and serving to discover any additional features or surfaces. Any such discoveries will be subject to hand excavation.

12. Following trenching, and guided by stratigraphic observations, remaining unexcavated areas of Stratum 3 will mechanically scraped, and any identified features will be excavated.

13. Final site mapping will be conducted.

LA 129216

About 16 percent of the site area (about 1,790 sq m) falls within the project limits, within a strip that is less than 15 m wide and 170 m long. Visible features are outside the project limits, although two burned caliche concentrations are within 10 m of the project boundary. A single arrow point is evidence of a Formative period occupation of the site, although the combination of burned caliche and the lack of pottery suggest that pre-Formative components may also be present or dominant. The surface manifestation of this site was considered inconclusive in terms of determining whether the site was eligible for inclusion in the NRHP.

The site is in a dune area, although the dunes at this site are not as high as in many of the sites to the east (this is the westernmost site in the project area). None of the site surface within the project limits qualifies as Stratum 1. A large area at the west end (about 1,250 sq m) and a smaller area on the east end (about 110 sq m) fall within the definition of Stratum 2 (Fig. 25). A small intermediate portion of the site (about 530 sq m) is covered by dunes and is defined as Stratum 3.

Site treatment sequence:

1. Establish site grid and main datums.

2. Conduct systematic surface artifact collection and surface characterization within project limits. Artifacts will be point-provenienced over most of the site surface, using 2 by 2 m grids only if any areas of high artifact density are discovered.

3. Formal strata definitions will be made based on the surface information.

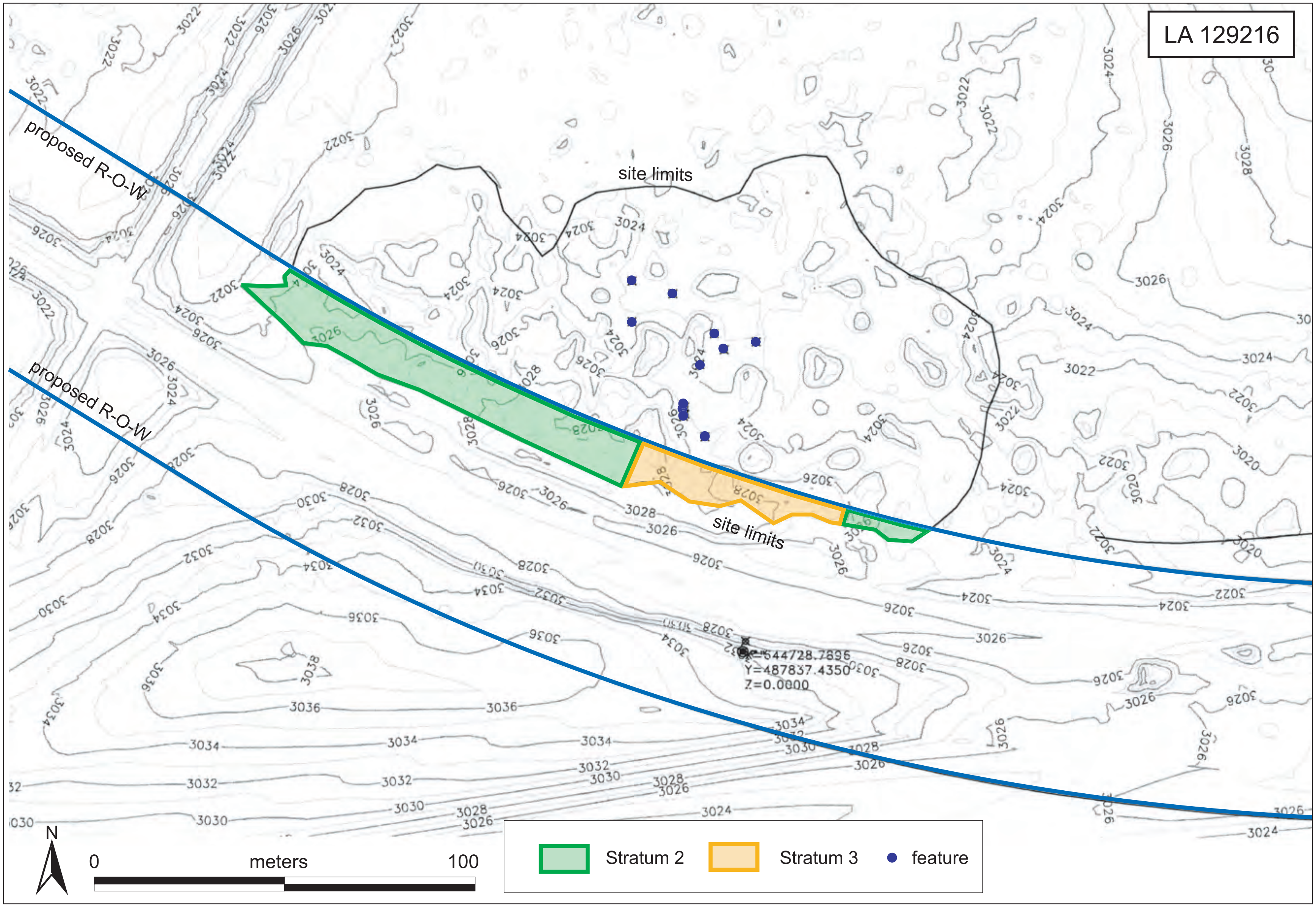

Figure 25. Data recovery strategy, LA 126216.

4. At least 4 percent of the area where subsurface deposits are not expected (Stratum 2) will be sampled using 1 by 1 m units placed judiciously within the stratum.

5. If subsurface cultural materials, features, or deposits are encountered in Stratum 2, the areas will be expanded with hand excavation. Excavation protocols will follow the intensive strategies for features and surfaces.

6. Backhoe trenching will take place parallel to the length of the highway and adjacent to the edge of the project limits. The trenches will be carried through the areas of Stratum 2 and into the area of Stratum 3 to establish the relationship between the dune field and the adjacent portions of the site.

7. Backhoe trenches will be placed within the dune field (Stratum 3) to establish geomorphic profiles and to look for internal cultural features or deposits. Two site features lie within 10 m of the project boundary adjacent to Stratum 3 deposits, and that area will be examined closely.

8. Any features or cultural deposits encountered within the dune overburden will be excavated by hand.

9. Using stratigraphic profiles and any information from hand excavation as a guide, the dune overburden material will be removed from the Stratum 3 area. If features or cultural deposits are encountered, they will be excavated per Stratum 1 procedures.

10. Upon the completion of the hand-excavation sample within Stratum 3, mechanical equipment will be used to systematically trench the areas, extending geomorphic observations downward and serving to discover any additional features or surfaces. Any such discoveries will be subject to hand excavation.

11. Following trenching, and guided by stratigraphic observations, remaining unexcavated areas of the site within the project limits will be mechanically scraped, and any identified features will be excavated.

12. Final site mapping will be conducted.

LA 129217 and LA 129218

LA 129217 and LA 129218 are adjacent to each other in the same geomorphic setting. Their partition is more administrative than substantive. They will be maintained as distinct administrative units, but their excavation will be carried out in tandem for the sake of efficiency and comparability.

Both sites within the project limits consist of dunes and the existing highway right-of-way cutting through those dunes. Both sites exhibit features of burned caliche scatters within blowouts, with light artifact scatters and projectile point styles suggesting Archaic occupations. Intact cultural features were documented for LA 129218, and it is considered eligible for inclusion in the NRHP. Surface observations of LA 129217 were considered inconclusive for determination of NRHP eligibility.

The entire site area of both sites is covered by large dunes, and all could logically be considered Stratum 3. However, there are some areas with concentrated features, and these have been placed in Stratum 1 so that they can be investigated during the first phase of excavation (Fig. 26). This will prevent the features from being damaged during subsequent sand removal and provide insight into the depth and nature of cultural materials and surfaces. The remainder of the sites within the project limits is Stratum 3. It includes a portion under the existing NM 128 pavement, which will be rehabilitated. The project boundary on the northeast side is therefore determined by the location of the existing right-of-way fence. The site portions placed in Stratum 3 will require extensive sand removal and monitoring for features. The Stratum 1 excavations will serve as guides to the nature and depth of occupation surfaces, as will the excavations at LA 129218.

Site treatment sequence:

1. Establish an encompassing grid and datum system for both sites.

2. Conduct systematic surface artifact collection and surface characterization within the project limits. Artifacts will be point-provenienced over

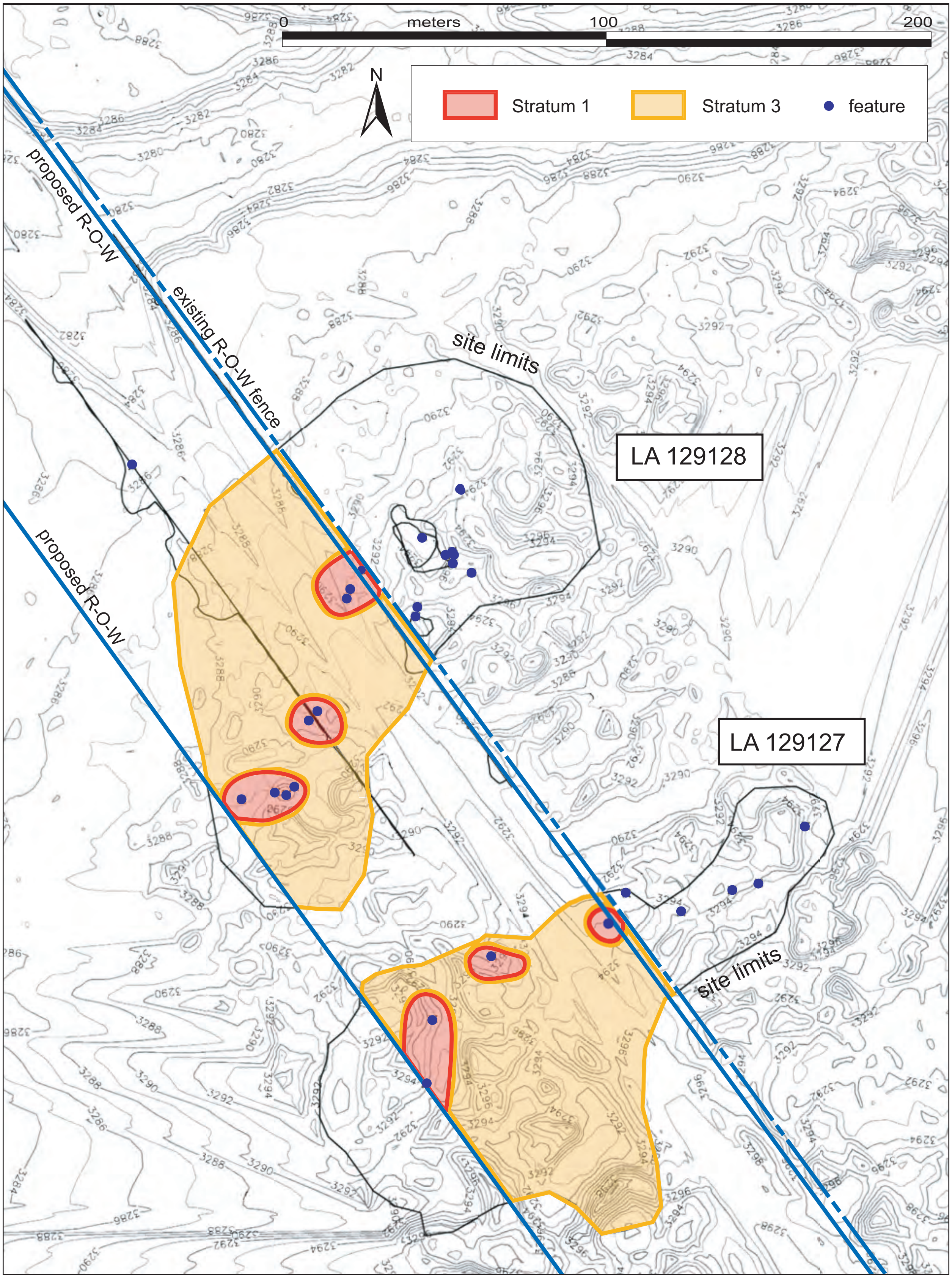

Figure 26. Data recovery strategy, LA 129217 and LA 129218.

most of the site surface, using 2 by 2 m grids where areas of high artifact density are encountered.

3. Site administrative boundaries will be set, and the stratum definition will be formally confirmed or modified based on the surface information.

4. Burned caliche scatters within the dune blowout areas will be subjected to hand test excavation using individual and contiguous trenches of 1 by 1 m grid units. The excavations will be considered tests to determine the extent and integrity of cultural deposits in the blowouts. If intact features or cultural deposits are present within the burned caliche scatters, they will be subject to intensive feature- and surface-focused hand excavation.

5. Backhoe trenches will be placed judiciously through dunes, creating geomorphic and archaeological profiles that connect with blowout areas that were subject to hand investigation. The profiles will be examined and described, including their articulations with observations from adjacent hand-excavated areas. Trench density will be at least one trench per 20 m of linear site dimension, but trench location and orientation will be determined by the dune configuration, locations of burned caliche concentrations, and geomorphic data needs.

6. Any features or cultural deposits noted in trenches will be subjected to hand excavation, with selective mechanical removal of dune overburden., if warranted.

7. Guided by information gained from the trenching and hand excavations, dune overburden will be removed to facilitate excavation of underlying deposits.

8. Any features or cultural deposits encountered will be hand excavated using either feature- or surface-focused strategies.

9. Backhoe trenching will be carried out to extend geomorphic observations downward and to serve as an additional discovery opportunity. Trenches will be placed judiciously, achieving an approximate density of one per 20 m of linear site dimension.

10. Any features or cultural deposits identified in trench profiles will be subject to hand excavation as expansions from trench exposures. Mechanical equipment may be used to remove overlying deposits if they are determined to be noncultural.

11. Mechanical scraping of the untrenched site areas will be used as a final discovery tactic, followed by hand excavation of any features that are discovered.

12. Final site mapping will be conducted.

LA 129220

This mid-twentieth century historic site is on New Mexico state trust land. It is a nonresidential ranching complex, and only the portion of the site within the project limits is a corral with railroad tie posts. As part of this project, the site will be investigated through archival research and surficial recording only. The site has been thoroughly recorded by TRC (Turnbow et al. 2000), and that record will be field checked and augmented. No excavation will be conducted.

LA 129222

LA 129222 consists of three burned caliche concentrations (features) and a light scatter of burned caliche and artifacts. The site lacks dunes and is characterized by stunted vegetation. A single Chupadero Black-on-white sherd suggests a late Formative component. The margins of the site overlap the limits of the new and the old highway alignments, and the features lie between the rights-of-way, outside the project limits. The portions of the site within the project area qualify as Stratum 2 and cover more than 6,300 sq m (Fig. 27).

Site treatment sequence:

1. Establish a grid and datum system for both areas of the site.

2. Conduct systematic surface artifact collection and surface characterization within the project limit portions. Artifacts will be point-prove-

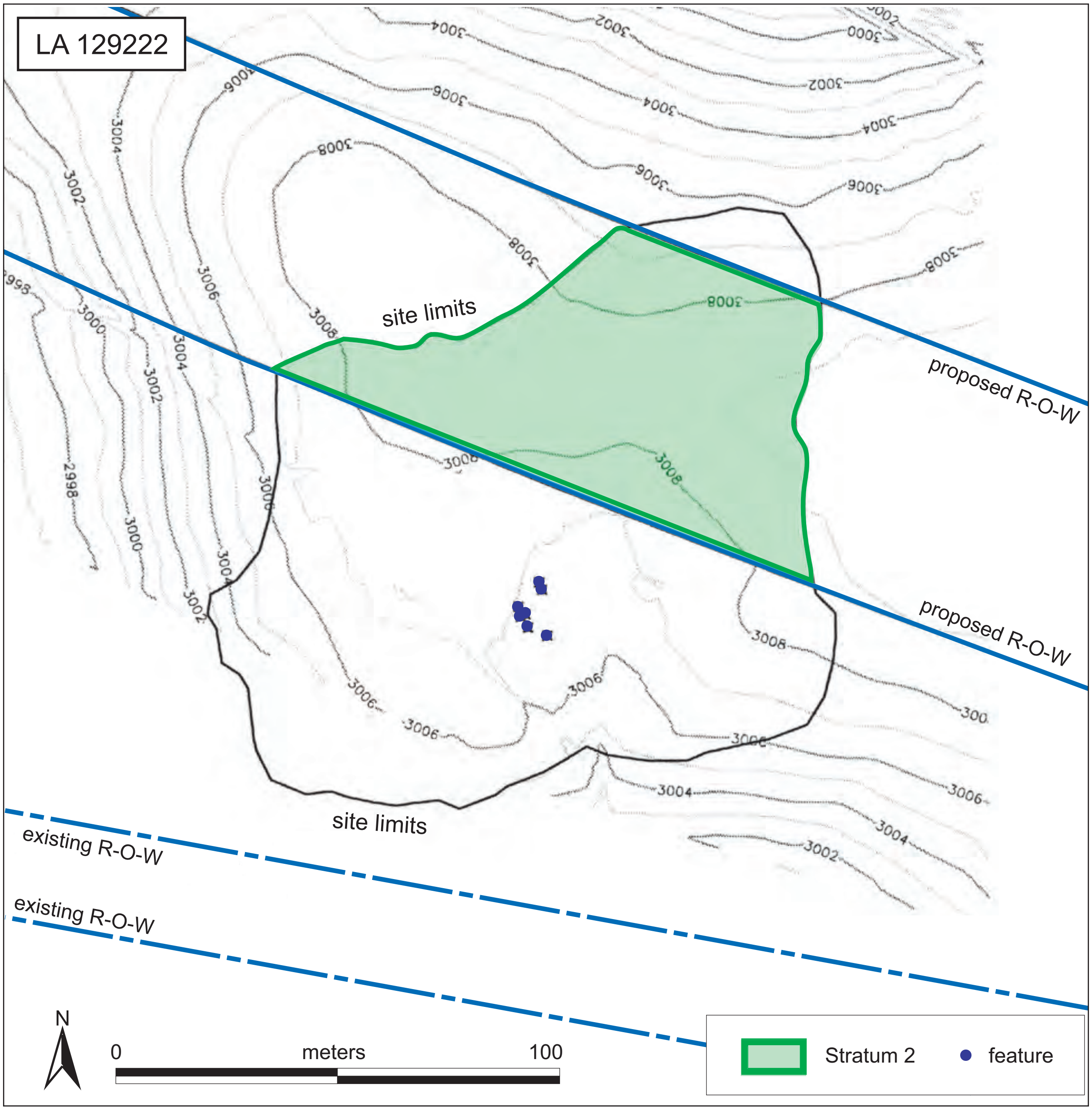

Figure 27. Data recovery strategy, LA 129222.

nienced over most of the site surface, using 2 by 2 m grids only where areas of high artifact density are encountered.

3. The stratum definition will be formally confirmed or modified based on the surface information. Areas within the existing right-of-way that have been cut and that lack surficial evidence of cultural materials will be excluded from the definition of Stratum 2 for hand excavation, but they will be included for the purposes of mechanical investigation.

4. The Stratum 2 areas exclusive of the cut areas as defined above will be sampled with judiciously placed 1 by 1 m excavation units. At least 4 percent of the areas of Stratum 2 within the project limits will be subject to hand excavation.

5. If subsurface cultural materials, features, or deposits are encountered, excavations will be expanded and follow feature- or surface-focused strategies.

6. A single backhoe trench will be placed within the site area along the edge of the existing highway right-of-way. Multiple backhoe trenches will be placed through the site area within the project limits of the proposed right-of-way. These backhoe trenches will be judiciously placed with an approximate density of one trench per 20 m of linear site dimension within the project limits. The trench profiles will be examined for cultural and geomorphic information.

7. If features or cultural deposits are present in the trenches, they will be investigated by hand excavation using the feature- or surface- focused strategies defined for Stratum 1.

8. Mechanical scraping will be used to examine areas not investigated areas of the portions of the site within the project limits. Any features discovered during scraping will be excavated by hand.

9. Final site mapping will be conducted.

LA 129300

Late Archaic projectile point styles and Formative pottery have been noted at LA 129300, indicating the multicomponent nature of the site. Features are often well developed and diverse in nature, suggesting recurrent occupations and potential residential occupations. The strongest concentrations of surficial cultural material are associated with blowouts between dunes. Access to the site is restricted by its 1/4-mile distance from the existing highway right-of-way, an active railroad track whose grade and track bed define the north boundary of the site, and localized flooding caused by potash mine effluent that prevents access from north of the railroad line. Three features are known to exist within the project limits.

Areas around each of the three features are defined as Stratum 1, with individual areas of about 128, 128, and 239 sq m (Fig. 28). Two of these areas are bounded in whole or in part by the majority of the site area, which has a low density of cultural material and a low probability of including intact subsurface features (Stratum 2) due to shallow soils and mechanical disturbance. Stratum 2 covers 4,076 sq m of the site area within the project limits. Sand dune and sand sheet accumulation characterizes the southeastern one-third of the project area (circa 2,105 sq m), surrounding one feature and adjacent to another.

Site treatment sequence:

1. Establish a grid and datum system for the site.

2. Conduct systematic surface artifact collection and surface characterization within the project limits. Artifacts will be point-provenienced over most of the site surface, using 2 by 2 m grids only where areas of high artifact density are encountered.

3. The stratum definitions will be formalized based on the surface information.

4. The three Stratum 1 areas will be intensively excavated by hand. In addition to feature-focused excavations, judiciously placed 1 by 1 m units, including trenches composed of contiguous units, will be placed to determine the nature and extent of cultural deposits. Feature 1 is adjacent to the railroad grade cut at the north edge of the site, and the area may have been modified by

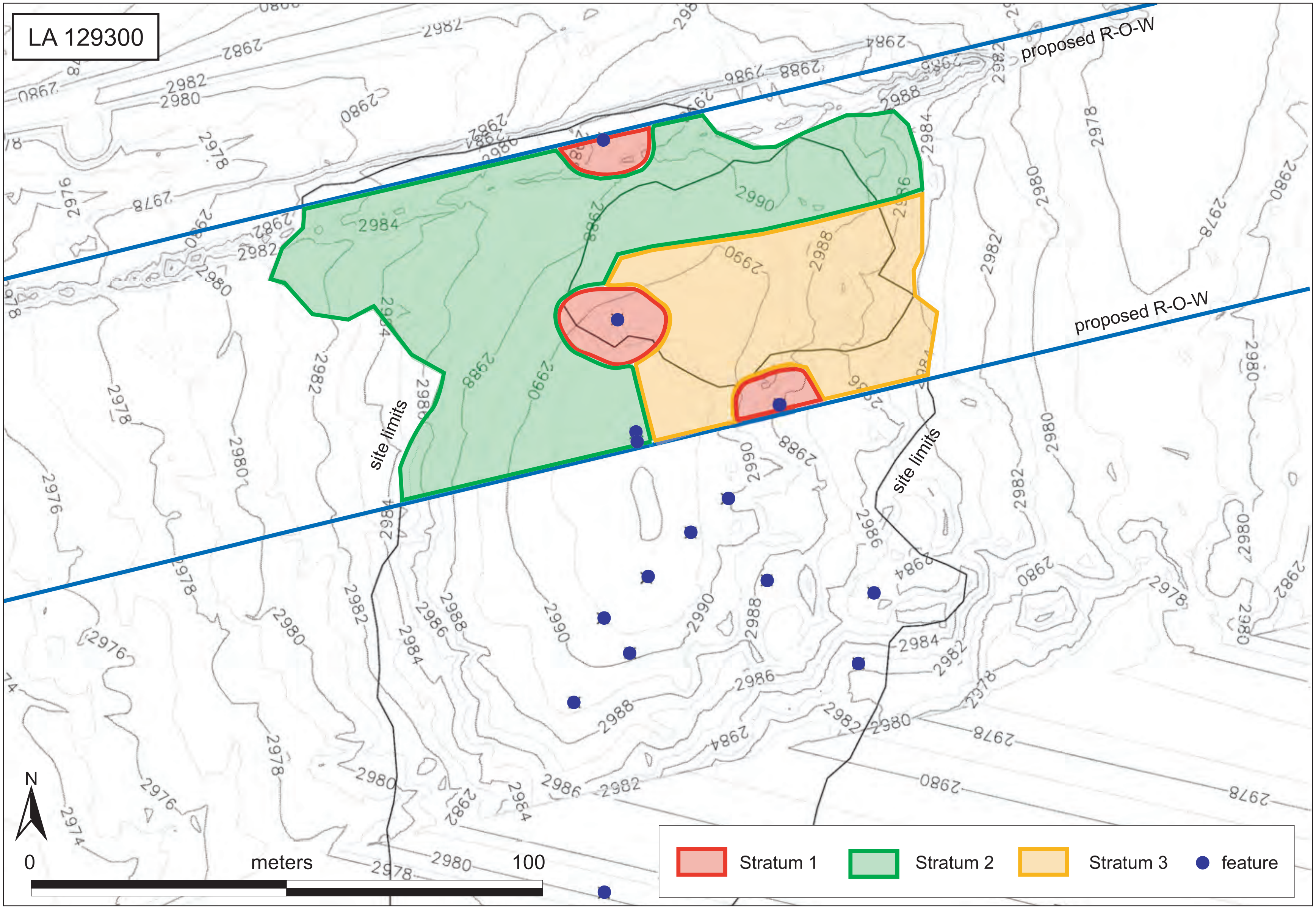

Figure 28. Data recovery strategy, LA 129300.

cutting and deposition of spoil from the grade construction. An initial goal of the Stratum 1 investigations in this area will be to assess integrity and to determine if portions of this area (and the adjacent portion of Stratum 2) should be excluded from the data recovery effort. Another goal (in addition to recovering feature- and surface-oriented data) will be to determine the nature of the interface between the three Stratum 1 areas and the adjacent areas of both sand accumulation and low cultural material density. At least 40 percent of Stratum 1 will be subject to hand excavation, but the total area defined as Stratum 1 may be reduced by the integrity assessment.

5. Stratum 2 is extensive within the project limits, but the portion adjacent to the railroad grade may subject to exclusion depending on the Stratum 1 integrity assessment around Feature 1. Investigation of Stratum 2 will be carried out with judiciously placed 1 by 1 m hand excavation units. Subsurface features or cultural deposits discovered by these excavations will be investigated by expansions with feature- or surface-focused excavations. Judicious placement will consider the need to understand the stratigraphic interfaces between Stratum 2 and adjacent areas of Strata 1 and 3 in preparation for mechanical trenching and overburden removal. At least 4 percent of Stratum 2 will be investigated by hand excavation.

6. Following the completion of hand excavation of Stratum 2, backhoe trenches will be put through the unexcavated portions of Stratum 2 and the two northern Stratum 1 areas. At least one trench will be placed along the southern boundary of the project to establish a stratigraphic context for the subsequent investigation of Stratum 3. Other backhoe trenches will be placed judiciously, with an approximate density of one trench per 20 m of linear site dimension.

7. Backhoe trenching will continue within Stratum 3, with judicious placement determined by geomorphic profile needs, surface topography, and surface distributions of cultural material. Profiles will be linked to the hand-excavated and backhoe-trench profiles for Strata 1 and 2. Any subsurface features or cultural deposits will be hand excavated.

8. The trenching in Stratum 3 will be followed by removal of sand overburden. Any features or cultural deposits will be excavated as expansions off of the initial discoveries.

9. Additional backhoe trenches may be placed to complete the exposure of geomorphic stratigraphy after the completion of hand excavation. Hand excavation will resume if any additional features or cultural deposits are encountered.

10. The final step in site excavation will be the mechanical scraping of unexcavated portions of all three strata.

11. Final site mapping will be conducted.

Additional Investigations

Geomorphic Studies

The need to establish geomorphic contexts for site interpretations may require the placement of backhoe trenches outside of site boundaries. In areas immediately adjacent to site excavations, and within the project limits, these trenches will be placed and described as a normal part of excavation activities. If trenches well outside of site boundaries are determined to be important for site or project interpretation, NMDOT and BLM (or other appropriate land management personnel) will be consulted prior to trench excavation. If trenches outside of site boundaries encounter cultural resources, excavation will stop, and NMDOT and BLM (or other appropriate land management personnel) will be consulted prior to resuming work.

Cultural Resources outside of the Project Limits

Circumstances can be envisioned where investigations might be appropriate within archaeological site boundaries but outside of the project limits.

The first of these is the mapping and collection of surface artifacts that are found outside of the project limits. The new highway alignment will open up some site areas to illegal artifact collection that were formerly afforded some degree of protection by relative inaccessibility. This is especially true of formal lithic tools and diagnostic pottery sherds. With the concurrence of BLM and NMDOT personnel, either adventitious or directed collection and mapping of those items will be carried out as part of the data recovery project.

The second is the excavation of features outside of the project limits that will either be destabilized by proposed construction activities or whose excavation will be essential to the interpretation of cultural features that have been excavated within the project limits. Such excavations will be conducted in accordance with this data recovery plan, only on BLM lands, and only after consultation with and approval by NMDOT, BLM, and HPD staff.

Analytic Framework and Procedures

Analyses of artifacts and samples collected during data recovery fieldwork are designed to serve the data needs of the research themes and questions. Analytic subsets are described by material class in the sections that follow, while this introduction provides a brief integrated description of the research topics.

Chronology is an essential focus of the analytic systems, providing the organizational framework for all other research efforts. Stylistically distinctive projectile point and ceramic styles will provide immediate feedback as they are collected during fieldwork. Confirmation and refinement of the temporal implications will be examined during laboratory analysis. Technical analysis of projectile points can contribute to arguments of style-date relevance by assessing production, use, and reuse histories, augmenting and revising interpretations based on shape (e.g., Moore 1999, 2003). Pottery types have inherent albeit variable dating information, and interpretations of assemblages, including "nondiagnostic types," are far more precise than interpretations based on individual types (Blinman 2000).

Radiocarbon samples will be analyzed for taxonomic identification and condition prior to laboratory submission to develop arguments of validity prior to receiving expected or unexpected results (Black and Ellis 1997:18–19). The sandy soils that dominate the project area are poorly suited to archaeomagnetic sample collection and analysis, but if any suitable sampling opportunities arise, samples will be collected and processed. Archaeomagnetic date interpretations depend on independent evidence of relevant dating-curve portions (Sternberg 1990; Wolfman 1990), so confident use of this dating technique will require its combination with other chronometric techniques. Experimental use of thermoluminescence dating techniques on pottery or burned caliche will be considered, but no specific plans are in place (cf. Lewis 1985).

Within the chronological framework, questions of taxonomic affiliation must be addressed with evidence of subsistence, settlement characterization, and regional interaction. A central issue is what functions are reflected by the temporally discrete components at the sites. Functional analysis of site structure, features, and all artifact categories are complementary and synergistic. Models of collecting and foraging strategies are detailed in the following sections, with heavy reliance on chipped stone analysis data. Models of local pursuit of agriculture must be contrasted with models of the exchange of agricultural foodstuffs, bringing to bear multivariate models of storage, processing tools and features, seasonality, and regional interaction. Regional interaction will be most reliably reflected in chipped stone raw material characterizations, with secondary contributions from ceramic provenance studies for Formative period occupations. The characterization of project area sites will then need to be contrasted with regional models, and it is as likely as not that taxonomic affiliation will fluctuate through time.

Questions of subsistence change that are embedded in the larger taxonomic questions above are worthy of independent study. They require strong floral and faunal data sets, both to describe subsistence mixes and strategies and to model the local and regional availability of economic resources. The ultimate contributions of geomorphological and paleoenvironmental studies (including pollen) to the environmental characterization cannot be predicted at this time, but the number and diversity of site settings suggest that significant contributions might be made to our understanding of the paleoecology of the region. Baseline studies of the productivity of contemporary shin oak communities, though not strictly archaeological, will provide important comparative data, whether or not shin oak turns out to be relevant in other than historic times.

The provenance-provenience contrast that is the basis for all ceramic studies of exchange or interaction (e.g., Blinman and Wilson 1993) underlies inferences of social interaction drawn from all material types. Initial questions of local resource availability and local production of technology need to be resolved, followed by assessments of whether "nonlocal" reflects the importation of raw materials for local production or importation of finished products. Circumstantial arguments of exchange vs. procurement are complex, and they carry weight only to the extent that patterns can be developed with a degree of redundancy across multiple material classes. Wiseman (2000) provides examples of the interaction of recovery technique (1/8-inch screening), contiguous excavation units, and exotic raw material patterns within lithic retouch types to develop theories of social boundaries. Such arguments cannot be definitive, but multidimensional inferences and models will provide productive structures for future research.

Ceramic Artifacts

Regge N. Wiseman

Data recorded for pottery from individual components and features includes pottery type and descriptive attribute categories. Information regarding distributions of various type and attribute categories contributes to the overall research goals by providing insights relating to the production, area of origin, decoration, and use of the associated pottery. One of the most important uses of ceramic data is determining the time of occupation represented at various sites and contexts by comparing a particular assemblage to those from other sites in the region. Examinations of pottery types and attributes from dated proveniences may provide information regarding trends in ethnic affiliation, patterns of pottery production and exchange, and the use and function of pottery in various activities.

Attributes of Ceramic Artifacts

Attribute categories in these investigations will be similar to those employed in recent OAS studies: temper type, paint type, surface manipulation, post-firing modification, and vessel form. More detailed characterization of pastes through refiring and petrographic studies will be recorded for smaller samples.

Basic pottery classification encodes a large amount of information. Pottery types are based on various combinations of paste and surface characteristics with known temporal, spatial, and functional significance. Sherds are initially assigned to specific traditions based on probable area of origin as indicated by paste and temper. They are then placed in a ware group on the basis of general surface manipulation, paint designs, and color schemes. Finally, they are assigned to temporally distinctive types within various tradition and ware groups.

Pottery Traditions and Types

Most of the pottery recovered from sites in southeastern New Mexico resembles types defined for the Jornada Mogollon area to the west and northwest. These include the El Paso area tradition (the El Paso Brown/ Bichrome/ Polychrome series; see Miller 1995 and references therein); the Jornada Brown/Three Rivers Red Ware series of the New Mexico Sierra Blanca region (Jornada Brown, Broadline Red-on-terracotta, San Andres Red-on-terracotta, Three Rivers Red-on-terracotta, and Lincoln Black-on-red [Mera 1943; McCluney 1962]); and Chupadero Black-on-white (Hayes et al. 1981; Warren 1981a, 1981b). Some of the types defined by Jelinek (1967) for the Middle Pecos valley in New Mexico (especially South Pecos Brown) are also found as far south as the Carlsbad area. Sherds of an as yet undescribed, presumably regional "type" called Carlsbad Brown were noted on one of the Loving Lakes project sites and is discussed below.

In addition to the types mentioned above, a wide variety of pottery types and wares from the Southwest sporadically occur east of the Pecos River in New Mexico and into Texas and might be recovered from the Loving Lakes sites. These include various of the Rio Grande glaze wares; Los Lunas Smudged; Mimbres Black-on-white; Kowina Black-on-red; Wallace Polychrome (now called Kwakina Polychrome); Tewa Polychrome; Mexican Colonial Ware; "Mexican bean pot ware," or historic Rio Grande micaceous utility ware; Red Mesa Black-on-white; White Mountain Red Ware; and Cuahuatitlan Burnished, to name a few (Watts 1963; Wiseman 1999; Wiseman et al. 1999).

Although no Southern Plains, Caddoan, or central Texas pottery types have been reported for a southeastern New Mexico site as far as I am aware, they have been reported for sites just over the state line in Texas. Sooner or later, surely some of them will show up in southeastern New Mexico, and archaeologists must be made aware of that possibility. Southern Plains, Caddoan, and central Texas pottery types reported from sites on the Texas portion of the Llano Estacado, in the Caprock Canyonlands, and on the Rolling Plains include an unspecified Caddoan incised ware, Leon Plain/Doss Red Ware, Bullard Brushed, and Borger Cordmarked (Watts 1963; Wiseman et al. 1999).

Finally, a "type" called Carlsbad Brown has been reported over the past several decades for the Carlsbad area. The validity of these sherds as a separate type is in question, and they may be subsumed under an established type such as Jornada Brown. Carlsbad Brown sherds are noted for their generally light brown to slightly orange surface colors, very highly polished surfaces (inside and out), and relatively hard pastes. Sherds conforming to these characteristics were noted on some of the project sites, presenting our pottery analysts with an excellent opportunity to study them in detail. Among other things, they may hold the key to the origins of two Southern Plains/Texas types: Ochoa Corrugated (Leslie 1965b; Collins 1968) and Leon Plain (Johnson 1994).

Pottery specialists working in southeastern New Mexico have not conclusively demonstrated that pottery was made by prehistoric peoples inhabiting the part of New Mexico east of the Pecos River. Furthermore, I have yet to be convinced that any of the types named by Jelinek (1967) were made in the Middle Pecos Valley between Roswell and Fort Sumner, as he contends. The rocks comprising the temper types of most of his types appear to have originated in the Sierra Blanca country of Lincoln County and in the general vicinity of Gran Quivira in Torrance and Socorro Counties, farther west in New Mexico. Thus, a major focus of the data acquisition related to the Loving Lakes project will be the collection of clay samples and potential tempering materials from the project area to test their pottery qualities and compare them to pottery recovered during the project.

Dating of Ceramic Artifacts

Unlike in other parts of the Southwest, pottery is only a general dating tool in southeastern New Mexico (Wilson 2000). Dendrochronology, or tree-dating, rarely works on woods recovered from sites in the region, and most of the major pottery types appear to have been long-lived. Surprisingly, even sites situated within or adjacent to the south-central mountains (Gallinas, Jicarillas, Capitans, Sierra Blanca, Sacramentos), where several of the key pottery types are known or believed to have been manufactured (Chupadero, Three Rivers, Lincoln, El Paso Polychrome), rarely produce datable tree-wood fragments.

A good example is LA 2112—the Smokey Bear ruin (Wiseman et al. 1976), or Block Lookout site (Kelley 1984). Although the tree-ring dating results were not available when Wiseman et al. (1976) was published, the Laboratory of Tree-Ring Research subsequently reported that none of the many samples of ponderosa pine and one sample of piñon pine submitted for analysis produced dates (W. Robinson, pers. comm., 1976). The trees were complacent; that is, their roots had access to reliable water, and therefore the ring widths were too uniform for dating. Robinson went on to say that this was often the case with samples from the Sierra Blanca region. Accordingly, tree-ring dates are available for only two sites in the southeastern quadrant of New Mexico, both from the south-central mountains: LA 1225, in the foothills of the Gallinas Mountains near Corona; and LA 1231, at Three Rivers, on the west side of the Sierra Blanca (Breternitz 1966).

Recognized pottery types that are typically found in quantity and ubiquity on southeastern New Mexico sites include Jornada Brown, El Paso Brown, Chupadero Black-on-white, El Paso Polychrome, Three Rivers Red-on-terracotta, and Lincoln Black-on-red. Of these, El Paso Brown, El Paso Polychrome, and Chupadero Black-on-white are fairly well dated.

El Paso Brown and Polychrome are radiocarbon dated to A.D. 200/600–1000/1100 and 1000/1100–1450, respectively. Attempts to discover within-type distinctions for the purpose of dating El Paso Brown by means of rim-sherd profile seriation have not been particularly successful (Miller 1995). Whalen (1996) has since suggested that changes in temper particle size might be useful in this regard, but his method has not yet been fully tested.

El Paso Polychrome has early and late variants denoted by systematic changes in rim thickness. The most common technique for establishing and dating these changes is the calculation of a rim-sherd index (West 1982; Seaman and Mills 1988). Generally speaking, the technique requires somewhat larger sherds because two different thicknesses are taken on each sherd. More recently, Speth (2004:75–76) found that the same result can be accomplished with a single thickness measurement, which permits the use of tiny rim sherds otherwise unusable for the West technique. Although much work needs to be done with the single-measurement technique, our ability to get relative dates by means of rim-thickness seriation means that more sites and components will be datable in the absence of absolute techniques, as long as sufficient numbers of rim sherds are available for measurement.

Using tree-ring-dated associations, Breternitz (1966) dated the beginning of the manufacture of Chupadero Black-on-white at A.D. 1150, noting that it was made until at least 1400. He does not offer an end date because Chupadero may have been made into the early historic period and thus beyond the cutoff date of his study. Hayes et al. (1981) suggested an end date of A.D. 1545, based on his work on Mound 7 at Gran Quivira. However, Snow's (1985) analysis of stratigraphic associations at several sites led him to suggest an end date of "no later than about 1500 and possibly as early as ca. 1450" (Snow 1985:23). On the basis of Snow's analysis, an end date of about A.D. 1475 seems more reasonable.

In summary, the use of pottery to date sites and components in southeastern New Mexico cannot and should not be a primary technique during the Loving Lakes project. The pottery can be used as a general guide to where Late Prehistoric components are located, but the primary means of dating the sites and components will be the collection of materials for absolute dating, such as charcoal for radiocarbon analysis.

Trends in the Production and Exchange of Pottery Vessels

The analysis of temper and paste is an opportunity to examine issues associated with exchange of vessels. The collection of potential pottery-making materials (clays and temper) from the project vicinity will help establish whether pottery manufacture took place there. Binocular microscope observations of temper and paste will be the basis for most source evaluations. Petrography will be used to confirm and refine resource characterizations. Depending on sample characteristics, more precise paste analysis, such as instrumental neutron activation analysis, may be warranted to distinguish regional production tracts.

The presence of trade pottery on southeastern New Mexico sites has been used in two ways. One is to date the occupations, for many of the types from other regions have been fairly accurately dated in their regions of manufacture. The other is to look at questions of exchange relationships with other peoples and the potential mobility patterns of the site occupants. These questions are especially relevant to the project sites and this region in particular because of the juxtaposition of farming peoples with hunter-gatherers and the well-known relationships of early Historic Plains and Southwestern peoples. These relationships obviously started before the advent of the Spanish; the questions are, how much earlier, and why were they established (Baugh 1984; Boyd 1997; Spielmann 1983, 1996)?

As mentioned earlier, Southwestern pottery is frequently found on project area sites, but sherds from Plains and Texas sites are not. Surely, pottery from these latter regions did occasionally make it to New Mexico sites. In the past, not all sherds have been retrieved from the field by project personnel, the decision having been made to collect only a sample. However, by Southwestern standards, many pottery types from the Plains tend to weather more severely than many Southwestern types; they may not be selected because of the natural tendency to choose the best examples for study and curation. Therefore, all sherds will be collected from the project areas regardless of size or condition.

Chipped Stone Artifacts

James L. Moore

Chipped stone artifacts should be recovered from all sites containing prehistoric components, and in some cases should comprise most of the artifacts found during data recovery. Analysis will be accomplished using a standardized format aimed at providing long-term comparability between data collected from assemblages across New Mexico and throughout the prehistoric (and in some cases, historic) period. This should allow the comparison of assemblages that were deposited during similar time periods but in widely separated locations to see how different environmental conditions can lead to similar or very different cultural adaptations. One of the most important of these concerns residential mobility, or how often people moved around the landscape. Analysis of chipped stone assemblages should allow us to examine mobility patterns exhibited by the occupants of these sites and assess degrees of residential mobility. This line of inquiry may be important in helping to determine whether the Archaic occupants of these sites operated as foragers or collectors while they were residing in these locations.

Other topics to be addressed include ties to other regions, site function, and site structure. By tracking the occurrence of materials that are not native to the project area, we should be able to define some of the ties this population had to other regions. Such ties can include indirect acquisition of lithic raw materials through exchange or direct procurement by forays aimed at acquiring desired materials. The condition of materials when they were brought to sites can provide information that will allow us to determine which of these processes is most likely. The variety of tools in an assemblage provides information on the range of activities performed at a site, and an assessment of this data can help determine how a site functioned in the settlement and subsistence system. The distribution of various classes of chipped stone artifacts across a site often provides clues to how different parts of a site were used and can augment data provided by other analyses. Though chipped stone artifacts, primarily projectile points, are often used to provide dates for sites, those dates have to be taken with a grain of salt. Especially in the Archaic period, certain projectile point styles continued in use for many hundreds or even a few thousand years, and often were collected and reused by later occupants of a region. Though chipped stone artifact styles are often the only way to date many sites during a surface examination, they are often not very reliable. Thus, dates based on chipped stone artifacts must always be considered tentative until bolstered by other types of temporal data.

Reduction Strategies

Reduction is the process of striking flakes from an unmodified piece of lithic material (nodule) or a previously used piece (core). 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 both 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 unprepared for a task by transporting tools with them; such tools were transportable, multi-functional, and readily modifiable. Sedentary groups did not necessarily need to consolidate tools into a multi-functional, lightweight configuration. (Andrefsky 1998:38)

Of course there are exceptions to this general statement. 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). Where lithic materials suitable for chipping occurred only in the form of small nodules, efficient reduction may have been impossible, and another strategy would have been used (Andrefsky 1998; Camilli 1988; Moore 1996). Either of these exceptions could potentially apply to the study area.

Southwestern biface reduction strategies were similar to the blade technologies of Mesoamerica and Europe in that they focused on efficient reduction with little waste. While the initial production of large bifaces was labor intensive and resulted in much waste, the finished tools were easily and efficiently reduced. Efficient strategies allowed flintknappers to produce the maximum length of usable edge per biface. By maximizing the return from biface cores, they were able to reduce the volume of raw material required for the production of informal tools. This helped lower the amount of weight transported between camps. Neither material waste or transport cost were important considerations in expedient strategies; flakes were simply struck from cores when needed. Thus, analysis of the reduction strategy used at a site allows us to estimate whether site occupants were residentially mobile or sedentary.

Theoretical Perspectives: Chipped Stone Tools and Mobility Patterns

From the limited amount of data that is currently available, several residential patterns are possible for the sites included in this examination. Artifacts diagnostic of both Archaic and Formative period occupations were recovered from these sites and often occurred at the same locale. Archaic populations in the Southwest tended to live by hunting and gathering, though in many areas horticulture was added to this mix in the Late Archaic period. Farming grew in importance during the Formative period, but hunting and gathering remained important. While hunters and gatherers tend to be highly residentially mobile, farmers are usually more residentially sedentary. While farmers still tend to move around the landscape quite a bit, depending on how important hunting and gathering are to their economy, their homes usually remain in one place for a comparatively long period of time. The scale of mobility is an important distinction between these lifestyles. Archaic hunter-gatherers tended to move their residence several times a year, and Formative period farmers tended to live in one place for a number of years.

By determining the type of occupation represented by each site (or types of occupations if multicomponent), we can estimate the level of mobility for the related occupational group. Since level of mobility is closely related to the type of settlement system and basic lifestyle, we can make important inferences about how different peoples might have used this landscape during their sojourn there. Chipped stone artifact assemblages can provide information critical to making such determinations. However, before proceeding to a discussion of how chipped stone artifacts fit into mobility patterns, we need to define the types of mobility we are looking for.

Mobility: Foragers, collectors, and farmers. Binford (1980) has identified two basic hunter-gatherer organizational systems, one in which consumers move to resources (foragers), and a second in which resources are moved to consumers (collectors). Fuller (1989:17) has summarized Binford's (1980) discussion of foragers, characterizing them as

> highly mobile, moving frequently and cumulatively several hundred miles annually; are highly flexible in terms of social structure; have no need to invest much in facilities; live in environments where resources are widely scattered or annually variable; and procure daily food requirements on a day to day basis. Variability between recognizable sites will be based more on seasonal or annual differences of resource use and duration than on site functional differences. Specialized activity sites are rarely recognizable except where rare resources are procured through an encounter strategy.

Two basic site types are theorized: residential or base camps, and resource extractive locales. In most instances, the latter are archaeologically invisible (Moore 1980; Vierra 1980).

In addition to residential camps, collectors "should use field camps for short-term, task group residence, for task-group information exchange stations, and for caches for product storage" (Fuller 1989:18). Fuller characterizes collectors as follows:

> Collectors employ logistical mobility and specialized task organization to keep supplied. They are characterized by use of storage facilities and logistically organized food-procurement parties (Binford 1980:10). A group tends to move into a resource zone and exploits that zone through specialized task groups in response to a resource structure

> that is either temporally or spatially aggregated. Task groups consist of skilled individuals who seek to procure specific resources in specific contexts, rather than through random encounter. (Fuller 1989:18)

The key difference between foragers and collectors, as defined by Binford (1980), is basically how often they move their base camps. Foragers inhabit base camps for comparatively short periods of time, often for only a day or two, and exploit food resources on an encounter basis. That is, foragers range out from their camps on a daily basis and collect whatever resources they happen to run into. Of course, these daily forays are not necessarily random but are usually based on an intimate knowledge of the local ecology and landscape within the territory that is normally exploited. Collectors, on the other hand, usually occupy base camps for much longer periods of time, ranging out from them using both day trips and "logistical forays" to collect resources for use or storage at the central location (base camp). The term "logistical foray" refers to the planned and organized nature of such expeditions. Groups of residents set out from the base camp with a specific location in mind, where they can obtain a certain resource (or set of resources) that can be returned to the base camp for use and/or storage. In contrast to day trips, logistical forays often require absences from the base camp of several days or more, allowing residents of the camp to exploit distant resources without having to move their homes. Collectors use storage features to cache resources at their residential camps in preparation for seasons of limited food availability, a strategy that is not employed by foragers, who simply move on.

Kelly (1995:120) noted that Binford's model "focuses not on the frequency of movement but on the *organization of camp movement relative to food-getting activities*." Thus, people might be on the move daily, but base camps are moved less frequently by collectors than foragers. Foragers and collectors are essentially terms used to describe the extreme ends of a continuum of mobility patterns

> that Binford saw as generally paralleling other scales of seasonal differentiation and patchiness of food resources. Where resources are homogeneously distributed and where food is available more or less year round, a forager pattern is more likely; where the opposite conditions holds true, a collector pattern can be expected. (Kelly 1995:120)

Thus, based on the availability and distribution of food resources, foragers tend to move often, occupying base camps for periods ranging from a few days to several weeks. Collectors tend to occupy base camps for considerably longer periods, perhaps on the scale of one or more seasons. While foragers usually exploit an area within an easy day's walk of their base camp, collectors may exploit a larger area through the use of short-term field camps. However, it should be noted that both of these patterns can be used by the same group during different parts of the year. Vierra and Doleman (1994) suggest that Southwestern hunter-gatherers tended to use a forager pattern of mobility from spring through fall and a collector pattern during the winter. Thus, during seasons when food resources were relatively abundant and more evenly distributed, Southwestern hunter-gatherers tended to move their residential base camps frequently, moving to resources rather than moving resources to them. During the winter, when food resources were less abundant and more patchily distributed, the same group tended to function as collectors. The main base camp was probably established where shelter and firewood were available, and a large area surrounding that camp was exploited by means of field camps.

The scale of mobility also varies for farmers according to their level of dependence on cultivated foods. Farmers who depend on cultivated foods for only a small part of their diet and remain more heavily invested in a hunting-gathering lifestyle might use a mobility pattern indistinguishable from that of collectors. At the other end of the spectrum, farmers who are heavily invested in a subsistence system based on cultigens often occupy a residential site for many years or generations. Again, however, there is some resemblance to a collector mobility system in that resources at a distance from the residence would be exploited by means of logistical camps.

Foragers vs. collectors. Archaic components at these sites are expected to reflect a foraging or a collecting lifestyle, and the differences between these mobility patterns can be modeled. Theoretically, three types of camps are possible for Archaic occupations: residential bases, field camps, and resource-extraction locales. The last is presumed to be archaeologically invisible except under rare circumstances. Residential base camps, where groups lived, were the focus of subsistence activities (Vierra 1994). A foraging residential base camp should reflect a range of maintenance, production, and food-processing activities without a heavy investment in habitation or storage structures. Structural remains, if present, should be ephemeral and indicative of short-term use.

Collector residential base camps should not only contain evidence of a wide range of activities, they should also demonstrate a corresponding investment in habitation and storage structures, denoting a lengthy occupation. Collector field camps should reflect temporary occupancy by a small group engaged in specialized activities. Therefore, a severely limited range of tasks should be represented, storage features should be absent unless the site was used as a cache, and structures (if present) should be ephemeral.

A potential problem in applying this model involves separating foraging camps occupied for short periods from field camps used by collectors. Both should exhibit evidence of short-term occupation, and the range of activities visible in the artifact assemblage might be quite limited for both. In many cases, they may be indistinguishable. This problem can be dealt with through analysis of the chipped stone assemblage.

The manufacture of general purpose bifaces reflects a mobile lifestyle and more commonly occurs at residential base camps than at field camps or resource-extraction locales. Kelly (1988:731) defines three types of bifaces: (1) bifaces used as cores and general purpose tools; (2) bifaces functioning as long use-life tools that can be resharpened; (3) bifaces serving as function-specific tools, with shapes designed for limited uses.

Each type of biface is curated, but for different reasons and in different ways. Use of bifaces as cores is conditioned by the type and distribution of raw materials. An expedient core-flake technology can be expected when suitable raw materials are abundant and tools are used where the materials from which they are made were procured (Kelly 1988:719). Little use of bifaces as cores should accompany this pattern. When local raw materials are scarce or of poor quality, bifaces can be made to help overcome the difficulties in using materials obtained at a distance from where they are used (Kelly 1988:719). When raw materials are extremely scarce, mobility is low, or a specific bifacial tool is required for activities performed away from the residential camp, there may be some use of bifaces as cores and extensive rejuvenation of bifacial tools (Kelly 1988:720).

Bifaces with long use-lives may be manufactured under a variety of conditions:

> In particular, tools designed for use on long search-and-encounter (as opposed to target specific) logistical forays will be under greater pressure to be designed to meet a variety of needs and tasks (e.g., cutting or scraping tools) and thus will need to be bifacial. This requirement can be relaxed for the equipment of target-specific forays (Kelly 1988:721).

Bifaces may also be manufactured as by-products of the shaping process and illustrate the importance of the haft to which the tool was attached (Kelly 1988:721). This type of biface might be more frequently maintained or replaced at residential rather than logistical sites (Kelly 1988:721).

Using these concepts, Kelly developed a model to aid in distinguishing between residential and logistical or field camp sites. The model has not been rigorously tested, but it does provide a series of predictions that can be applied to chipped stone assemblages. When combined with other data sets such as feature type and placement, number and diversity of activity sets represented, and types of resources exploited, the applicability of the model to the site can be assessed. For example, if residential features are present but analysis suggests that the site was a logistic locale or field camp, the model may be incorrect. However, if the residential pattern as predicted by both Kelly's model and site structure are in agreement, the model may tentatively be accepted as valid.

Collectors versus sedentary farmers. Because these sites are in an area that contains several playas, we must consider the possibility that one or more components could represent a farming residence. While a residential locale related to farming use of this area would be easily distinguished from a forager residential camp, the same might not be true of a collector residential camp. A collector residential camp should contain evidence of a wide range of activities and a relatively heavy investment in habitation and storage features denoting a lengthy occupation. Since occupation was sporadic or for only a season or two, sheet trash rather than middens is expected. A heavy dependence on bifaces should be visible in the chipped stone assemblage. Collector field camps should reflect a severely limited range of activities, storage structures should be absent (unless the site was a cache), and habitation structures (if present) should be ephemeral.

A completely different pattern should be visible if the site was a residence for sedentary farmers. Expediently produced and used chipped stone tools should be associated with substantial habitation and storage features. A wide range of activities should be represented, and at least one midden should occur. While general purpose bifaces might be present, most formal chipped stone tools should have specialized shapes produced for specific functions. Field camps should be similar to those described for collectors, but there should be an emphasis on expediently produced and used chipped stone tools rather than bifaces.

Foragers versus collectors versus farmers. Foragers and collectors should have left remains behind that can be distinguished from one another. Forager residential sites should reflect an occupation of limited duration and may contain ephemeral structures. Collector residential sites should reflect a longer and more intensive occupation, and should contain more substantial habitation structures as well as storage features. Collector field camps may resemble forager residential sites in many ways, but it should be possible to distinguish between them using the range and types of activity sets and chipped stone artifacts represented. Kelly's (1988) model of biface production and use will be employed to help make this distinction.

Residence by sedentary farmers should be relatively easy to distinguish from the other patterns. Features should be more substantial and indicative of long-term occupation. Formal middens should occur, and the character of the chipped stone assemblage should differ considerably from that of hunter-gatherers.

Expectations for the chipped stone assemblage. As the preceding discussion illustrates, chipped stone data cannot be completely and accurately evaluated in isolation; information on the range of features and structures identified at a site as well as data sets related to other artifact classes are also needed. However, characteristics of chipped stone assemblages can be of great interpretive value and help point to site function as well as the type of mobility pattern used by site occupants. This is especially true of residential sites, and to a lesser extent nonresidential sites.

Foragers are at the highest level of the mobility spectrum and consequently are the most interested in *efficient* chipped stone reduction. That is, foragers are concerned with the weight of the raw lithic materials they carry with them and the amount of waste involved with the reduction of those materials. Thus, carrying around a large core of low-quality raw material that would tend to shatter when struck and create a high percentage of waste is not efficient. However, carrying one or more large generalized bifaces made of high-quality material that can be struck to produce usable flakes with little waste or can be fashioned into a formal tool as a replacement for implements that are lost or broken *is* efficient. Thus, evidence of the production of large generalized bifaces should be most prevalent at forager residential camps. While the production of large generalized bifaces tends to create quite a bit of waste, once made these tools are light and efficient to carry. Large generalized bifaces are sources of sharp, thin flakes that can be used in a variety of cutting tasks and without modification for cutting or chopping, and as blanks for the manufacture of specialized tools. Thus, evidence of the production and use of large generalized bifaces should be very common at forager residential camps. *Expedient* reduction should also be evident at these locales, particularly of locally available materials. Expedient reduction can be defined as the unplanned removal of flakes from cores for use as informal tools. By unplanned removal we mean that flakes are not struck in a systematic fashion, but wherever a good striking platform occurs. The range of tool types, both formal and informal, will depend on the amount of time a site of this type was occupied, and the types of tools present should reflect the range of activities performed during that occupation.

Collectors, who are in the middle of the mobility spectrum, can afford to be a little less efficient in chipped stone reduction than foragers. Evidence of the production of large generalized bifaces should occur at collector residential camps, but to a significantly lesser degree than at forager camps. These assemblages should be dominated by the expedient reduction of locally available materials, but debris from the production and use of large generalized bifaces should also comprise a significant proportion of the chipped stone assemblage. Collector residential camps should display a wider range of formal and informal tools than forager residential camps, and tools may actually comprise a larger percentage of the assemblage as a whole than is true of forager residential camps.

Farmers, at the far end of the mobility spectrum from foragers, can afford to be comparatively inefficient in terms of chipped stone reduction. Expedient reduction should completely dominate chipped stone assemblages from sites of this type, and there should be little evidence of the manufacture of large generalized bifaces. Indeed, most of the bifacial tools recovered from farming residential sites should consist of small specialized tool forms, though large generalized bifaces may occasionally occur.

Thus, two characteristics of chipped stone assemblages are of particular importance to this study: the amount of large biface manufacture in an assemblage, and the types and sizes of bifacial tools. The production of large bifaces should be evident and often dominant in hunter-gatherer assemblages, while evidence of the manufacture of these types of tools should be absent or rare in chipped stone assemblages associated with a farming adaptation. Similarly, large generalized bifaces that could be used or adapted to a variety of purposes should be relatively common in hunter-gatherer assemblages, while farming chipped stone tool assemblages should be dominated by small specialized forms, with little evidence of large, general purpose tools. Some of these differences can be expected to carry over to logistical camps associated with collector or farming modes of subsistence. Collector field camps should display evidence of the use of large bifaces such as tools, cores, or blanks. Some evidence of the use of these tools might occur at farming logistical sites, but to a much smaller degree.

As should be evident from this discussion, there are no cut and dried boundaries between foraging, collecting, and farming chipped stone assemblages. Rather, they occur on a curve ranging from efficient to expedient reduction. The degree of efficient or expedient reduction displayed depends on a number of factors, including level of mobility, availability of local materials, and suitability of local materials for reduction. Thus, in an area that contains an abundance of local materials amenable to chipped stone reduction, there might be little need for efficient reduction, even by foragers. Similarly, in areas where suitable materials occurred only in small nodules, efficient reduction might not have been possible, even for foragers. To accurately assess the meaning of the reduction strategies displayed at sites in the project area, some familiarity with the relative abundance of materials and the size range in which they occur will be necessary.

Studies at Salt Creek (Moore 2003), in the Roswell area, suggest that many of these trends have been observed at sites near the study area. At Salt Creek, though most chipped stone reduction through time was focused on the use of locally available materials, mostly cherts and quartzites, some imported materials were used, and the percentage of imports dropped from the Late Archaic to the Early Formative period. Residential mobility decreased between the same two general time periods and was reflected by changes in chipped stone assemblages. This decrease was especially visible in the manufacture and use of large generalized bifaces, which never stopped but did decline significantly through time. Chipped stone analysis suggested that most of the sites examined during the Salt Creek study were forager base camps.

Methods of Chipped Stone Analysis

All chipped stone artifacts will be examined using a standardized analysis format developed by the OAS (1994a). Standardization is aimed at increasing comparability between projects completed across the state. Hopefully, this will eventually allow analysts to investigate specific problems with a much larger database representing sites distributed through both time and space. The OAS chipped stone analysis format includes a series of mandatory attributes that describe material, artifact type and condition, cortex, striking platforms, and dimensions. In addition, several optional attributes have been developed that are useful for examining specific questions. This analysis will include both mandatory and optional attributes.

The main areas that will be explored are 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 were procured. By studying the reduction strategy employed at a site it is possible to compare how different cultural groups 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 on a site can be used to help assign a function, define the range of tasks accomplished with this artifact class, and examine the structure of work areas. Chipped stone tools can sometimes provide temporal data, but they are unfortunately usually less time-sensitive than other artifact classes like pottery and wood.

It may be necessary to sample if very large assemblages are recovered. If this becomes necessary, a rough sort will first be performed to provide a characterization of entire assemblages. Any rough sort will include, but will not necessarily be limited to, assessing each provenience unit for counts of artifact and material types. Macroscopic examination will be used to assign artifacts to categories included in the rough sort. While such an approach does not provide the precise information available from intensive analysis, it will allow us to determine whether or not samples are representative of the assemblages they were drawn from.

Intensive analysis will include the examination of each chipped stone artifact under a binocular microscope to help define morphology and material type, examine platforms, and determine whether it was used as a tool. The level of magnification will vary between 20X and 100X. Higher magnification will be used for wear-pattern analysis and identifying platform modifications. Utilized and modified edge angles will be measured with a goniometer; other dimensions will be measured with a sliding caliper. Results will be entered into a computerized database for more efficient study and comparison with data from other sites.

Four classes of chipped stone artifacts will be recognized: flakes, angular debris, cores, and tools. Flakes exhibit one or more of the following characteristics: definable dorsal and ventral surfaces, bulb of percussion, and striking platform. Angular debris lack these characteristics. Cores are nodules from which flakes and angular debris have been struck and on which three or more negative flake scars originating from one or more platforms are visible. Tools can be divided into two distinct categories: formal and informal. Formal tools are artifacts that were intentionally altered to produce specific shapes or edge angles. Alterations take the form of unifacial or bifacial flaking, and artifacts are considered intentionally shaped when flake scars obscure their original shape or significantly alter the angle of at least one edge. Informal tools are flakes, angular debris, or cores that were used in various tasks without being purposely altered to produce specific shapes or edge angles. This class of tool is defined by the presence of marginal attrition caused by use. Evidence of informal use is divided into two general categories: wear and retouch. Retouch scars are 2 mm or more long, while wear scars are less than 2 mm long. While formal tools are morphologically distinguished from the by-products of chipped stone reduction, informal tools are morphologically classified as flakes, angular debris, or cores.

Attributes that will be recorded on all artifacts include material type and quality, artifact morphology and function, amount of surface covered by cortex, portion, evidence of thermal alteration, edge damage, and dimensions. Platform information will be recorded for flakes only. Following are descriptions of attributes included in the standardized OAS analysis. Because material color can often be a clue to origin, a series of relevant color codes will be generated and applied to all chipped stone artifacts.

Material type. This attribute is coded by gross category unless specific sources are identified. Codes are arranged so that major material groups fall into sequences progressing from general undifferentiated materials to named materials with known sources. The latter are given individual codes.

Material texture and quality. *Texture* is a subjective measure of grain size within rather than across material types. Within most materials texture is scaled from fine to coarse. Fine materials exhibit the smallest grain sizes and coarse the largest. Obsidian is classified as glassy by default, and this category is generally applied to no other material. *Quality* refers to the presence of flaws that can affect flaking characteristics, including crystalline inclusions, fossils, cracks, and voids. Inclusions that do not affect flaking characteristics, such as specks of different colored material or dendrites, are not considered flaws. These attributes are recorded together.

Artifact morphology and function. *Morphology* categorizes artifacts by general form. *Function* categorizes artifacts by inferred use.

Cortex. Cortex is the 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 is estimated and recorded in 10-percent increments.

Cortex type. The type of cortex present on an artifact can be a clue to its origin; thus, cortex type is identified, when possible, for any artifacts on which it occurs.

Portion. All artifacts are coded as whole or fragmentary; when broken, the portion is recorded if it can be identified.

Flake platform. This attribute refers to the shape of and any alterations to the striking platform on whole flakes and proximal fragments.

Thermal alteration. When present, the type and location of thermal alteration are recorded to determine whether an artifact was purposely altered.

Wear pattern. Cultural edge damage denoting use as an informal tool is recorded and described when present on debitage. A separate series of codes are used to describe formal tool edges, allowing measurements for both categories of tools to be separated.

Edge angles. The angles of all modified informal and formal tool edges are measured; edges lacking cultural damage are not measured.

Dimensions. The maximum length, width, and thickness of all artifacts are measured.

Summary

Analysis of chipped stone assemblages will aid in examining questions related to the basic characteristics of life in the project area. The general questions that will be addressed include:

1. How can the process of selecting raw materials be characterized? Were certain materials and qualities selected for, and can any differences in this process be seen between components and sites? Is there variation in the types and amounts of exotic materials used through time?

2. What do the types of tools tell us about the range of activities that occurred at these sites?

3. How were raw materials reduced? Were there purposeful attempts to enhance their flaking characteristics, or were materials left unmodified?

4. Can the range of materials found on a site tell us anything about the size of the area being exploited on a regular basis? Is there any evidence of changes in the size of the territory being exploited through time?

5. Can the distribution of chipped stone artifacts provide information on where activities occurred on a site, or were most of these materials redeposited in specific discard areas?

Analysis of chipped stone artifacts will focus on providing data that can be used to characterize the assemblages from these sites and address the general questions discussed above. It will also provide information that can be used to deal with more complicated issues concerning characteristics of the region's prehistoric occupation and mobility patterns.

Ground Stone Artifacts

James L. Moore

Ground stone artifacts should be recovered from most of the prehistoric sites in the Loving Lakes project. This class of artifact is often used to provide subsistence information. Such data can be derived either indirectly or directly. Tool size, form, and other general characteristics have been used in the past to infer function. However, many assumptions are made when such attributes are used to determine how an artifact was used. A better way to do this is to collect data that are directly related to that use such as recovering residues (especially pollen) and analyzing wear patterns on grinding surfaces. But while ground stone artifacts can provide information on subsistence, can they tell us anything about how a region was occupied?

Theoretical Perspectives

As with other artifact classes, the analysis of ground stone tools may provide information that will help us examine residential mobility. That there are differences between the types of ground stone tools used by residentially mobile and sedentary peoples should come as no great surprise. Archaic hunter-gatherers tended to use one-hand manos, basin or slab metates, and mortars. These are fairly generalized tools that can be used to grind a variety of wild and domestic plant foods, but these forms were not designed to rapidly and efficiently process large quantities of food. Ground stone tools used by Southwestern farmers, specialized toward the processing of corn, usually included trough (one end closed) or through-trough (both ends open) metates and two-hand manos. Such tools allow foods like corn to be processed rapidly and efficiently (Lancaster 1983). A group that is wholly dependent on hunting and gathering would be expected to use the simple, generalized tools described for the Archaic. Farming populations would be expected to mostly use the specialized forms, which increase grinding speed and efficiency. People in the process of becoming farmers and reducing their dependence on wild resources should use a grinding tool kit that is neither wholly generalized nor completely specialized. Examination of ground stone tool kits should help us estimate the level of mobility demonstrated by occupants of these sites. By comparing mobility trends through time we may be able to illustrate some of the effects of the transition from mobile hunter-gatherer to sedentary farmer.

Measures of grinding efficiency and dependence on cultigens. In studying grinding tools from the Mimbres area, Lancaster (1983, 1986) determined there was a steady rise in efficiency over time. This took the form of increasingly large grinding areas and the use of materials of variable texture. Experiments showed that efficiency was enhanced by enlarging the size of the grinding surface (Lancaster 1983:81), which appeared in his sample as an increase in the size of metate grinding surfaces through time (Lancaster 1983:88). While the popularity of basin and slab metates seemed to fluctuate, and these types may have been used as utility grinding implements, trough metate varieties clearly reflect this tendency (Lancaster 1983:48–49). Trough metates were the most popular form during the Early Pithouse period, but through time they were mostly replaced by the through-trough type (Lancaster 1983:47). This modification increased the length of the grinding surface and consequently its area. Thus, trough metates had an average grinding surface of 758 sq cm, while through-trough metates averaged 1,123 sq cm, a 33-percent increase (Lancaster 1983:42–43). Apparent functional differences between trough and basin/slab metates were based on wear patterns. Both varieties of trough metate exhibited striations parallel to the long axis of the tool, while striation patterns on a large percentage of basin and slab metates were random (Lancaster 1983:45).

There was also variation in the types and textures of materials used. Trough metates were mostly made from vesicular basalt, and basin/slab metates from nonvesicular basalt and rhyolite. Medium-coarse materials dominated the assemblage before the Classic phase, while during that period the assemblage contained nearly equal amounts of coarse- and fine-grained materials. This is interpreted as a shift from a single-stage to a multistage grinding process (Lancaster 1983:87).

Though Lancaster (1983) was unable to discern any similar patterning in manos, a study by Hard (1986) shows that these tools vary correspondingly, perhaps because of the nature of the samples examined. Lancaster did not look at Archaic sites from the Mimbres area, concentrating on sites occupied by people who were more or less dependent on farming. Hard examined a considerable amount of data on the use of ground stone tools by both hunter-gatherers and farmers. Thus, his sample was broader, and patterns were undoubtedly easier to discern.

Hard (1986:105) feels that as reliance on cultigens increases, there is a corresponding increase in mano length and mean metate grinding surface area. Only manos were examined by his study, though Lancaster's (1983) study supports the latter pattern. After an examination of ethnographic and archaeological materials, Hard (1986:161) determined that degree of reliance on agriculture can be measured by mano length. The break between hunting and gathering and dependence on cultigens appears to occur between average lengths of 10 and 13 cm. Hunter-gatherer manos average 10.6 cm long, while a mean length of 13 cm corresponds with a substantial dependence on cultigens (Hard 1986:161). The longest mean in his sample was 25 cm, which appears to equate with about a 70-percent dependence on cultigens (Hard 1986:161). The mean length of Tarahumara manos is 20.8 cm, and they depend on cultigens for about 60 percent of their diet (Hard 1986:161).

Thus, examination of mano length and the size of metate grinding areas provide a means of assessing the degree of reliance on agricultural production versus gathering. Archaic groups lacking any reliance on farming should have produced assemblages in which average mano length would be at or near the low end of Hard's range. Metates should predominantly be of the slab or basin form, and there should be no evidence of the use of trough metates. A low dependence on domesticates (primarily corn) should produce manos that are shorter and metates with smaller grinding surfaces than is the case for groups that exhibit a long history of agricultural dependence. A single-stage grinding system would be expected, and trough metates may occur, though basin and slab forms should dominate the assemblage. Through-trough metates are not expected. Farmers should produce a ground stone assemblage that demonstrates a high degree of subsistence dependence on cultigens. Manos should be at the long end of Hard's range, the size of grinding surfaces on metates should indicate processing efficiency, a multistage grinding process may be evidenced, and trough and through-trough metates may occur.

Ground stone tools and prehistoric foods. Analysis of ground stone assemblages may also provide information about the range of foods consumed by site occupants. Pollen often adheres to some of the types of plants that are processed with ground stone tools and can be recovered by a washing procedure. The material acquired in this way can be analyzed like other pollen samples. A study of this nature can potentially provide two types of information. The first is economic in nature. Recovery of pollen that adhered to materials processed by ground stone tools can help determine what those foods were. Of course, our ability to accomplish this depends on whether pollen is preserved in pores in the rock, and the condition of preserved pollen. Like many other analyses, the examination of economic pollen recovered from ground stone tools is a hit-or-miss proposition. Thus, our study of the use of plants for food will not focus on this analysis, but any information derived will be used to expand and amplify other sources of data. Grains of corn starch can also sometimes be identified on ground stone and will be monitored to supplement and amplify pollen information.

A study of this type also has the potential to provide corroborative data concerning differential uses of ground stone tools. As discussed earlier, researchers have suggested that various types of metates were used for different purposes. Pollen analysis could potentially provide data that will either help corroborate or refute such arguments. Of course, several potential problems should be kept in mind. Recovery of economic pollen from ground stone tools is not a given, especially if they have been exposed to the elements. Thus, tools that appear to have been buried since discard or abandonment, preferably within structures, will be the focus of this analysis. Tools from extramural trash deposits will also be considered, depending on their condition, position, and evidence of weathering. In all likelihood, only a sample of tools will be studied, and examples of each type (e. g., slab, basin, trough, or through-trough) may be included in the sample.

Methods of Ground Stone Analysis

Ground stone artifacts will be examined using a standardized methodology (OAS 1994b), which is designed to provide data on material selection, manufacturing technology, and use. Artifacts will be examined macroscopically, and results will be entered into a computerized data base for analysis and interpretation. Several general attributes will be recorded for each ground stone artifact, and specific attributes will be recorded only for certain tool types. Attributes that will be recorded for all ground stone artifacts include material type, material texture and quality, function, portion, preform morphology, production input, plan view outline form, ground surface texture and sharpening, shaping, number of uses, wear patterns, evidence of heating, presence of residues, and dimensions. Specialized attributes that will be recorded include mano cross-section form and ground surface cross section.

By examining function(s), it is possible to define the range of activities in which ground stone tools were used. Because these tools are usually large and durable, they may undergo a number of different uses during their lifetime, even after being broken. Several attributes are designed to provide information on the life history of ground stone tools, including dimensions, evidence of heating, portion, ground surface sharpening, wear patterns, alterations, and presence of adhesions. These measures can help identify post-manufacturing changes in artifact shape and function, and describe the value of an assemblage by identifying how worn or used it is. Such attributes as material type, material texture and quality, production input, preform morphology, plan view outline form, and texture provide information on raw material choice and the cost of producing various tools. Mano cross-section form and ground surface cross section are specialized measures aimed at describing aspects of form for manos and metates, since as these tools wear they undergo regular changes in morphology that can be used as relative measures of age.

Pollen washes will be conducted in the laboratory, necessitating certain precautions. Ground stone tools from trash deposits will be placed in plastic bags after being removed from the ground and lightly brushed to remove loose soil. A thin cover of dirt will be left on tools found on floors or in mealing bins until they are ready for photographing. Loose dirt will be removed prior to photographing, and then the artifacts will be placed in plastic bags.

Laboratory processing will proceed as follows. The entire surface of tools will be brushed before samples are collected. Grinding surfaces will be scrubbed to collect embedded materials using distilled water and a toothbrush. The size of the area sampled will be measured and noted. Wash water will be collected in a pan placed under the sample and packaged for storage. Samples selected for analysis will receive a short (10-minute) acetolysis wash. Under certain circumstances, this may help preserve the cytoplasm in some modern pollen grains, allowing recent contaminants to be distinguished from fossil pollen.

Pollen samples from ground stone artifacts will be subjected to a full analysis to distinguish economically used wild plants and cultigens. The occurrence of broken and whole grains and clumps of grains will be monitored during counting. In addition, evidence of corn starch in samples will be noted.

Summary

Ground stone artifacts will be used to provide data in three general areas. We have suggested that there will be differences in the types of tools used by hunter-gatherers who were fully mobile, hunter-gatherers who were in the process of settling down and farming, and farmers with a long history of sedentary life. Both the types of metates found in assemblages and the average lengths of associated manos can be used to examine this phenomenon. Fully mobile hunter-gatherer ground stone assemblages should contain generalized tools, including relatively short manos and metates with small grinding surfaces. Recently settled hunter-gatherer assemblages should be dominated by metates designed to grind corn with moderate efficiency, and manos of moderate length. Established farming populations should possess an assemblage dominated by metates that are highly efficient for corn processing and manos that are relatively long. Both Lancaster's (1983) and Hard's (1986) analyses should provide useful comparisons.

Ground stone tools will also be sampled to determine what foods they were used to process. In particular, we will try to determine whether basin/slab and trough metates were used to grind different suites of materials. Of course, this study depends on the range of ground stone tools recovered, how well pollen is preserved on grinding surfaces, and whether or not postdepositional processes have been at work. Unfortunately, we will not be able to determine this until at least a sample of specimens have been analyzed.

Faunal Remains

Nancy J. Akins

The Loving Lakes sites have deposits that cover a considerable time span within different vegetation zones and could contribute important information on the prehistory of this region. Unfortunately, bones tend to be poorly preserved in this part of the state (e.g., Akins 2003b:130; Staley 1996:204), severely limiting our ability to frame and address questions about subsistence strategies, mobility, and change through time. To overcome a lack of data for the surrounding area, it is necessary to look to other areas and build on recent OAS projects in southeastern New Mexico.

In their regional overview, Katz and Katz (1994) provide basic themes and observations that provide a basis for approaches to faunal data. Most relevant are those pertaining to settlement intensity. The Late Archaic is viewed as a period of expanding settlement and subsistence with widespread and numerous burned-rock features. Pottery was added in the Early Formative with indications of initial sedentism in the mountain/plains border region. Domestic architecture and burned rock rings indicating increasing settlement and subsistence stability occurred between A.D. 750 and 950. Exploitation of shinnery oak may have facilitated these changes. Village life continued to intensify until A.D. 1075–1125, when sites became smaller and fewer. Another expansion followed (A.D. 1125–1200), and bison hunting became a viable strategy between A.D. 1200 and 1300. Athabaskans made their appearance around A.D. 1375, and bison hunting occurred on the plains between A.D. 1500 and 1600 (Katz and Katz 1994:50–53).

Faunal Assemblages in the Area

Many of the sites in this region are short-term, repeatedly occupied sites, suggesting exploitation of similar resources over time. These small camp sites generally represent but one aspect of a broader subsistence strategies that transcend chronology. For example, the general concept of Archaic adaptation is one of small mammal utilization (e.g., Sebastian 1989:52), yet particular sites were used for large-animal exploitation regardless of time period. Roney's excavations at Hooper Canyon Cave found that almost 84 percent of the Archaic bone was from large mammals and only 11 percent from small mammals. The same was true of his ceramic-level faunal assemblage (Roney 1995:72).

More typical is the assemblage from Macho Dunes (LA 29363), a seasonal camp dating from the Middle Archaic (A.D. 610–950) just west of Carlsbad (Zamora 2000:147–148). A small but diverse faunal assemblage, mostly small mammals (squirrel, kangaroo rat, small mouse, woodrat, porcupine, cottontail, jackrabbit, canid, badger, bison, bird, and turtle), was recovered. Almost all of the bone was from the Formative component, but the few attributed to the Archaic component are mice and cottontail (Moga 2000:119, 122).

At Punto de los Muertos (LA 116471), northwest of Carlsbad, an unusually large assemblage of animal bone (n = 8,053) and human bone was recovered from a rock circle dating from the Late Archaic to after A.D. 1000 (Wiseman 2003:101). Excavation recovered a fairly small number of species for the sample size—at least 26 that are mostly rodents, small mammals, and birds—but the assemblage also includes appreciable amounts of medium-sized artiodactyls such as deer and pronghorn. Much of the bone is burned and broken into small pieces (Akins 2003b:118–119).

Late Prehistoric sites in the Carlsbad area generally produce faunal assemblages dominated by small mammals and mussels. In the Brantley Reservoir area, northwest of Carlsbad, the Champion Site, consisting of a ring midden, a number of hearths, and scattered lithic and ceramic artifacts, had a small but varied faunal assemblage. In addition to an abundance of freshwater mussels, there were small numbers of jackrabbit, cottontail, squirrel, prairie dog, woodrat, turtle, and carnivore bones (Gallagher and Bearden 1980:119–120). Later excavations at a range of sites, including ring middens and stone enclosures, recovered freshwater mussel, cottontail, jackrabbit, woodrat, pocket gopher, deer, bird, and fish remains (Robertson 1985:A19–A20).

Just north of the project area, sites excavated in conjunction with WIPP produced little fauna. One lithic and ceramic artifact scatter (ENM 10418) contained cottontail, deer, bison, and freshwater mussel (Lord and Clary 1985:183–188).

In the Roswell area, the Fox Place, with material mainly dating between A.D. 1250 and 1300, produced a very large amount of bone (over 25,000 specimens) along with 10 small pit structures and a rectangular ceremonial structure. The fauna is diverse, including numerous bird, fish, and turtle species in addition to rabbit, pronghorn, deer, and mussels. The age distribution of the animals indicates that many were taken from late spring into early fall, and possibly during winter (Akins 2002; Wiseman 2002).

The Henderson site, an adobe pueblo with about 60 rooms in the Roswell area, dated between A.D. 1275 and 1350. It was the residence of a semisedentary community that occupied the site from early spring until after the harvest and spent the colder months elsewhere. Early in the occupation, subsistence was an even mix of farming, hunting, and fishing, while the later phase, beginning around A.D. 1300, has an abundance of transported bison and indications of a fully nomadic bison-hunting economy (Speth 1997:1–3).

Little fauna was recovered from sites excavated in a transmission line excavation in Eddy and Lea Counties. With the exception of a bison kill (LA 22107) dating between A.D. 1445 and 1625, very little bone was found, and most was not identifiable. In addition to the bison, probable pronghorn, rodent, jackrabbit, and bird were recovered (Staley 1996:195–197, 204).

Faunal Research Orientation

The basic research framework for the work will follow that developed for the faunal remains recovered from the Townsend Site (LA 34150), on the north edge of Roswell. Faunal preservation was relatively good at the site. It included components dating to the Archaic and Formative periods (Akins 2003a). This framework assumes that these short-term and repeatedly occupied sites lacking evidence of sedentary occupation were meant to take advantage of water sources and exploit one particular or various resources, generally plants. With the exception of bison, which fluctuated over time, the main resources exploited would be similar, regardless of the time period. Changes over time may be subtle, involving slight changes in the proportion of a resource used, what season or how it was used, and how it was processed and discarded. Because the resources were generally similar, it is often necessary to look at all aspects of the data and go beyond the faunal assemblage to infer aspects of settlement and mobility. This framework also assumes (based on evidence found in the human remains from this site and from Henderson) that in the southeast, even more sedentary agriculturalists continued to hunt and gather, utilizing many of the same sites as Archaic and more mobile groups. Furthermore, it assumes that the length of occupation, diversity of occupation, season of occupation, and size of the group can be inferred in at least some instances and help provide an interpretative framework.

The Townsend Site is both north and south of Salt Creek. The creek is not a perennial stream but, like the NM 128 playas, the stream bed and tributary channels support lush plant growth, and they may have supported springs in the past. Small mammals and artiodactyls may have used the spring and associated vegetation, as bison probably did when they occupied the Southern Plains. Bison were absent or rare on the Southern Plains from about 6000 to 2500 B.C. and from

A.D. 500 to 1200 or 1300 (Dillehay 1974), possibly as early as A.D. 1000 (Hofman et al. 1989:165). The Townsend Site Archaic components consisted of two distinct camp sites, one just north of the creek and the other considerably south of the creek. No evidence of structures was found, but widely scattered thermal features, a possible activity surface, and a sparse distribution of artifacts suggest short-duration occupation in the south area. That to the north had numerous thermal features, a mano and metate cache, and a lack of concern for where trash was disposed, suggesting these groups anticipated fairly short stays but intended to return. Fauna from the north indicates a fairly balanced use of small (4.6 percent rodent and 40 percent small mammal) and large animals (37.5 percent large mammal), with no mussel, bird, turtle, or fish. Site structure and artifact assemblages, especially the presence and quantity of nonlocal lithic materials, suggest these groups were more mobile and anticipated fairly short stays. This is consistent with views that Archaic people relied on a broad spectrum of plants and animals, moving to take advantage of highly seasonal foods that were available for short periods of time (Sebastian 1989:54-56). Like annual plants, small mammals have shorter life spans, reproduce and mature rapidly (Binford 2001:366–367), and are often encountered during foraging expeditions (Akins 2003a:276, 304–308).

Assuming that populations increased during the Formative, the effective foraging area would have been reduced as other groups occupied and exploited parts of their former range. This would have forced the inhabitants to extract more food from the same or an even smaller area. Means for achieving this include increasing the amount of labor directed at subsistence activities, shifting to species that occur in greater concentrations (e.g., bison), increasing the use of resources that take more time to process (such as shinnery oak), use of traps (e.g., for fish and birds), increasing the use of aquatic resources (e.g., fish, turtles, mussels, and some bird species), and adopting domesticated plants (e.g., corn) or animals (e.g., turkeys) (Binford 2001:188–189, 210).

The earlier Formative groups at Townsend (A.D. 570–940) built and occupied shallow pit structures with little storage or evidence that they were built for a lengthy stay at the site. Extramural features clustered around the structures with relatively dense artifact concentrations and charcoal-stained soil. The lithic assemblage had less nonlocal material, while the floral and faunal assemblages suggest the initial response was to expand the range of plant and animal foods used. Faunal assemblages dating to this period have mainly small forms (55 to 84 percent small mammal, depending on the structure), including rodents, birds, turtle, and fish, and more of the bone was processed, burned, and fragmented. Thus, the use of fewer large animals and a decrease in the use of nonlocal lithic material suggests a reduction in the size of the area regularly exploited (Akins 2003a:304–308).

Slightly later (A.D. 990–1050) structures were deeper but had no formal features, few extramural features, and only sparse trash in the vicinity of the structures. Greater intensity of resource use is indicated by the fauna and flora. Corn was more abundant, suggesting these groups may have increased their reliance on corn. The fauna remains diverse, with rodents, carnivores, fish, and considerable amounts of freshwater mussel. One of the two structures had relatively large amounts of artiodactyl bone (39.7 percent large mammal in a sample of 141 specimens). A human burial found in the fill of this same structure had morphological traits suggesting a fairly sedentary and probably agricultural population (Akins 2003a:304–308).

Specific Research Questions

If sufficient material is recovered, the faunal data will be used to document the use of these sites over time. The perspective will be one of observing how groups adapted to demographic and possibly environmental changes and whether they extracted increasing amounts of resources from smaller areas. In particular, is there evidence for a change in use of larger to smaller animal forms as mobility became limited by increasing regional population? Is there evidence of a more intense and broader use of species that would suggest constraints on mobility and attempts to exploit a smaller area more effectively? Is there evidence of intensive bison use at any of the sites? Is there evidence that the sites at the western and eastern ends of the project area exploited a different range of animal resources or exploited them in different amounts and ways? Are there particular animal resources that could provide information on the microenvironments found around these playas? Are there domestic species or differences in how animals were used that could indicate use by Athabascan groups?

Human Remains

Nancy J. Akins

Human burials and even isolated elements are rarely found in sites like those in the project area. Nevertheless, there is a possibility that burials or isolated remains will be encountered.

Land status determines which laws and regulations govern the treatment of human remains recovered from archaeological sites. All but one of the project sites are on federal land, invoking the Native American Graves Protection and Repatriation Act (25 U.S.C. 3002, 1990). This act states that human remains and associated funerary objects, sacred objects, or objects of cultural patrimony found on federal land belong to the lineal descendants or tribe or organization which has the closest cultural affiliation or is recognized as aboriginally occupying the area where the objects were discovered and states a claim for the remains. For intentional archaeological excavations, it is the responsibility of the federal agency to "take reasonable steps to determine whether a planned activity may result in the excavation of human remains, funerary objects, sacred objects, or objects of cultural patrimony" and to notify and consult with groups that occupied the area aboriginally before issuing any approval or permits (43CFR10.3).

The other site, on State Trust Land, consists of a 1940-era corral. However, in the unlikely event that human remains were to be discovered while recording this corral, state law (NMSA § 18-6-11.2, 1989; and HPD Rule 4, NMAC 10.11) would apply. Since human remains are unanticipated at this site, they will be treated as discovery situations and excavated under the annual burial permit issued to the Office of Archaeological Studies.

In addition to NGPRA and the State Burial Law, the draft Department of Cultural Affairs Policy Regarding Tribal Consultation requires that OAS make a good-faith effort to consult with Native American governments when actions could affect Native American human remains. Under this policy, OAS will at a minimum inform Isleta del Sur, Acoma, Mescalero, the Kiowa of Oklahoma, Comanche, and the Apaches of Oklahoma of the project location and nature of the sites. Otherwise, if human remains are encountered, OAS will provide written information to any other pueblo, tribe, or nation that has an interest in the geographic area where the human bone was discovered. If any of these groups express an interest in making a claim to the remains, OAS will assist them in any way possible.

Research Background and Objectives

None of the project sites are large enough, nor were they occupied long enough, that we expect to encounter human remains as isolated elements or intact burials. If any are found, it is unlikely that the number will be large, and the primary objective will be to provide life-history information that can be integrated into broader research perspectives on topics such as subsistence, diet, and demography (e.g., Martin 1994). Even in small samples, the basic analysis of human remains has the potential to contribute significant information on prehistoric life. Human bones and teeth record conditions during life as well as in death (Goodman 1993:282). Several indicators of physiological stress are used to address general health. These include adult stature, which may be related to nutrition, and subadult size, which can indicate the timing of stress events. Defects in dental enamel (hypoplasias or pitting) are associated with specific physiological disruptions and can be assigned an age of onset. Dental asymmetry begins *in utero* and reflects developmental stress, while dental crowding can be nutritional or genetic. Dental caries reflect refined carbohydrates in the diet and can lead to infection and tooth loss. Dental abscessing can become systemic and life-threatening. Osteoarthritis and osteophytosis can indicate biomechanical stress. Osteoporosis, related to calcium loss and malnutrition, can be acute to severe during pregnancy and lactation, and can also affect the elderly. Porotic hyperostosis is related to iron deficiency anemia and leaves permanent markers. Periosteal reactions result from chronic systemic infections (Martin 1994:94–95). Although limited by the quality of preservation of bone and the integrity of the interment, all of these observations can be made without invasive or destructive analyses.

Other types of information can be obtained through simple metric observations. For example, femur shaft size is an indication of strength, while the shape reflects mobility. As mobility decreases, shaft shape become more circular, while more ovoid shapes are characteristic of hunter-gatherers (Bridges 1996:112, 118–119).

In addition, mortuary treatment places the individual in a social context, adding valuable information on social, demographic, and economic conditions (Brown 1995:7; Larsen 1997:247). Recent mortuary analyses have approached a variety of topics ranging from individual, gender, ethnic, political, and social identity, to interpersonal conflict, resource control, labor and organization, ritual and meaning, social inequality, trade, population dynamics, and residential patterning (Larsen 1997:260).

Few burials have been recovered from the Carlsbad area. Summarizing burials from this part of the state, Stodder (1989:302–303) found references to 49 from Eddy County and 10 from Otero County. Many were found by Mera (1938) in caves in the Guadalupe Mountains. More recent excavations at Punto de los Muertos (LA 116471) encountered a large amount of fragmented human bone (n = 2,194) from at least 12 individuals mixed with animal bone in a largely disturbed context. Nearly half of the bone was burned, and some had traces of hematite. Calibrated ASM dates on human bones (n = 3) range between 775 and 5 B.C., while those on animal bone (n = 2) indicate a wider spread (805 B.C.–A.D. 450). The remains appear to indicate a relatively healthy and mobile population. No porotic hyperostosis was noted, and only a few teeth exhibit hypoplasia lines. The hypoplasias indicate some form of stress in at least two individuals. No caries were found, but some teeth have heavy attrition, indicating use of stone-grinding tools. One or two of the males were large and robust, with femur shapes suggesting considerable mobility (Akins 2003c:131–141).

In contrast, the single burial from the Townsend Site was a young female (18–22 years). While the site has no indication of a settled agricultural existence, this individual may have belonged to a Late Prehistoric group of relatively sedentary agriculturalists. The evidence consists of caries, which are more consistent with a processed carbohydrate diet, and a round femur cross section (Akins 2003a:297–300).

Another young (16–18 years old) female was found at Las Molinas (LA 68182), a large number of bedrock basin metates and mortars and a trash-filled crevice near the Townsend Site. She lacked some teeth, but those recovered have no caries and little dental attrition. A number of hypoplasia lines indicate repeated episodes of stress during childhood. Her femur shaft was quite ovoid, and the index larger than any of the females from Henderson or the Townsend burial (Akins 2004:121–125).

In an area with so little information on human remains, collecting basic descriptive data is always a primary goal. Beyond this, data from any remains recovered during this project will be examined for evidence of mobility verses sedentism and for the agricultural commitment of the groups who inhabited the sites. Mortuary practices, metric observations, demographic structure, indications of general heath and nutrition, dental wear, caries frequencies, and femur size and shape are all indications of diet and mobility.

Archeobotanical Remains

Mollie S. Toll

Floral studies provide direct evidence of the patterning of daily economic activities, contributing an informative layer of details to the emerging picture of human occupation in southeastern New Mexico. Multiple questions at issue in the prehistory of the Eastern Plains can be addressed by examining associated plant remains. Botanical remains will be recovered in soil samples to be processed by water flotation, pollen samples, wood charcoal, and larger botanical artifacts collected during field excavation. Flotation can be expected to recover parts of wild plants (chiefly seeds, but also, importantly, leaf, fruit, and root fragments from monocot leaf succulents such as agave, sotol, and yucca) and cultivars, should we encounter any farmers.

What We Know about Prehistoric Plant Use in Southeastern New Mexico

Available comparative flotation data include assemblages from Archaic and Formative period seasonal base camps and special activity sites from Chihuahuan Desert or semidesert grassland and desert scrub communities. Useful comparisons can be drawn from sites in the intermontane basins of south-central New Mexico, as well as the lower Pecos River Valley. In addition to the very hot, desiccated climatic conditions that persist throughout this region, the project area is distinguished by soil conditions that further limit primary productivity, vegetation cover, and floral diversity. Underlying gypsum bedrock, gypsum soils, saline springs, and extensive alkali playas all contribute to soil chemical conditions that dramatically limit plant growth. Two floral communities characterized by taxa tolerant of saline conditions comprise fully 38 percent of the 100.8 ha study area (Marron and Associates 2000:3.9). The closed basin alkali riparian community is dominated by saltbush, alkali sacaton, seepweed, and pickleweed, while the highly localized endemic gypsum bedrock community is distinguished by taxa rarely encountered elsewhere in the state: *Tiquilia* (borage family), *Nerisyrenia* (mustard family), and *Sartwelia* (gypsumweed).

Recovery of perennial plant species presents a complex interpretive problem for sites of southern New Mexico Basins and the Hueco Bolson. Ethnographic studies from the historic era point to a heavy focus on concentrated perennial resources such as the leaf succulents, cacti, and mesquite (Castetter and Opler 1936; Bell and Castetter 1937, 1941; Castetter et al. 1938; Baseheart 1974). Previous discussions of site function and subsistence strategies have centered on defining small sites consisting primarily of fire-cracked rock thermal features as special processing camps. Many studies have concluded that small rock hearths as well as considerably larger fire-cracked rock features from sites excavated in the foothills and basins of south-central New Mexico and northern Texas were predominately used to process leaf succulents (O'Laughlin 1980; Carmichael 1985; Seaman et al. 1987; Gasser 1983). Interpretations of feature use are based on feature distributions, presence and quantity of fire-cracked rock, and distributions of leaf succulents today (O'Laughlin 1980; Seaman et al 1987). However, very little direct archaeobotanical evidence exists to reinforce these interpretations. Those sites where agave remains have been recovered are in the foothills or valley margins, where agave is easily accessible. Oxalic acid is a component of agave and causes contact dermatitis, providing motivation for processing the plant as close to the source as possible (Niethammer 1974:4; Buskirk 1986:170; Franceschi and Horner 1980; Kearney and Peebles 1951:193; Johns 1990). Buskirk notes that each agave crown can weigh as much as 20 pounds. Because it was common practice to roast 40 or more crowns at a time, their weight could also have been a compelling factor in the placement of roasting pits.

With only one questionable yucca/agave carpel as evidence of the possible processing of leaf succulents during the Archaic period at Keystone Dam Site 33, O'Laughlin (1980:93) still states that the primary function of small fire-cracked rock hearths at the site was to "bake leaf succulents such as soap-tree yucca, lechuguilla, and sotol." Evidence of exploitation of other economic plants at this site comes in the form of carbonized seeds of two species of cacti, sedge, and several edible weeds. While it is possible that leaf succulents were processed at Site 33, it seems more accurate to assume that plant processing included a variety of plants at this and other Archaic sites of the Chihuahuan Desert.

Prehistoric exploitation of shinnery oak (*Quercus havardii*) is an additional topic for which floral taxonomic data will be sought. Sand shinnery communities are found on about six million acres of the Southern Plains, largely in the southeastern corner of New Mexico, and neighboring portions of Texas and Oklahoma (Peterson and Boyd 1998). Though there are considerable debates about the extent of this community, both today and in the past, it is evident that this oak species is well adapted to this inhospitable environment and has been locally present for hundreds or thousands of years (Peterson and Boyd 1998:1, 2) . Cleverly, shin oak consists of massive underground stem systems supporting meager above-ground growth (short-lived twigs, mostly

30-60 cm high) and some of the largest acorns, up to 25 mm long, known in the desert Southwest (Martin and Hutchins 1981:519). Clearly shin oak has the potential of providing a critical food resource for humans and game species in this desperately dry corner of New Mexico. Important questions thus include: How edible are these giant *Q. havardii* acorns? What preservation problems affect the archeological recovery of prehistoric specimens? Acorn remains have been conspicuously absent from most Southwest archeobotanical assemblages, and we are as yet unable to determine why. Acorns are found at very few sites, often as unburned, rodent-gnawed specimens in caves or dry shelters, where their presence may not be related to prehistoric subsistence at all (e.g., Adams and Huckell 1986:297). Recovery of small numbers of partially carbonized acorns at Fresnal Shelter (Bohrer 1972:214) may be the only reason to pursue the study of shin oak as a prehistoric resource.

Plant use over time. Floral remains from sites investigated in southern New Mexico and northern Texas for all time periods are providing accumulating evidence that a variety of plants were exploited. Prehistoric populations living in an environment that is cyclically very dry and very hot might reasonably choose a varying and flexible economic strategy, growing domesticates and journeying to the nearby mountain foothills and higher elevation basins for exploitable resources.

Plant remains recovered from the Archaic period and early Mesilla phase reflect the geographical locations of the sites. The richest array of economic plant remains is found at the Keystone Dam Site and Fresnal Shelter (Bohrer 1981). Keystone Dam is on an alluvial terrace east of the Rio Grande and west of the Franklin Mountains, giving site occupants access to both riverine and montane plant resources. Fresnal Shelter is in a limestone cliff overhang of Fresnal Canyon in the Sacramento Mountains. More limited floral remains from these time periods at the Piñon project may indicate true resource-specific processing of leaf succulents and cacti at Cornucopia Draw (Toll and McBride 1999). Other floral studies come from sites situated in arid dunal basins, where resource availability is limited to grasses, weedy annuals, and yucca; here, grasses are the most widespread seed genera recovered. Evidence of domesticated plant use during the Archaic is restricted to Fresnal Shelter, in the Sacramento Mountains of southeastern New Mexico. Bohrer (1981:45) classifies maize as one of the "less commonly eaten foods" at the shelter based on constancy and presence ratios of all plant remains recovered. During the Archaic, it would appear that grasses, annuals, and perennials (including leaf succulents) were all used to a greater or lesser degree, depending on what environmental zone was under exploitation, while domesticates played a minor role in the diet.

Prickly pear seeds are the most common plant remain recovered from Mesilla phase contexts. Goosefoot, hedgehog cactus, mesquite, and purslane form a second tier of exploited taxa. Cultigens are present in a wider range of locations, in both basin and valley margin areas. Plant remains from Piñon were more restricted in diversity, consisting of agave and prickly pear. The most diverse array of plant taxa was recovered from Turquoise Ridge, including maize and domesticated beans (Whalen 1994). Considering that Turquoise Ridge is on the edge of the Hueco Bolson, the best-watered spot between the desert basin zone and the mountain zone, this diversity is not surprising. Evidence of the exploitation of leaf succulents is present at several sites, but positive identification of agave is limited to Piñon and Wind Canyon. Fewer grass taxa were recovered from Mesilla phase sites, suggesting that grasses could have been exploited more during the Archaic than during the early Formative.

Plant remains recovered from Doña Ana/El Paso phase sites indicate that the role of domesticated plants may have stayed much the same as in the Mesilla phase. Cultigens have been found at several Formative period sites (Ford 1977; Wetterstrom 1980). Corn caches in storage pits were discovered by Scarborough (1985) at Anapra Pueblo near Sunland Park, and Brook (1966:41) notes that 200 bushels of corn were excavated from a village about 64 km north of Hot Well Pueblo in El Paso. During the Doña Ana and El Paso phases, goosefoot is the most widely recovered plant taxon. Amongst perennials, agave and hedgehog cactus surpass the previously common prickly pear. In this period, a wide array of annuals and perennials were utilized, including taxa that did not occur in previous time periods (Mexican buckeye, tepary beans, *Pectis* type, and sedge).

Wood use. Mesquite is the dominant wood taxon identified at sites throughout the lower Pecos Valley, Mesilla Bolson, Hueco Bolson, and Tularosa Basin. A dense wood that provides "a bed of hot, slow burning coals," Mesquite's admirable fuel qualities are surely responsible for the clear prehistoric preference for this fuel, even in areas of the El Paso region, where it is not particularly abundant today, such as the high desert zone on Fort Bliss (Ford 1977:200). The predominance of mesquite charcoal is also significant at sites in the lower elevation zones, where mesquite flourishes today in Chihuahuan desert scrub communities (Brown 1994), since the extent and density of mesquite has increased dramatically in this zone in the last hundred years (York and Dick-Peddie 1969). The greater abundance of mesquite in the archeological record than in the contemporary environment (Minnis and Toll 1991:397) points to the particular usefulness and desirability of this fuel.

We can expect to see heavy use of mesquite in the Loving Lakes sites as well, bolstered by smaller amounts of locally available but less useful shrubby taxa such as creosotebush, tarbush, acacia, condalia, and ocotillo (Martin 1980). The absence of larger arboreal species with more substantial timbers no doubt affected site architecture and even size in the dunes and playas of the lower Pecos. Where arboreal species are more easily gathered, as in the Hondo Valley and Roswell areas, a very different wood assemblage is seen. Here, inhabitants took advantage of the considerable diversity of woody taxa from the varied habitats afforded by topographic heterogeneity and the presence of an active stream. Towards the bottom of this elevational gradient, structures at Fox Place showed ash as the apparent material of choice for construction, followed by cottonwood/willow (Toll 2002). Ash, like hackberry, is a hard, heavy, and relatively weak wood (Lamb 1975:5-6) used in the historic period for fenceposts, fuel, and axe handles (Vines 1960:207, 863). In addition to substantial timbers, roofing needs include smaller fill elements, which are also found in roof deposits. Reedgrass and muhly grass stems have been recovered, as well as oak twigs and ponderosa twigs and needles at sites at various elevations. Shrubby wood associates clearly with fuel use at all elevations. Taxa include mesquite, creosotebush, greasewood, and several members of the rose family. At higher elevations, coniferous wood (largely juniper and piñon) collected from ridges or washed down from upstream habitats forms a significant portion of fuel assemblages.

Cornucopia Draw, southwest of the Loving Lakes project area, presents an entirely different approach to wood use, linked to available species and a different constellation of subsistence activities. Here, mesquite is nearly absent, and wood use is distinguished by a marked emphasis on ocotillo, with small amounts of juniper, creosotebush, Mormon tea, and saltbush/greasewood (McBride 1996; Toll and McBride 1999). The high percentage of ocotillo wood may be linked to the agave pit-roasting process. Pennington (1963:130) describes the use of dead stalks of a tall cactus that grows in western canyons and middle sections of canyon slopes in the Tarahumara country of Mexico. The spiny branches are laid crosswise upon the layer of plants that cover the stones in the roasting pit, and the mescal hearts are placed on top of the branches and then covered with a layer of grass or pine needles. Ocotillo branches may have been used in much the same way, accounting for the unusually high percentage of ocotillo in the charcoal assemblage.

Macrobotanical studies of cultigens. Morphometric parameters of corn are our chief source of information about Formative period farming in the southeastern plains. We might reasonably expect to see evidence of more intensive, productive farming at floodplain pueblos in the area, such as Henderson and Bloom Mound, compared to pithouse villages such as Fox Place, which appear to have grown by accretion. Careful analysis of the corn remains at Henderson (Dunavan 1989) would seem to reject any such differential effort or success: the Henderson cobs are small, slender, and cigar-shaped ("Chapalote-type"), predominantly 10-rowed, with significant numbers of 8- and 12-rowed cobs. These cobs match those found at Fox Place (A.D. 1200s; Toll 2002). Our small and scattered sample of prehistoric corn from the southeastern plains is thus far relatively homogeneous, extending back into the Beth's Cave and Feather Cave eras (very early Formative, A.D. 500–800; Adams and Wiseman 1994). While *Zea* is the only domesticate recovered at many Formative period sites in the southeast, there is every reason to believe that farming included a more diversified repertoire. Differential preservation leaves a very poor record of squash and beans. Both taxa have been recovered from other (largely higher elevation) sites in the area (Minnis et al. 1982; Adams 1991; Struever and Donaldson 1992; Toll 1996), though in very low frequency. Carbonized *Cucurbita pepo* seeds were also recovered at Block Lookout (Ford 1977). We have much to learn about farming and its relation to other subsistence pursuits in this area; as details emerge, the picture may well be more diverse and complex.

Guidelines for Botanical Data Collection

Flotation sampling. The potential contribution of flotation analyses to the project will be maximized by attention to reasonable and appropriate sampling in the field. It is helpful to recognize a fundamental difference between floral data collected in soil samples and virtually every other artifact category. Standard field procedure now dictates collection and curation with provenience information of every sherd, bone, and lithic artifact encountered during most excavation situations; sampling of this universe may take place later in the lab. Doing the equivalent for botanical materials would mean bringing home the entire site: a ludicrous proposition. This makes every soil sample collected in the field a sampling decision. Samples not taken are generally gone forever. On the other hand, a decision to sample widely and intensively (e.g., alternate meter grids in every cultural stratum) to guard against such information loss can generate hundreds or thousands of unanalyzed samples. Lacking infinite time and resources, we must try to garner the most information from judicious sampling. Two aspects hallmark the most effective sampling protocols: awareness of which depositional contexts are most productive of floral remains, and recognition of site areas from which subsistence data will be most useful in addressing the research foci of the project.

Previous experience with flotation analysis at sites on the plains of southeastern New Mexico warns us that preservation of floral materials is likely to be poor. We will generally be dealing with shallow sites with few structures in windblown settings. Our best option is to maximize the size of individual soil samples from carefully considered proveniences. In practice, this will mean full collection of intact features (especially burn features) whenever possible.

Pollen sampling. Pollen sampling should be considered complementary rather than parallel to flotation. Pollen is preserved in very different contexts from carbonized seeds and has different contributions to make to the biological data corpus that informs on subsistence and environmental parameters. Whereas primary and secondary deposits from thermal features make up much of the useful flotation record (along with far less frequent catastrophic burn events), pollen does not survive burning *or* deposition in alkaline, water-holding features (such as ash-filled, lined hearths). Pollen's particular gift lies in locating and identifying plant utilization activities that *aren't* likely to involve burning in places such as milling bins, ground stone artifacts, storage features, coprolites, and interior floors. Since structures will likely be rare in these sites, well-preserved interior floors are not expected to be encountered with any regularity. These surfaces do provide opportunities for productive use of pollen data and should be sampled with care. Systematic intensive sampling (e.g., alternate meter grids) of pollen *and* flotation can work well together to produce relatively detailed mapping of activity areas of interior space, revealing aspects of site and household economic organization. The potential contributions of pollen analysis are generally wasted on strata such as trash fill, roof fall, and middens.

Agricultural fields are another cultural provenience not likely to be encountered in this project but have information potential that can be addressed with unburned floral artifacts. Field personnel should be alert to this potential, just in case. Pollen analysis has been used effectively to verify designation of prehistoric fields and identify specific crops grown. Pollen, and not flotation samples, should be taken from protected spots in any possible farm fields. Suitable locations might be from among or tucked under rocks forming field borders or water-diversion features.

Macrobotanical and wood sampling. Attentive field collection of wood and charcoal can greatly increase the interpretive value of this artifact category. Charcoal samples should be directed toward proveniences that can most clearly represent fuelwood or construction elements. To the degree that such deposits can be identified confidently, species composition data will provide far more detailed and accurate pictures of prehistoric wood utilization. We know from numerous projects (including the Fox Place, Toll 2002:129 and Table 60) that fuelwood and construction wood often had distinctly different selection criteria. Consequently some of the most interesting aspects of prehistoric wood use emerge when these functional contexts are differentiated. The number of charcoal loci that are clearly one functional context or the other may be few, but excavation surely constitutes the best opportunity for identifying suitable samples. Primary deposits in thermal features, and secondary trash strata (room and floor fill, secondary deposits in pits and structures, middens) are likely fuel contexts, while roof fall, intact roofs, and in situ posts are all likely contexts for construction materials.

Some wood taxa recovered from archeological sites on the Eastern Plains of New Mexico are good candidates for transportation as driftwood. At Salt Creek sites, for instance, oak, rose family, pine, and juniper grow today at considerably higher elevations and may have been carried down the creek as driftwood from the Capitan Mountains to within reasonable collecting range of site occupants (McBride and Toll 2003:293). Out-of-range woody taxa encountered in our analysis will alert us to possibilities of driftwood transportation or changes in vegetation communities over time.

Conclusion

The data recovery program of the Loving Lakes project is challenging. The sites are large, their content and integrity are largely obscured, and their true data potential is unknown prior to excavation. Regional research problems are both basic and sophisticated in their nature and potential. Even if the sites enclose little more than is evident from surface observations, the archaeological record will contribute to a substantial improvement in our understanding of both regional history and prehistory. If the overlying dunes have encapsulated discrete components (as opposed to temporally mixed palimpsests), the data recovery effort will provide an opportunity for substantial substantive and methodological contributions to the archaeology of southeastern New Mexico. Key elements are thoroughness in the assessment of the data potential of the site strata, flexibility in response by the field supervisors so that they can take advantage of opportunities while minimizing redundancy, and targeted high-precision recovery using feature- and surface-oriented strategies.

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